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Engineering and Mining Journal

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INDEX TO VOLUME CVI

July 1 to December 31, 1918

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McGRAW-HILL COMPANY, INC.
10TH AVE. AT 36TH ST.
NEW YORK

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ENGINEERING AND MINING JOURNAL

INDEX TO VOLUME CVI

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EXPLANATORY NOTE

Illustrated articles are denoted by an asterisk (*); book notices by a dagger (†).

This index is made comprehensive but concise. Pains are taken to bring together matter belonging to the same subject, so that when a reader looks up an article, he will be cited to related data. Series of simple page numbers, following names of mines or companies, usually refer to news notes. When minor references are numerous, as in the case of "Anaconda," they are sometimes separately designated as "Various notes." With a major entry or series of entries, may be placed several minor ones, relating to the same subject in order that its history may be followed. If the author's name be known, it is the simplest means of reference. Productions are indexed under names of metals and countries or states. The mere juxtaposition of a mineral and geographical name usually signifies an output, but may cover other statistical or news matter. Not all news are indexed but a liberal selection of them is made.

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Engineering and Mining Journal

July 6, 1918

Volume 106

Number 1

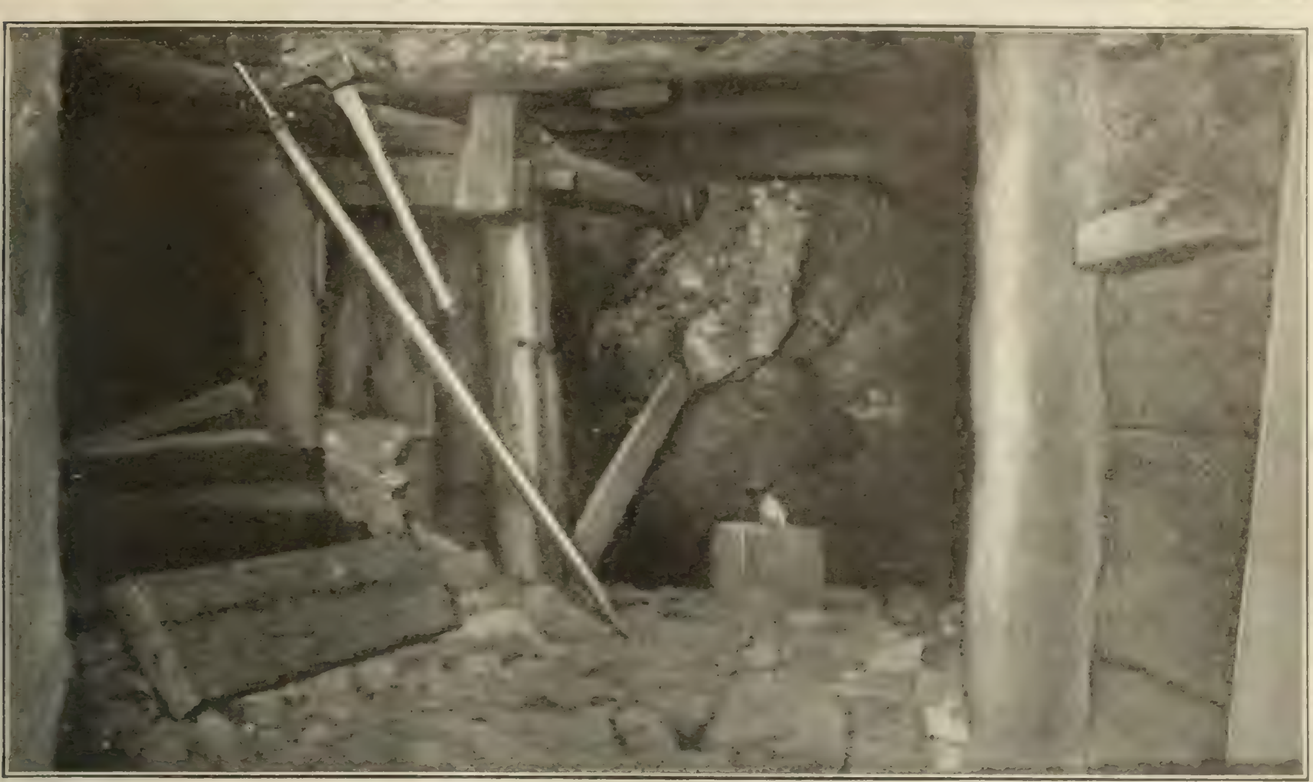

FIG. 1. TWO 16-FT. SPLICED STULLS FOR THE NEXT SET AHEAD IN THE CAVED PORTION OF A STOPE ARE TEMPORARILY SUPPORTED ON STRINGERS EXTENDED FROM UNDER THE CAPS OF THE SETS IN PLACE

Recovering Caved Stopes in Narrow Veins—II

BY CLAUDE T. RICE

The threatened collapse of a stope, timbered but unfilled for five floors, was prevented by quickly reinforcing the middle floor with heavy stulls cushioned at each end with headboards 15 in. thick. A caved stope which was filled mainly with large slabs of ore was reopened by taking the ore out in vertical slices from the top down, though in another cave in which the ore had broken small, and so would run easily, the stope was reopened by slicing the caved ore down on its angle of repose. In still another rather high cave that had been caused by falling of a large mass of ore from the back, with the result that the working had been stripped of timbers, the ore was recovered and the stope reopened, by building a truss across the top to support the back, and then drawing the ore from below this truss without providing other support for the walls, and with little shoveling.

AT THE Hecla mine a year or two ago a stope, approximately 600 ft. long and five floors, or 45 ft., high, in one of the veins on the 1200 ft. level, suddenly began to take weight and to give trouble. This was not surprising, for that part of the stope had been open to a height of five floors for several months, as the mine had been short of waste filling for some time. The mining of the top floor of this stope had been permitted to lag greatly, owing to the fact that this working was in ground that appeared to be well able to wait indefinitely for filling.

The back of ore was strong enough; it was the walls that had begun to give trouble, for the span of five floors, or 45 ft., as shown in Fig. 2, had proved too much for them, and they were suddenly showing signs of great weight. The stulls of the lower part of the stope began to snap and pop; especially those upon the middle floor. Something had to be done immediately, or the stope would surely be lost.

With 600 ft. of stope threatening to cave, it was a formidable problem. Yet the loss of the stope was averted in a simple way, as the men who had the condition to contend with understood what was really happening. Large stulls, many of them 24 in. in diameter, were put in at 5-ft. centers on the middle floor of the stope, which varied in width from 7 to 14 ft. Nothing else was done; yet these stulls prevented the stope from caving and held the working open until it could be filled.

Stope Saved by Putting in Stulls and Exceedingly Thick Headboards

The reason that this line of stulls held the stope open, even after the weight from the walls had begun to break fairly large stulls, is indicated by the fact that these new stulls were almost immediately driven into their headboards several inches. In other words, it was the initial creep of the walls, as they tried to arch themselves across this wide span, that was causing the timbers to fail. The walls, therefore, were prevented from coming in not so much by the size of the stulls that were used as by the especially thick headboards—five 3-in. planks at each end—that were put in between the stulls and the ground to act as cushions. With 30 in. of crossgrain timber, exclusive of wedges and filling pieces, between the walls and the stulls, sufficient cushioning timber had been provided to take care of the creep of the ground until arches of equilibrium had been established, in both walls, across the span of five floors.

Providing for the initial creep of the ground is a most important point in the timbering of any working, and it is because many mining men do not have a clear conception of what really happens when ground begins to take weight that hundreds of posts, stulls and caps are broken in mines each year that should not be broken and would not have been if put in with sufficient provision for taking care of the initial creep of the ground. It therefore may not be amiss to digress slightly in order to explain just what occurs when ground takes weight, and precisely what did happen in this large Hecla stope when the walls began to cave in, as the whole subject is rather intimately entwined with the matter of caved stopes and their occurrence.

It seems extraordinary, especially after the weight of the walls had begun to break stulls 18 in. in diameter and only from 7 to 14 ft. long, that a stope 45 ft. high and 600 ft. long which was threatening to cave could be saved simply by putting in a series of large stulls at 5-ft. centers along the middle floor. Yet to one who understands just what happens when ground takes weight it is not surprising that such a simple reinforcement was sufficient to hold the stope. The reason why this line of stulls, which was put in with exceedingly thick headboards on the middle floor of this stope, prevented the working from caving, even after the weight had become so great that it was breaking stulls 18 in. in diameter (and ground is pretty heavy that will break such stulls when they are only 7 to 14 ft. long), was simply that the 30 in. of crossgrain timber in the headboards of the new stulls was amply thick enough to continue to yield until the initial creep of the walls had stopped. When that was over, these new stulls, 2 ft. in diameter and placed at 5-ft. centers, were strong enough to hold in place the ground that had not keyed itself up.

If these stulls had failed, the ground that had not been able to key itself up into position in the walls would have come in. The footings from which the "dry" arches or sub-arches of self-support were springing would have failed. The ground that had keyed itself in place would then have come in. The failure of the footings of the arches would have increased the space of the major arch, and that would have caused the solid rock of the walls again to become beams, and they would have had to slab off under tension and shearing stresses until they had again assumed the arched shape proper for carrying the weight entirely in compression across the increased span. By that time the working would have been filled with broken material from the walls, and probably the span across the top of the opening would have been increased so greatly that the back itself would have begun to cave. The stope would have been filled with broken material from the back and walls, and the working would finally have been lost in spite of everything that could be done. That is the mechanics of caves.

Sometimes it is walls, at other times it is the back, occasionally it is both the walls and the back that give the trouble. It all depends upon the conditions and the strength of the ground. But practically all caves, if the truth were known, could be traced back to the fact that when the working was first opened up, and also when it was subsequently retimbered, the sets or posts or stulls were put in without any provision for keeping the weight of the ground from becoming excessive on the main members of the sets during initial creep. The timbers have consequently failed much sooner than they should have, and so the working has had to be retimbered much oftener than it should have been, ground has had to be taken out at each retimbering, and this has made the working larger and larger, and therefore even harder to hold. Finally, as the result of this improper handling of the timbering of the opening, the ground in the whole vicinity has got in motion, and the working has probably caved.

Cave Filled Mainly with Large Slabs Reopened by Taking the Ore Out in Vertical Slices

The first caved stope the reopening of which will be discussed in detail is that which occurred between No. 4 and 6 chutes on the 1200-ft. level in the main Hecla orebody. As shown in Fig. 3, this cave was 60 ft. long and did not catch itself up until it was about 38 ft. above the tramming track of the slice that was being mined. Throughout most of its length this cave had a width of 24 ft. In caving, the back had come down mainly in large slabs, so that the pile of caved ore showed little tendency to run, even in rather steep faces. Consequently the ore was taken out in vertical slices from the top down, supporting the walls with spliced timbers as fast as sufficient room was made for a stull to be positioned properly with respect to the sets in the uncaved part of the stope.

At the time that the cave occurred, the back had been stoped up 10 floors, or 90 ft., above the 1200-ft. level. The customary horizontal slice three floors high had been taken out across the top of the stope, the stope tramming tracks had been raised from the sixth to the ninth floor, crossboard lagging had been put in on the floor above, and the stope tightly filled with waste below the ninth floor in preparation for resumption of stoping, when suddenly the back for 60 ft. along the vein began to take weight. So little time remained for putting in reinforcing timbers that only the tramming floor could be attended to before the stope caved. But fortunately the stringers put in on both sides of the track and the helper posts stood on them to catch up the stull caps of the crossboard floor had proved sufficient reinforcement to hold the tramming floor open, although the rest of the stope closed in completely.

As soon as the back had stopped caving and the stope had become quiet, reopening of the working began. Beginning on the crossboard floor in the uncaved part of the stope, and two sets back from the end of the cave that was nearest to a chute, the back was stoped up a floor and advanced to the edge of the cave, timbering the new floor securely with stull sets as the face was carried ahead. As the end of the cave was still going up almost vertically, the stope was again raised a floor two sets back from the face, advanced to the edge of the cave, and timbered securely. On this floor the stope broke into the open space above the pile of caved ore, and as the back over the cave was only three or four feet higher than the back over the stope, it was decided to work in from this floor in catching up the cave.

SPLICED STULLS USED IN CATCHING UP CAVE, AS STOPE WAS 24 FT. WIDE

As the caved stope was 24 ft. wide, even right under where the back had caught itself up, spliced stulls had to be used in making the back secure. In order to facilitate the handling of these catching-up stulls, stringers 16 ft. long and extending 6 ft. out into the cave were put in on the top floor of the stope. These stringers were securely carried at the stope end by being blocked down tightly upon false posts from the stull cap above, being held in position the while by means of collar cleats from the stull cap, as shown in Fig. 1. At their outer ends the stringers were blocked up to the proper height from the pile of caved ore. Four stringers were put in, so that there was a stringer under each end of the two stulls that were to be butted together. One of these stulls was 16 ft. long—the greatest length of timber that could be got into the stope conveniently. The other was 8 ft. long.

As soon as they had been lifted up on the stringers, the two stulls were toenailed together with 120-penny spikes. This having been done, the spliced stull was rolled out into proper position at 5-ft. centers from the last stull cap in the stope. Headboards of 3-in. planks, three deep and 5 ft. long, were put in at each end, and the spliced stull was then securely blocked in place. In blocking all the stulls in these caves, the bottom wedges were driven in much further than the upper ones, so as to bend the headboards out considerably at the bottom. Then, in case the top weight should come again on the stope before side weight had nipped the stulls securely into their headboards, the timbers would be much less likely to give way.

As soon as the first catching-up stull had been got in, and the back caught up securely from it, the miners began to carry down an approximately vertical slice across the end of the pile of caved ore, so as to make room for a line of stulls from top to bottom of the cave. The ore from the slice was allowed to run down to the crossboard floor, where it was drawn into a car, with a minimum of shoveling, and then run to the nearest chute.

In carrying down the slice, little trouble was had in keeping the face almost vertical, owing to the boulders that were scattered through the pile of caved ore. Occasionally one of these boulders would give trouble, and then it would be drilled half-way through with a Jackhamer drill and blasted with just enough dynamite to split it open, shaking the pile as little as possible. But if the boulder could be skidded down to the crossboard floor without much difficulty, this would be done before the boulder was block-holed.

As soon as enough wall was exposed to permit of positioning a spliced stull properly at 5-ft. centers horizontally and 9-ft. centers vertically from the other timbering in the stope, four stringers would be put in on that floor, with their outer ends carried from the pile of caved ore. Then the spliced stull, after having been toenailed together, would be rolled into position on these stringers and securely blocked in place, just as in the case of the catching-up stull, except that the headboard planks of the lower stulls were only 2½ ft. long—the length of headboard used in the stull caps of the stope. As soon as a stull had been got in below one above, not only would the two be braced from the stull caps adjoining, but posts would also be put in between the lower and the upper stull, so as to tie them together into a stull set and make the timbering in the cave more secure.

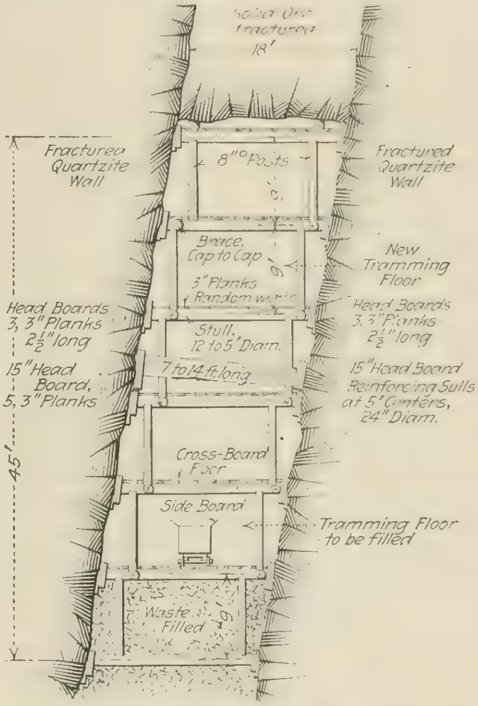

FIG. 2. CAVING WAS AVERTED BY QUICK ACTION IN PUTTING IN HEAVY STULLS WITH THICK HEADBOARDS ALONG THE CENTER OF THE STOPE

In this manner the vertical slice was worked down until the crossboard floor was reached. Then, as the place of the ore had been taken by a series of stull sets which were tied to the timbering of the uncaved part of the stope adjoining, and the walls were securely supported, the miners went again to the top of the cave, moved the stringers ahead a set, again carrying their outer ends on blocks from the pile of caved ore, and put in another catching-up stull, just as before. As soon as the back had been securely blocked up from this catching-up stull, which, of course, had 5-ft. headboards, as did the first catching-up stull, the miners would begin to carry down another vertical slice across the end of the cave, timbering it as fast as they took out the ore. In this way the pile of caved ore was worked out in a series of vertical slices.

As soon as all the ore had been got out of the cave, the uncaved part of the stope on the end at which the reopening of the cave had begun was stoped across to the nearest waste raise, the 13th floor mined across the stope, and the back over the far end of the cave squared up. Then, after the far end of the cave had been lagged so as to keep the waste filling from becoming mixed with the ore when mining of the block next that end of the stope began, the tramming track of the stope was raised to the 12th floor, the crossboard lagging was put in on the 13th, the stope filled tightly with waste up to the new tramming floor, and everything made ready for the resumption of stoping, just as though there never had been a cave.

The stope that caved between Nos. 10 and 12 chutes of the 1400-ft. level had to be reopened in a somewhat different manner, as the ore had broken small in caving, and so ran easily. The vein had been stoped to a width of about 20 ft. between these chutes, and the working carried up seven sets above the level. The tramming tracks of the stope had just been raised to the sixth floor, the crossboard lagging put in on the floor above, and the stope below filled, when the back began to cave for a length of almost 100 ft. along the vein. Stringers and helper posts were rushed in on the tramming floor, and these proved sufficient to hold that floor open. But most of the stope above was stripped of timbers, and the stull sets at the edge of the cave were smashed down at the center, even on the crossboard floor.

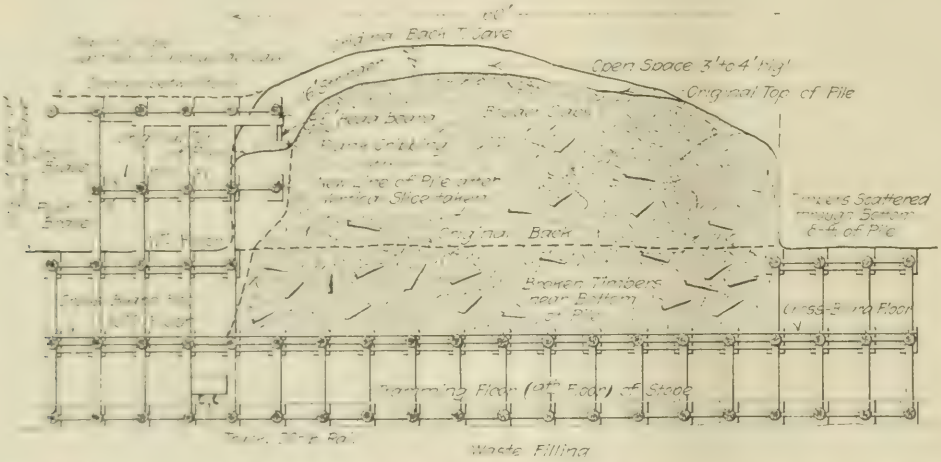
60'
Original Back of Cave
Open Space 3' to 4' high
Original Top of Pile
Broken Ore
Line of Pile after Vertical Slice taken
Original Back
Timbers Scattered through Bottom 6-ft of Pile
Broken Timbers near Bottom of Pile
Cross-Board Floor
Tramming Floor (9th Floor) of Stope
Waste Filling

FIG. 3. LONGITUDINAL SECTION OF STOPE ABOVE 1200-FT. LEVEL THAT CAVED BETWEEN CHUTES NOS. 4 AND 6, 60 FT. LONG, 38 FT. HIGH AND 24 FT. WIDE

This cave, as shown in Fig. 4, was more than 90 ft. long and had eaten up for more than 50 ft. above the tramming track of the stope before it stopped. Throughout most of this height the cave was 20 ft. wide, but at the top the vein was only 7 or 8 ft. wide. The ore had broken fine in caving and had run down at the ends at a fairly low angle of repose. As the stope had arched itself in the plane of the vein, and an open space from 5 to 7 ft. high had been left between the back and the top of the caved pile, it was easy to enter the cave from either end after the ground had become quiet.

Stulls with 5-ft. headboards were put in at the top to catch up the back, starting at one end and working ahead and up the cave. Generally the headboards of these catching-up stulls were put in three 3-in. planks deep at each end and planks 5 ft. long were always used as headboards on the catching-up stulls. When these catching-up stulls could not be got in near enough to the back to block the ground up directly from them, sprags, and even small false sets, were stood on top of them to catch up the ground. In places where the stulls, owing to the shape of the walls, had to be placed rather far apart, bad ground between was also caught up by lacing old planks across from stull to stull.

When the top of this cave was reached, an Ingersoll-Rand tugger hoist was mounted on a 3-in. crossbar and used for "snaking" stulls and other timbers up the pile, for as soon as the near side had been caught up securely, catching-up stulls were also put in down the other side of the cave and the back at that end also made safe.

As soon as the back had been securedly caught up and the sides trimmed down carefully, the miners began at the end nearest a chute to run the ore in the pile down at its angle of repose through the crossboards into a car, and then trammed it to the nearest chute practically without any shoveling. In this way the pile of caved ore was removed, and the walls were supported with spliced stulls as soon as enough wall was exposed for placing these permanent stulls at 5-ft. centers horizontally, and 9-ft. centers vertically, from the timbering in the uncaved part of the stope adjoining.

The stope being 20 ft. wide, these stulls had to be spliced. First a stull 16 ft. long was blocked up into proper position on the pile of caved ore, and then a butt-block stull 4 ft. long was put in to splice it out across the stope. Headboards 2½ ft. long and of the usual thickness were put in at each end between the spliced stull and the ground, and, in order to enable these stulls to carry top weight better, they were put in a little high at the splices.

As fast as the stulls were got in they were braced sideways from the nearest stull on the same floor both at their ends and at the splice, and as soon as a stull had been put in under one above, posts were stood under the splices as well as under the ends of the stulls, so as to tie the timbering together securely into stull sets, and these posts, in their turn, were also braced sideways from one another, so that if a boulder should roll down the stope it would not knock out a post.

As rapidly as the pile of caved ore was worked back at the bottom, and stull caps that had been crushed down at the center were uncovered on the crossboard floor, new spliced stulls were put in over them, blocking the splice up from the crushed-down stull at the same time that posts were put in both at the ends and over the splice to tie the new stulls to the stull cap above so as to form new stull sets. By the time five or six of these new spliced stull caps had been got in on the crossboard floor, the walls had pinched the stull caps on the different floor above sufficiently into their headboards for the old crushed-down stull caps of the crossboard floor to be taken out with perfect safety. Of course, as soon as the crushed-down stull caps, some of which were 18 in. low at the center, were taken out, posts were stood under the new caps, both at their ends and under the splices. This leaving of the crushed-down stull caps in until the ground had nipped the spliced stull sets above securely into their headboards was much better practice than to have taken out the crushed-down stull caps as fast as they were uncovered.

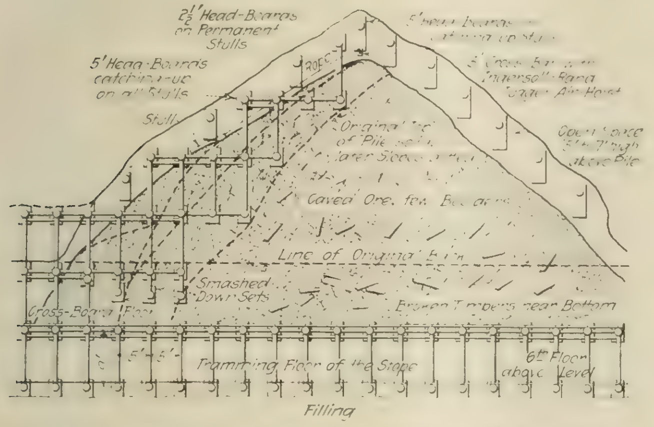

FIG. 4. LONGITUDINAL SECTION OF STOPE ABOVE THE 1400-FT. LEVEL THAT CAVED FOR A LENGTH OF 90 FT., BETWEEN CHUTES NOS. 10 AND 12. THIS CAVE WAS 55 FT. HIGH AND 20 FT. WIDE

In this way, as fast as the ore was drawn down at its angle of repose into cars on the tramming track of the stope, and taken to the nearest chute to be sent to the level, new stull caps were put in to support the walls, and then as soon as they could be, these stull caps were tied to those above, and to the side, with posts and braces to form a series of stull sets.

When all the ore had been got out of the cave, and the working had been timbered securely, stoping was resumed at the end that was nearest to a waste raise, and the different floors were carried through to this waste raise and manway. Often, when that had been done, the tramming track of the stope was raised to next to the top floor, the crossboard lagging put in on the top floor, and the floors below the tramming track were filled tightly with waste in preparation for resumption of stoping.

Before filling the stope, the little ore that had been exposed in the walls by the slabbing resulting from the caving of the working was drilled, either with a stoper or a Jackhamer, and shot out carefully with a minimum of dynamite. Generally so little ground had to be taken out in mining this ore that blocking could be used to fill in behind the headboards of the stull sets, but occasionally so much ground had to be shot out in getting the ore that a new butt stull had to be put in. Fortunately, owing to the way in which both the stull caps and the posts are braced from one another in the Hecla stull-set system of timbering, there was little possibility of the timbers collapsing when the ground was shot out, and it is just to prevent that possibility that both the posts and the stull caps are so securely tied to one another by collar braces. Of course, the ore could have been shot out of the walls while working the ore out of the cave, but waiting until the stope is all caught up and everything is ready for filling, before the ore is shot out of the walls, is much better practice, as there is then much less danger of starting the stope to caving again.

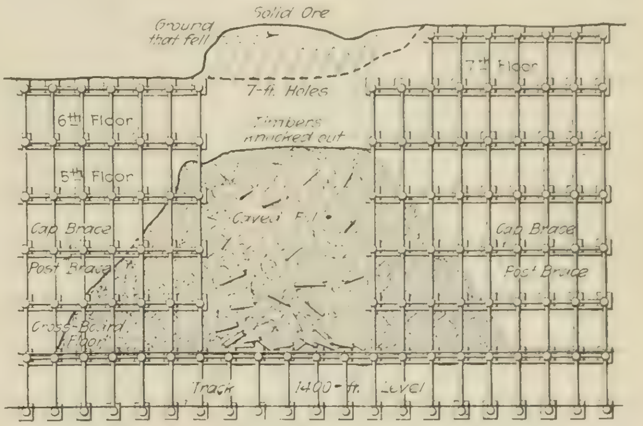

FIG. 5. LONGITUDINAL SECTION OF STOPE ABOVE 1400-FT. LEVEL THAT CAVED FOR A LENGTH OF 30 FT., A WIDTH OF 32 FT. AND A HEIGHT OF 50 FT. BETWEEN CHUTES NOS. 30 AND 32

Another cave, if such it may be called, that presented a somewhat different problem, occurred in the stope between Nos. 30 and 32 chutes on the 1400-ft. level. The stope had been carried up six floors, but as the mine was temporarily short of waste filling, the seventh floor was being worked out. At that time only drilling was being done by the miners, and the blasting of the holes was left for a special crew to do after the night shift had left the mine. As a result, often 100 holes would have to be blasted at a time in one stope. In this particular stope about 60 holes 7 ft. deep had been drilled in the back, and were ready for blasting. The ground, although breaking well, required considerable dynamite to break the holes to bottom, and the blasting crew loaded the holes a little heavier than usual. As a consequence the holes not only broke to bottom, but, going all at one time, they shook the back so badly that a block of ground about 6 ft. deeper than had been drilled fell out of the top of the stope. The back was thus several feet higher than the seventh floor, as can be seen by referring to Fig. 5, though, as there had been considerable muck on the different floors at the time the holes were blasted, the pile of broken ore in the stope came almost up to the fifth floor. This pile of broken ore gave excellent support to the walls and probably prevented a more serious cave, as this great mass of ore, falling all at one time, had stripped the stope of timbering down to the crossboard floor.

When the shift came on in the morning the bosses found a stope, 32 ft. wide, stripped of timbers to a height of about 55 ft. and for a distance of 30 ft. along the vein. Both back and walls appeared to be strong.

The plan adopted for catching up the back was to build a trussed structure of spliced stulls 16 ft. long across the top of the stope. Then, after the back had been caught up by bulkheads from this truss, the ore was to be drawn out of the stope, and waste filling run in without putting in additional timbers to hold the walls. In Figs. 6 and 7, which are sections through the top of this stope, the method that was used in building the truss is shown.

Putting in the truss to catch up the back was not such a simple operation as might appear from the drawings. Stringers were laid lengthwise with the stope. At the cave end they rested on the pile, but at the stope end they were carried by the stope timbers. The stringers, which were 16 ft. long, were round timbers slabbed off on their top and under sides, put in to carry the stulls that were to be trussed together to support the roof. To enable the stulls to carry a considerable top weight, they were put in about 18 in. higher at the center than at the walls.

The four stringers which were to carry the bottom trusses of the structure were therefore put in so that the outer ends of the stulls of the trusses came level with the stull caps of the stope, and the inner ends where the stulls butted against one another were raised about 18 in. higher than the outer or wall ends. This required that the stope ends of the stringers which were next the walls should be carried from false posts, so that they came just under the stull caps, and in order to keep them from moving while the stulls of the trusses were being rolled out on them, these stringers were wedged down securely on the posts from the stull cap above. The stope ends of the two stringers that were to carry the center or spliced ends of the trussed stulls were blocked up from the top of the stull cap, and posts were put in on top of them, so as also to wedge them securely in place, in order to prevent their moving while the trusses were being positioned upon them.

As soon as the stringers had been blocked securely into position at their stope ends, and their outer ends had been blocked up from the pile of caved ore to the proper heights, three stulls were rolled out upon each pair of stringers and positioned at 5-ft. centers from one another and the stull caps of the stope. These stulls, 16 ft. long, were butted against one another and then made ready for blocking in place by putting headboards made up of 3-in. planks, three deep and 5 ft. long, between them and the walls. But until the whole structure was in place, the wedges of the headboards were driven just tight enough to keep the timbers from moving out of position, as if they were driven tighter the stulls would ride on one another at the center.

As soon as these three pairs of trussed stulls had been put in, posts were stood on them in daps cut about ½ in. deep, a post being stood at each end of each of the stulls of the three trusses. Then, on top of these posts, stulls with daps cut in them at the proper points were placed so as to form a second series of trusses across the stope, with headboards 5 ft. long put in between them and the walls, and the wedges again driven just tight enough to hold the trusses in position. As soon as these upper trusses were in, both the stulls and the posts were braced girtways from one another and from the timbering of the stope, so as to prevent the trusses from swinging sideways. This having been done, posts were again stood upon these stulls in properly positioned daps, and stulls for another series of trusses lifted on top of them. Headboards, 5-ft. long and made up of 3-in. planks three deep, were put in between them and the walls, with the wedges again driven just tight enough to hold the trusses in position. In this way, as shown in Figs. 6 and 7, a trussed structure three sets long and three sets high had been erected across the top of the stope. But before the structure could be blocked into place, a cribbed bulkhead had to be built along the top of the structure to catch up the back and keep the stulls from riding on top of one another at the splices when the structure was blocked from the walls.

The top trusses were therefore lagged with 3-in.

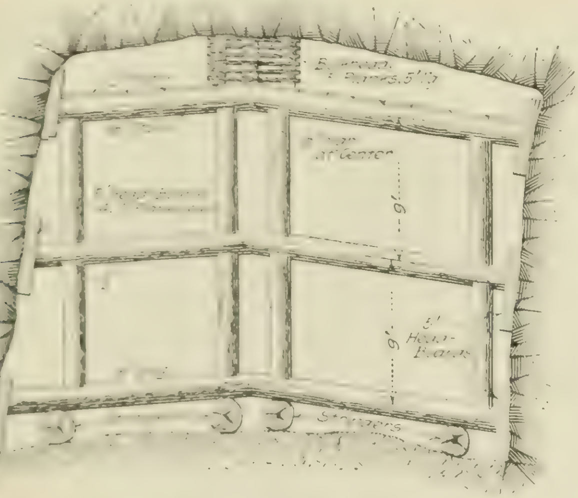

FIG. 6. THE BACK IS CAUGHT UP BY A TRUSSWORK OF SPLICED STULLS SUPPORTED ON STRINGERS BELOW AND BY DEEP BANKS AT HEADBOARDS AT THEIR ENDS

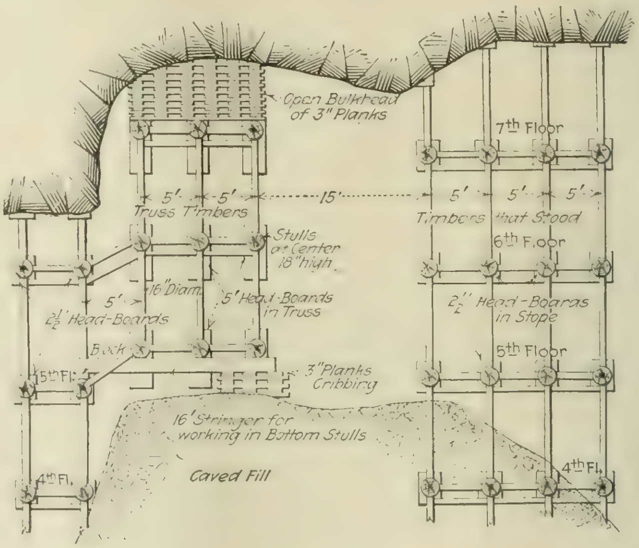

FIG. 7. AT THE TOP OF THE CAVED FILL THE TRUSSWORK OF SPLICED STULLS IS SUPPORTED ON CRIBBED PLANK, WHICH ALSO CATCH UP THE BACK ALONG THE TRUSS RIDGE

planks, and a cribbed bulkhead was built along the ridge of the truss to catch up the back as well as to hold the trusses down and prevent the spliced stulls from riding on one another when they were being blocked in place. Three-inch planks were used in building this bulkhead, because they could be put in place much more easily and cheaply than larger timbers, even if many more of them had to be used, and because, when stoping was resumed, the planks could be used for flooring in the stope. These planks were 5 ft. long, and three planks were used to each course of the bulkhead, one at each end and one at the center. One of these cribbed bulkheads was built at each end of the structure, butting the planks of each bulkhead against the planks of the other over the center truss.

Blocking the Trussed Structure in Place

When everything was ready, men were stationed at different points in the trussed structure so that the wedges in the bulkheads and the various headboards could all be driven home at the same time, as otherwise the stulls of the trusses would begin to ride on one another while the wedges in the different headboards were being driven, and the whole structure would become distorted, and would then have lost much of its strength. A man was stationed on each side of the two bulkheads that had been erected on top of the trusses, and a man placed at each of the headboards of each of the three trusses upon the three floors of the structures, so that it required 11 men to drive wedges and one man to watch while the timbers were being blocked in place. Then while the wedges in the bulkheads and in the various headboards were slowly and carefully driven home, the man in charge of the work watched the various trusses closely so as to keep any of the trusses from being tightened faster than the others. In this way the several trusses were seated firmly against their headboards without developing tendency to ride at the splices, and the back over the structure was keyed into position.

As soon as this first trussed structure had been completed, another was built, two sets wide, to catch up the rest of the back over the top of the cave, and to tie the first structure to the timbering of the uncaved part of the stope on the other side. Then, when a bulkhead had been built on top of the second truss, and the structure securely wedged in place by driving the wedges of the different headboards and the bulkhead home at the same time, the back was carefully picked down and caught up with sprags and blocking from these trusses wherever it was weak.

When the back had been made secure in this manner drawing of the ore from under these trusses through the crossboards into cars on the stope track below began. As the ore was withdrawn, close watch was kept of the trusses to see how they were taking the weight, and the walls were carefully picked down as fast as they were exposed. In this way the ore was drawn out of the stope without accident and with little shoveling.

As soon as all the ore had been got out of the stope, the tramming track was raised to the fifth floor of the stope, waste brought in from the nearest waste raise, and the stope below the fifth floor tightly filled. Then, when crossboards had been put in on the sixth floor, mining of the seventh floor was resumed.

(To be continued.)

The Gulf Coast Domes in Relation To the Sulphur Supply

By Kirby Thomas*

The geological history of the "dome" phenomena peculiar to the Gulf Coastal Plain of Texas and Louisiana and of a small portion of the shore of the Mexican Gulf is a subject of controversy, but certain facts of economic importance are generally admitted. The increasing demand for sulphur for industrial and war purposes justifies greater attention to these domes than has heretofore been accorded them.

Two of the most important sulphur deposits in the country are directly associated with these dome formations. One, worked by the Union Sulphur Co. in Calcasieu Parish, La., has been yielding extensively for more than 10 years, and the other, at the Freeport sulphur mine, at Bryan Heights, Tex., at the mouth of the Brazoria River, has more recently become a producer. There are known in the region upward of 50 domes, more or less defined. Many have been drilled for oil, and in most cases some sulphur has been found, but so far no public record has been made of any deposits as rich or as extensive as the two properties mentioned.

Some of the domes, as at Spindle Top, Sour Lake and Humble, in Texas, have been practically sieved in exploring for oil. It is possible that in some instances, particularly in the early drilling for oil, important sulphur bodies were encountered without being noted. But many of the domes have not been completely or systematically drilled, and some promising sulphur deposits have not been exploited, either because of market conditions or the excessive valuation placed upon them by their owners. It is entirely probable that other important deposits will be disclosed in connection with the domes, either in exploring for oil, salt or, possibly, potash, or because of the higher price and greater demand for sulphur.

The acceptance of the dome theory as applied to these deposits and the interpretation of the conditions and nature of the domes implies a limitation and localization of the individual deposits and a correspondingly short life for operation. This is contrary to the earlier idea held by some geologists, and the later "arguments" by many promoters, that these known sulphur deposits in Texas and Louisiana were of great horizontal extent and practically of unlimited tonnage possibilities. As is now known, the domes are from a few acres to a few hundred acres in extent individually, and the sulphur is definitely confined within the boundaries of the dome structures and is not continuous within the boundaries, but varies greatly in amount and availability in different domes.

Lost time in the Bunker Hill & Sullivan mill at Kellogg, Idaho, during 1917, totaled nine days, distributed by causes as follows: Oiling motors, 36 hours; screens, elevators and rolls, 25 hours; holidays and miners' picnic, 92 hours; pumps and power off, 15 hours; Hardinge mill, 1 hour; classifiers, 5 hours; belts, conveyors and shafting, 6 hours; slush ice, 6 hours; general repairs, 15 hours; transmission rope, 12 hours; and high water, 3 hours. During the year 493,030 tons of ore was concentrated, making the average work of the concentrators 1385 tons per 24 hours of actual operation.

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Notes on Shaft Relining With Concrete

By G. G. STONEMARK*

Shafts "A" and "C" at the Tener Mine, Chisholm, Minn., were relined with concrete, two methods being employed in sending the concrete down from the shaft collars. At "A" shaft, the mixture was dropped 300 ft. through a 4-in. pipe; at "C" a specially made car was filled with the concrete and lowered on the cage. Steel panel sections were used as forms when concrete was poured.

IN AMERICAN mining methods, permanent lining of shafts with concrete has established a procedure of maintaining the alignment with permanent stability and for fire-resisting qualities, and the development of concrete shaft lining has been rapid and progressive. In Europe, brick, steel and cast-iron linings are common, and there is a scattering of concrete linings of unit construction. The influence which concrete lining has exerted upon the design and upon the problem of choosing a shape has made it unnecessary for the engineer to adopt the cross-section to limitations imposed by rigidity of lining material, and the thickness of the lining and reinforcement can be varied to meet local conditions of changeable stresses.

Profile of Shaft Timber Determined by Plumbing Methods

In most shafts constructed of timber, unless the conditions are unfavorable to the fungus growth which causes rot, the sustaining power is so diminished as to force the original alignment out of plumb. To reëstablish this, some means of determining with approximate accuracy the position of the shaft must be resorted to, and the most efficient way I know of is by the use of line and plumb bob, similar to the method used in plumbing a shaft to establish lines underground. Four lines are essential, one in each corner, or as nearly so as possible, that they may hang free and be placed in reference to a proposed or actual axis of the shaft. The next step will be to determine the profile of the shaft timber by measuring the distance down from the collar of the shaft as a base vertically, and the distance from each wire to each end piece and wall plate. These points, plotted in four planes, will determine the inclination and an accurate condition as to the alignment of the existing timbers. Where a careful alignment was made when the sinking operations were in progress, it may be a simple matter to determine the original alignment, because of the fact that part of the old timber still remains in its original position or a portion of some section may be in such condition as to hold its original alignment

Permanent Lines Necessary to Exact Alignment

The plotted points representing these timbers will show themselves on the profile by their parallel to the plumb line, but, should this not be the case, an average can be plotted so as to conform with the headframe, so that a small movement either way from the original axis of the shaft is negligible, both from a standpoint of excavating new ground or that of moving or shifting the sheave wheel to conform to the new alignment. Of course, judgment is necessary as to what amount of shifting is possible.

Having determined the alignment by placing the plumb lines with respect to the proposed or original alignment, it becomes necessary to make the lines permanent, so that the placing of the concrete forms can be done with accuracy. For retaining the lines in the shaft diagonals, sprags can be nailed across the end piece and wall plate, and a nail or spud driven directly in the plumb line and at distances about 40 to 50 ft. apart. Then when one spud is destroyed by the removal of the old timbers in the lining operation, it will only be necessary to go to the one higher up and hang the plumb line. These lines should always be referenced on surface in some manner, because when the operation of lining approaches the surface, somewhere near the top there will always be more or less settlement of the timber remaining, and one can therefore reset new lines with little trouble.

Methods of Lining Two Minnesota Shafts

The following methods were used in lining with concrete the Tener shafts "A" and "C" of the Oliver Iron Mining Co., at Chisholm, Minn. The headframe at "C" shaft, Tener mine, is higher than usual above the collar and higher also than is general practice on the Mesabi range, and has an ore pocket of ample dimensions. Inside of the pocket was built a temporary partition, dividing it so that sand could be placed in one-third of the space and the remainder allowed for rock. The cement was stored in a temporary shed constructed in the framework beneath the pocket, but was placed at an elevation over the mixer. The loading track was next moved as near as possible to the headframe, an opening between the rails excavated, and a launder used as a chute was built to extend down to the nearest compartment of the shaft. This compartment was bulkheaded and boarded up to form a skip pit, having an opening over the wall plate and with the end of the launder chute extending through.

All the aggregate was loaded in ore cars, so that it was an easy matter to dump the contents into the launder, from which it could be drawn off into the skip and hoisted in the same manner as ore. A temporary hoist was installed for this purpose, because the other hoisting engine consisted of a single drum and was used to hoist the cage in the other compartments. If sand was to be hoisted, it would be dumped directly from the skip into the pocket. An inclined chute, built on an ordinary stock pile trestle car truck and wide enough to accommodate the full width of the skip, was used when rock was hoisted, and a skip loaded with rock dumped on this chute would simply slide across the sand compartment and into the rock compartment.

The quarter pans in the pockets were taken out, the chute was reversed, and a temporary covered chute built to hold the different aggregates which led down to the measuring hopper. This hopper was situated over the mixer and on the same level as the shed for the storage of cement. Each chute was provided with a quarter pan, so that the workmen could run out the required amount of the different aggregates. Two workmen were stationed here to fill the measuring hopper and another workman whose function it was to open the cement sacks, pour them into the measuring hopper, trip the outlet and chute it down to the mixer. Two men were stationed on the mixer floor to look after the water and dump the mixer into a specially made car, which was placed on the cage and lowered to the forms below. When the pouring was completed, the car was taken off and the cage used to hoist all material taken out of the shaft, such as old timbers and lagging, and also for lowering and hoisting the men.

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No Time Gained in Sending Concrete Through a Pipe for Short Distances

Before the work was started, I thought probably that the method of dropping the concrete through a pipe would be speedier. If the depth had been greater, this might have been so, but not in this instance, because, comparing the working time with that consumed at "A" shaft, in which all concrete was dropped through a pipe for a depth of 250 to 300 ft., the time taken to lower 45 to 50 batches at "C" averaged 3½ to 4 hr., the same as at "A." On timing several batches sent down 250 ft., it took on an average of 2½ to 3 min., with less time for shorter distances.

Elbow Used to Stop Force of Concrete Dropped Through a Pipe

Comparing the two methods of conveying the concrete from the collar to the forms below, certain conditions will have to be met successfully, such as stopping the concrete when it is dropped through the pipe. At "A" shaft, where all the concrete was dropped through a 4-in. pipe, a hopper built at the top of the pipe at the collar conveyed the concrete to the pipe from the surface car. At the bottom of the pipe, in order to convey the concrete to the car on the cage, and regulate the flow, a long sweep elbow was screwed to the column pipe. This elbow reduced the force of the rush of concrete to a medium flow, but so quickly did the concrete wear a hole through the elbow that it had to be replaced at every pouring, and finally an extra heavy cast-steel elbow, with a short piece of pipe screwed on, was tried, with better success.

In depositing the concrete in the forms, essentially the same methods were used in both shafts. The door at the bottom of the hopper-shaped car on the cage was opened, and the concrete flowed through a hole in the cage floor into a section of a funnel-shaped pipe. This pipe had an opening about 18 in. in diameter at the top, tapered with a slight curve, and was reduced in section to about 8 in. at the other end, so as to fit a light steel pipe having lengths of 1, 2 and 4 ft., and so made as to telescope into each other by means of a pair of eyes riveted at one end and a pair of hooks at the other. This arrangement made a flexible pipe that would reach any part of the forms and in almost any position desired for depositing concrete.

Among the difficulties encountered in dropping concrete through a pipe is the liability to clog, for care is not always taken to see that all large stones are removed. Several times during the pouring in "A" shaft, the column pipes had to be disconnected to determine where the clog was situated, and it was necessary to hammer the pipe until the concrete was loosened, in which case all the material remaining in the pipe was wasted.

Six Men Per Shift Lower and Distribute Concrete

At "C" shaft all the concrete was lowered with the cage, using the same car as employed at "A," down to a sill placed across the shaft on the wall plates for each consecutive pouring. The same flexible pipe was used to distribute the concrete to any part of the forms. A shaftman, stationed on a platform built level with the sills, opened the door of the hopper-shaped car as soon as the cage came to rest on the sills, and it was a matter of a few seconds for the contents of the car to flow out. The cage was then hoisted to the surface, where another batch was in the mixer and ready to be dumped into the car. The process continued until a form was completely poured. The men knew their respective duties, and became more proficient as the work continued, so that extra help was not necessary. Of the six men employed, including the foreman for each shift, three were generally required in the shaft and the other three at the surface, although an additional man was always at the shaft to look after the odds and ends and to run the mixer when concreting was being done.

Manner of Placing First Form at Shaft Bottom

If the lining is to start at the bottom of the shaft and the lines, surface plant, and all else is in readiness, the shaftmen first clean the bottom of the shaft of all dirt and remove all the old lining sets for 10 ft. or more, depending on conditions. If the bottom is in rock, no bearers will be required, but if not, hitches must be cut in the sides of the shaft to permit the placing of steel bearers, the length of which depends on the size of the shaft. These hitches should be at least from 1 to 1½ ft. deeper than the bottom of the shaft, so that a spread footing can be secured. In order to get the full benefit of the steel used for the bearers, concrete is slushed in and reinforced with short steel rails or other rods that can always be found in the scrap pile, and placed so as to form a grillage which is built to the level required for the bearers. The first form in the shaft is built as high as the top of the bearers. This is made of plank, set carefully to line and leveled up and the bottom of the form made to fit the profile of the shaft bottom so that the concrete will not flow out. After the form is poured, it is allowed to stand for a few days, and during this time the sides of the shaft are trimmed out to the next line required for the thickness of the lining.

Wooden Forms Superseded by Steel

Until the regular forms arrived, a few sets were placed by means of wooden forms in "C" shaft, but these were found to be uneconomical. The steel forms used by the Oliver Mining Co. were panel sections of such dimensions as to be easily handled by rope and block, and made of $\frac{3}{16}$-in. plate stiffened at the edges by 2½-in. x 2½-in x $\frac{3}{16}$-in. angles. The panels varied in size, the smallest being 6½ in. x 12 in. and the largest 2 ft. 11 in. x 5 ft. 11½ in. In all, 46 panels were required for one complete 6-ft. set, and 32 for a 4-ft. set. In forming an end lining, six panels, and for a wall plate lining eight panels, were used above the dividers and end pieces, with nine small filling panels in between the end pieces and dividers. In between the panels were placed insert keys of ½ in. x 4 in. flat steel that were made a little short of the required height of a full panel. If these keys had not been so placed, it would have been next to impossible to remove the panels. So the keys were first removed, and this gave the panel an additional space, so that all panels could readily be removed, and whenever one panel was removed in a tier, the others were simply unbolted in consecutive order.

REINFORCED CONCRETE DIVIDERS AND END PIECES SECURE SHAFT RIGIDITY

To give the shaft line a greater stability and a means by which the skip guides could be fastened, cast concrete dividers and end pieces, reinforced by steel rods and of sufficient length to be well imbedded in the lining, were placed at intervals and the reinforcement was allowed to extend beyond the end. These end pieces and dividers also supported the steel forms in rigid alignment by means of cord holes so spaced that a bolt of short steel rod could be inserted through the angles of the forms and into the end pieces or dividers. A set of end pieces and dividers was first placed on the bearers previously set and leveled up, and the first set of forms placed and bolted together, the slab reinforcement having been previously fabricated by wiring together vertical and horizontal reinforcing rods.

Inside the shaft forms, braces made of 2 or 2½-in. pipe were placed transversely. These braces were flattened and had holes made in each end, so that when they were fastened at an angle the correct dimensions necessary to hold the forms rigid could be secured. The braces were also used to support staging planks. Another set of spacers was required to keep the end pieces and dividers in alignment, and these were made of 3-in. x 6-in. plank, armored at each end, with strap steel securely fastened and of such length as required between the end pieces and dividers. The forms were then shifted to conform with the plumb lines, and temporarily wedged to keep them in place during the pouring of the concrete. The reinforcing was held in place by a steel template fastened to the top of the forms. The lower end of the forms was tied to the rods of the preceding sets, which were cut long enough to extend 3 or 4 in. out of the concrete.

Everything being ready for the pouring of the concrete, temporary sills were laid across the shaft on a wall plate 8 to 12 ft. above and used to support a funnel-shaped spout having an 18-in. opening and slightly curved and reduced at the other end to telescope into the short section of the light steel pipe, which has been previously described. A number of shaftmen were then sent to surface to handle the mixing, and other work. The hopper-shaped car was placed on the cage, the first batch of concrete started in the mixer, and when the desired consistence of the concrete was obtained it was sent on its way to form an integral part of a lasting structural unit. Immediately after the forms were placed, the concrete was covered with planks, and the work of removing the old timber and trimming for another set of forms was begun. Removing the old timber was dangerous, and care and watchfulness were absolutely essential, for paint rock and the other materials which have little or no support are generally loose, and it seemed at times that little was required to bring down a mass of the ground.

VOID BEHIND SHAFT LINING FILLED WITH EXCAVATED MATERIAL

All unnecessary material was hoisted to the surface in a bucket hung underneath the cage. In case too great a space between the form and the wall was left, a back form was built, and the space filled with the excavated material. When the sides were trimmed to the required dimensions, the work for the next form was placed and lined up the same as the preceding one.

Six complete sets of forms were used in both shafts, making a section of 24 ft. of lining, and this gave sufficient time for the concrete to set and become strong enough to support the superimposed load.

SIX-FOOT SETS USED IN UNIFORM GROUND

During the progress of the work some unfavorable ground was encountered, and room for a 6-ft. set was impossible. In these cases, a 4-ft. set was poured, and the same method as for the 6-ft. set used. Several such cases were encountered in the "A" and "C" shafts when working the surface above the ore. At every third set, when the sets were spaced 6 ft. apart, an extra divider was inserted to support a steel solar deck, which had an opening for a ladderway. Steel ladders long enough to reach from one solar to another and bolted at the foot to the deck and stiffened by struts fastened to the wall were used. These ladders are made of 1½-in. x 1½-in. x ¼-in. angles, using ¾-in. pipe spaced 12 in. on centers for rungs.

The table shows the comparison in progress made at "A" and "C" shafts:

PROGRESS MADE AT "A" AND "C" SHAFTS, TENER MINE, CHISHOLM, MINN.

	"A" Shaft	"C" Shaft
Number of weeks worked.......	18	19
Average progress per week, ft..	16½	15½
Average progress per month, ft..	75	68
Greatest progress per week, ft..	30	48
Greatest progress per month, ft..	112	132
Depth of concrete, ft...........	304	292

At "A" shaft, column openings were made at the pump station and at the level. At "C," a skip tender's drift and small pump station were concreted; also column openings for two levels. In both shafts, concrete covered I-beams were used, 15-in. beams for columns and 12-in. beams for caps.

Steam Shovels could be used to mine brown coal at a low cost at Morewell, Australia, where there are extensive deposits, writes Consul General Brittain from Sidney. The veins are said to run from 150 to 200 ft. in thickness. It is claimed that motor spirit, benzine, illuminating oil, paraffin, and other byproducts could be profitably extracted. At present it costs about $1.92 per ton to mine the coal, but an American interested in machinery is endeavoring to place steam shovels at the disposal of the coal company, with which, he claims, the coal could be mined at $0.12 per ton by stripping the surface soil and taking the coal out direct with the shovels.

Belt Concentrators and Wet Concentration

BY ALEX. McLAREN*

The prevailing tendency in the use of the riffled table in place of the belt concentrator or vanner is not always based upon a consideration of the limitations of either type. The author describes the work for which each type is best suited, and advocates the return to the use of the vanner for the treatment of unclassified or fine pulps and for pulps in which specific gravity difference between gangue and concentrate particles is small.

IN RECENT years there has been a marked tendency to use riffled tables for all purposes and kinds of wet concentration, and to abandon the use of vanning machines. In some cases, riffled tables may have been chosen because of their comparative simplicity and large capacity and frequently because tables of the same type had been used in similar positions in other mills. But there has been in instances too little consideration given to the special requirements of the particular case in hand. The first requisite for wet concentration is a pronounced difference in the specific gravity of the metalliferous mineral and the gangue in which it occurs. The second requisite for satisfactory separation by means of tables is that every particle of metalliferous concentrate must have sufficient mass to facilitate its movement along the table riffles and to prevent it from being washed sidewise over the riffles by a water stream of sufficient force to move every particle of gangue (in the same pulp) over the riffles and to waste.

The second requirement referred to takes into account both the difference in specific gravity of the concentrate and of the gangue, and the "settling coefficients" of the individual particles of each. These "settling coefficients" determine the resistance to stream flow of particles of different specific gravities, or of different sizes and shapes but of equal specific gravities. More exactly, the "settling coefficient" may be said to express the resultant of existing conditions, as shown by the rate of settling of the particle under observation. The rate of settling will equal the rate of vertical flow required to hold the particle in suspension, and it becomes a factor in any expression of stream flow required to move the particle in any direction.

SPECIFIC GRAVITY DIFFERENCE AND MASS NECESSARY

It seems unnecessary to state that the metalliferous concentrate must have a specific gravity greater than that of the gangue to cause it to settle beneath the gangue on the table, and that its particles must have sufficient mass to cause them to travel along the table and to hold them to the table while the heaviest grains of gangue are being washed away. But is the latter point sufficiently considered when a riffled table is specified to handle a mixed feed containing all sizes and shapes of grains, or unclassified material containing slimes that have not sufficient mass in their individual particles to move along a table?

The vital difference between riffled tables and vanning machines is in the method of recovering the concentrates after they have been settled and roughly separated from the gangue. The former depends for its action upon the inertia of the concentrates to cause them to travel along a fixed practically horizontal surface by successively jerking this surface from under them, while a stream of water washes transversely across the direction of this motion, over the settled concentrates, and carries away the barren gangue. The vanning machine is equipped with a traveling belt, upon which the concentrates are settled and on which they lie in fixed contact, while the traveling surface is slowly moved uphill, beneath the gradual flow of the pulp feed. The settled concentrates, both because of their weight and because of their stability upon the moving surface, are carried to the concentrate discharge. The belt-surface may be practically smooth or it may be ribbed or pitted so as to increase this stability.

TREATMENT OF GRANULAR PARTICLES AND PARTICLES OF SMALL SPECIFIC GRAVITY DIFFERENCES

An ore in which the metalliferous particles occur in coarse grains, so that a truly granular structure is maintained after crushing, and where the grains are considerably heavier than the grains of gangue material of equal size, can be treated with high efficiency on riffled tables having the proper design and adjustment. An ore in which there is only a slight difference between the specific gravity of the concentrate and that of the gangue, or one in which the metallics occur in exceedingly fine particles, or in which a considerable portion crushes into fine particles, presents a different case. The resistance of the fine particles to stream flow is less than that of coarser particles of lower specific gravity. In order that these particles may travel along a reciprocating deck, they must be in partial suspension at least during each forward move. In order that suspension might be maintained at a minimum, even glass tops have been tried, with indifferent success. The principle remains, and the grains of concentrate must be of considerable weight and size in order to make a satisfactory recovery on this type of machine.

The ordinary vanner separates and settles the heavier material onto a moving surface of rubber, canvas or similar material, and the settled concentrates remain in contact with this moving surface and move practically in unison with it until drawn up over the head end and finally washed off in the concentrate box, in which the belt is immersed in an inverted position. The weight of the particle is made use of only to secure its settling and separation from the lighter gangue particles and to hold it in contact with the belt from the moment it touches it until it is saved in the concentrate box. The lighter gangue particles, by the constant motion of the machine, are kept more or less in suspension, and naturally float downhill to waste. It is true that the larger heavier particles will settle more quickly than the smaller, lighter particles, but the length of the machine

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and the adjustment of its slope are such that even the lightest particle that it is desired to save is given time to settle on the belt, and, once settled, it is saved.

The above description applies particularly to an unclassified feed from which it is especially desirable to save the finest values. The coarse, rich material can be saved readily. It is the fines in which the serious loss is likely to occur. But even after having saved the richer concentrates, both coarse and fine, there remains a middling product composed of chemical compounds of lower specific gravity, or of grains containing both heavy and light minerals. The riffled table usually makes such a product, which is discharged separately from the concentrates and tailings. What is to be done with this product? Obviously, the grains consisting of both concentrates and gangue must be ground finer and reconcentrated. This means practically a "slime" treatment to insure a high recovery.

EXPERIMENTAL INVESTIGATIONS

I made investigations to determine whether the tables in the mill that I was operating were actually saving all of the concentrates worth saving in the fine unclassified mill feed, and to determine whether the vanner could save fine rich mineral that the table could not save from the same feed. The material was a silver-gold ore and not amenable to satisfactory concentration. The results, therefore, illustrate the principle more clearly than would have been the case with an ore in which all the concentrates were heavy and crystalline. The ore was crushed through a 30-mesh burred slot screen, passed over amalgamating plates and then to riffled tables, adjusted, and riffled to secure the best results. The entire tailings and wash water from the tables were thickened in dewatering cones (not classifiers) to a pulp of four parts of water to one part of ore (by weight). This was then delivered to standard Senn panning-motion vanners. The results of the test appear in Tables I and II.

TABLE I SCREEN ANALYSIS OF PULP AND CONCENTRATES

Mesh	To Tables Per Cent.	Table Concentrates Per Cent.	Senn Concentrates Per Cent.
+ 40	16 15	8 67	3.70
+ 60	24 08	22 63	1 81
+ 80	11 28	5 44	0.55
+100	10 28	12 14	1.59
+150	5 73	7.89	0.91
+200	9 51	14 40	8.45
−200	22 06	26.07	79 08
Loss screening	0 91	2 76	3.92

TABLE II ASSAYS OF TABLE CONCENTRATES

	Au. Oz	Ag. Oz	Total per Ton (a)
Product as made	1 56	284 36	$273.96
Product + 200 mesh	1 10	146 42	147 21
Product − 200 mesh	6 20	1,688 50	1,561 77
Senn Concentrates			
Product as made	0 86	143 82	$140 03
Product + 200 mesh	0 62	122 22	116 70
Product − 200 mesh	1 02	147 94	146 80

Product Concentrates Made on Tables

Sp. gr.	3 60		
Tons concentrates	6 44		
Oz. Ag per ton	196 19	175 12 oz. at 85c.	$148 85
Oz. Au per ton	1 27	1 136 oz. at $20 67	23 48
			$172 33

Product Concentrates of Senn

Sp. gr.	2 67		
Tons concentrates	9 66		
Oz. Ag per ton	141 46	84 82 oz. at 85c.	$72 10
Oz. Au per ton	1 18	0 708 oz. at $20 67	14 63
			$86 73

$86 73 is 50 3% of $172 33

(a) Silver at 85c. per ounce.

The investigations show that the tables are saving a satisfactory concentrate, and that they are saving the richest of the fine material, but the amount and value of concentrates made by the Senn vanners out of the table tailings are equivalent to one-half the total value of the table concentrates.

The screen analyses show that the minus 200-mesh concentrates made by the vanners are of practically the same value per ton as the average of all the plus 200-mesh concentrates made by the tables, and these minus 200-mesh concentrates are 79% of the total weight of the vanner concentrates. The minus 200-mesh particles did not have sufficient mass to move along the table deck and, at the same time, to escape the wash water. The richest of the fine material was saved on the vanners. It requires little argument to prove that tables in the above case were not the best selection for the maximum saving unless followed by vanners. But why not use the vanner for the entire treatment?

In spite of the many tables that have been given the name of "slime table" and of claims that have been made of high recoveries of fine concentrates on riffled tables, the practice is questionable. The tests quoted show that tables can recover fine material if it is sufficiently clean. That it must also be granular may be taken for granted. The vanner is not out of date, and it continues to be one of the best appliances for handling unclassified or fine feeds, or feeds in which there is only a small difference in specific gravity between the particles of concentrate and gangue. It can recover the medium-grade slime concentrates as well as the rich concentrates and the coarser granular material.

"Platino," a Platinum Substitute

Various tests were made on "Platino," an alloy made by Drijfhout & Son in Amsterdam, says L. B. van der Marck in *Pharm. Weekblad* 55, 149-51, 1918 (Chem. Abstr. May 20, 1918). It is made of 11% Pt and 89% Au approximately. It showed no loss in weight after 20 minutes' treatment each with 25% HCl, 65% HNO_3, 96% H_2SO_4 and fused $Na_2B_4O_7$; after 15 minutes with a fused mixture of K_2CO_3 and Na_2CO_3; nor after evaporation of 10 c.c. of HF. A dish weighing 41 grams lost 1 mg. with fused $KHSO_4$ and 0.2 mg. with fused KNO_3 (20 minutes each); 7 mg. with fused KOH (15 minutes), and 20 mg. with a mixture of 96% H_2SO_4 and 2% HNO_3 (5 minutes). It was unaffected by heating one-half hour in a smoky petroleum gas flame. Except for the high loss in a H_2SO_4-HNO_3 mixture, it is equal or superior to platinum ware.

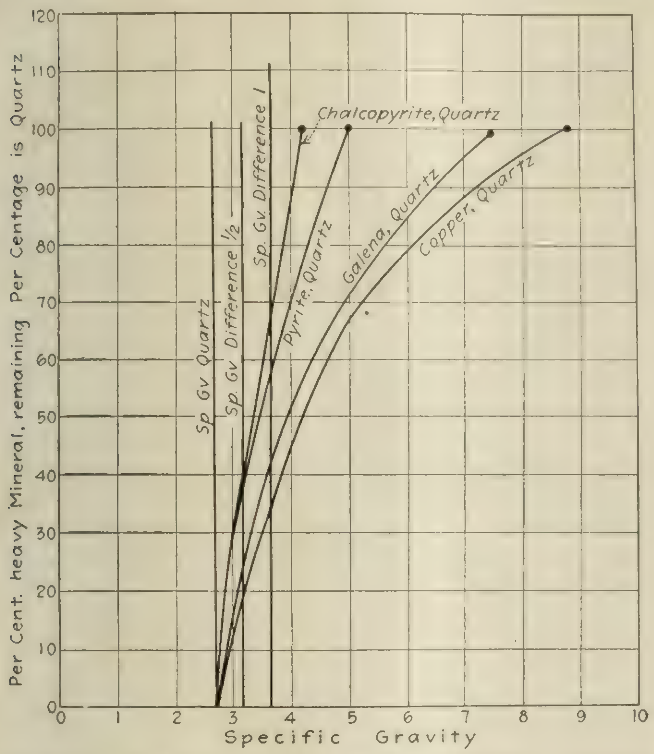
Pyrites in Huelva, Spain

The Province of Huelva, Spain, is the greatest producer of pyrites in the world. There still exists, according to the calculations of mining experts, says *Commerce Reports*, about 250,000,000 tons, of which the present exportation is about 3,000,000 tons per annum. In normal times the United States takes 1,000,000 tons; in 1917 the tonnage reached was 755,991 only, from the following mines: Rio Tinto, Tharsis, and Esperanza (British), 614,317 tons; Perrunal and San Platon (French), 122,091 tons; and La Joya (Spanish), 19,583 tons.

Remember the Comfort Fund of the 27th Engineers.

Middlings

In the wet concentration of ores the term middlings is applied to a crushed product the individual grains of which are composite; that is, they contain, attached to or imbedded in the gangue, particles of valuable mineral. Theoretically no free grains of valuable mineral are present, but practically there will always be a varying proportion of such grains. This proportion will depend upon the efficiency of the separating machine and upon the care and skill of the operators. The crushed product of practically all ores, even though crushing be carried to an extreme, will contain middlings, the proportion being dependent upon the degree of crushing and the nature of the association of the valuable mineral with the gangue. If crushing is carried out to a limited degree, a large proportion of middlings product is to be expected from ores wherein the valuable mineral is finely disseminated. In graded crushing and stage concentration, it is expected that middlings products will be made at each step in the separation. Stage concentration presupposes the separation and rejection of clean tailings whenever possible, but the middlings product is retained for further crushing and separation if the recovery made is greater than the cost.



SPECIFIC GRAVITY OF COMPOSITE MINERAL GRAINS

Very little discussion of the subject of middlings separation has appeared, although every millman and mill superintendent has had to contend with the problem. The separation of free mineral grains where the difference in specific gravity between the heavy and the gangue mineral exceeds two or more points can be readily effected, but the question of the feasibility of separation when the specific gravity difference is less than this limit is an open one. What should be the specific gravity difference for separation by wet-concentration appliances? This question cannot be answered definitely. In a general way it can be stated that a specific gravity difference of at least one is desirable and that where the difference is less than one the separation is apt to be indifferent.

Disregarding the question of the size and shape of the mineral particles, and considering only specific gravity, the question arises: What is the specific gravity of the composite particles (middlings)? The specific gravity of composite mineral particles can be determined directly by the specific gravity balance, or by calculation from the mineralogical analysis. A simple formula for a composite of two minerals is: A = sp.gr. (1) mineral; B = sp.gr. (2) mineral; C = % of (1) mineral; D = % of (2) mineral;

$$\text{Sp.gr. of composite grain} = \frac{100AB}{AD + BC}$$

From the formula, the accompanying chart has been constructed for several heavy minerals associated with quartz. On the chart, three vertical lines have been placed, one indicating the specific gravity of quartz, the next a specific gravity difference of one-half, and the third a specific gravity difference of one. It is evident from the chart that there must be a relatively high percentage of heavy mineral in the composite grain in order to exceed a specific gravity difference of one. For native copper 35% copper content is necessary; for galena, 42%; for pyrite, 57%; for chalcopyrite, 66%. For a specific gravity difference of one-half the percentages are: copper, 18%; galena, 21%; pyrite, 35%; chalcopyrite, 38%. The probability of the separation of composite grains, based on the fundamental principle of difference in specific gravity, can thus be approximated from the chart.

An example may be taken to illustrate specifically. Assume an ore composed of 10% galena and 90% quartz. Suppose that in crushing to a given size 90% of the galena is liberated and 10% is in the middlings; that 80% of the free galena is recovered (72% of original) and that the remainder is in the slime. If it is assumed that all of the galena is uniformly distributed as composite grains, then the specific gravity of the composite grains containing 10% galena and 90% quartz will be 2.78, or only 0.24 greater than the specific gravity of quartz. Obviously few middlings could be separated. If the 10% galena in the middling was associated with one quarter of the quartz grain in the ore, the percentage of galena in the composite grain would be 40% and the specific gravity would be 3.58, or a difference in specific gravity between galena and quartz of 1. This would be sufficient for separation. Assuming that a recovery of 80% of these grains is made, there would be secured in a middlings product 8% of the original galena. If all of these middling grains were then crushed sufficiently fine to liberate clean galena, and 80% was recovered, there would be only 6.4% of the original galena recovered. The total recovery would be 72 + 6.4, or 78.4 per cent.

The case assumed is a favorable one. With minerals of lower specific gravity, such as chalcopyrite, blende or pyrite, the specific gravities of composite grains, even where the proportion of heavy mineral is high, would be so near to that of quartz that only an indifferent separation of middlings could be effected. Only the largest middlings grains would be secured, and the proportion of such grains as compared with the whole would be relatively small.

The difficulty that confronts the millman is to save a relatively large percentage of middlings for retreatment. This, as has been shown, is not easy to do, and success depends largely upon the nature of the association of the valuable material with the gangue. Where the valuable mineral occurs in moderately coarse particles, the composite grains may be expected to contain a sufficiently high percentage of heavy mineral to make their separation easy, but where the heavy mineral is in fine grains and uniformly disseminated, the recovery of composite grains must necessarily be small. This explains why, in the treatment of disseminated copper ores, only 60 to 70% of the copper content is secured.

Finer crushing suggests itself as a solution, but only partly remedies the difficulty, for with finer crushing the composite grains are also finer and more difficult to separate by wet-concentrating appliances. The proportion of valuable mineral in the slime is also increased. Until the advent of flotation, fine-crushing and the use of slime-concentrating appliances afforded the only means for increasing recovery and for reducing the loss of metal in middlings. Flotation has removed, to a large extent, the restrictions upon fine-crushing, and with fine-crushing the proportion of middlings product becomes greatly reduced and is no longer a serious obstacle to the attainment of high percentage recoveries from disseminated ores. Even with fine-crushing and flotation, there will be a small part of the middlings product, that portion consisting of particles containing valuable mineral completely enveloped by gangue, which cannot be recovered.

Grinding of Ore in Ball-Mills

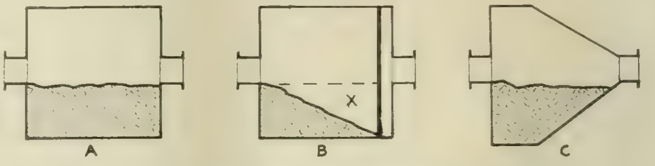
By Algernon Del Mar.*

Modern metallurgy requires ore ground to certain degrees of fineness, from which concentrates may be floated. The supply of such ore must be constant and uniform and must be produced at the lowest cost per ton. Too often the metallurgist is constrained from giving opinions that may vary from those generally accepted for fear of being thought behind the times. At the risk of being tabulated in this class, I purpose to show that present-day ball-mill practice is open to discussion, and that the modern ball-mill which is characterized by a diaphragm grating and discharge lifters is not always so efficient as the older central-discharge ball-mill. To many this statement will be rank heresy; to others it has been proved beyond dispute.

It may be taken for granted that when grinding a coarse unclassified feed, say a rock-breaker product, the quick discharge, as exemplified in the Marcy, Allis-Chalmers and Chalmers & Williams ball-mills, will produce a greater tonnage per hp. of finished product than a central-discharge mill, because, in the first place, the rock is retained in the mill until small enough to issue through the diaphragm, and, in the second place, the unclassified ore may include a proportion of fines that needs no further grinding, and so should be rushed through the mill to prevent overgrinding. If the ore delivered to the mill, however, be a classified feed in which all the particles must be ground, and, particularly, if the greater part of the ore is small enough to pass through the diaphragm orifices, there is no advantage in the quick discharge, and, in fact, its action may cut down the capacity of the whole mill by causing the return of an excess of oversize. It likewise causes an excessive wear on the liners and an abnormal consumption of balls.

The greater consumption of balls with the quick discharge is due to the fact that at the discharge end of the mill the pulp level is low and the balls strike against each other with little pulp between the faces, thus wearing on one another instead of on the pulp. The liners wear abnormally at the discharge end for the same reason, and should therefore be thicker there than at the feed end.

The first point to notice in connection with the main argument is the level of the pulp in the central-discharge mill, in the quick-discharge mill and in the conical mill, if I may be pardoned for bringing this into the discussion as showing a similarity between it and the quick-discharge type of mill.



PULP LEVEL IN DIFFERENT MILLS
A—Central Discharge Mill; B—Quick Discharge Mill; C—Conical Mill

Effect of Pulp Level in Different Mills

Referring to the diagrams *A*, *B* and *C*, it may be seen that in the central-discharge mill the pulp level varies little from a horizontal line, so that a constant depth of pulp is retained in the mill; that in the quick-discharge mill, *B*, the pulp level decreases toward the discharge end, that the balls at this end have only a thin layer of pulp to act upon and the space *x* is therefore useless for grinding; likewise, that the space occupied by the diaphragm is useless, which in a mill four feet long cuts out one-sixth of the possible grinding space. The conical mill *C* shows a pulp line decreasing in depth toward the discharge end. The two rival mills, then, the quick-discharge cylindrical and the quick-discharge conical mill, both show varying depths of pulp thickness, while the now neglected central-discharge mill maintains a constant pulp level, with a greater volume of balls acting on the pulp to be ground.

SCREEN ANALYSES OF 4x4-FT. BALL-MILL DISCHARGE
All percentages cumulative except for —200 mesh

Mesh	A	B	C	D	E	F
+ 4	9.5	...	....	....	....	..
6	12.6	...	....	....	....	..
8	18.1	...	....	....	....	..
10	24.1	...	....	....	....	..
14	28.8	...	....	....	....	..
20	33.5	...	....	....	....	..
28	38.2	...	1.2	....	....	..
35	45.4	6½	2.1	....	....	..
48	53.7	35	3.7	0.5	....	1
65	59.9	58½	5.0	4.5	....	8
100	71.6	76	18.75	36.0	7.9	33
150	85.7	89½	63.75	70.0	31.7	58
200	90.3	93	81.25	82.0	40.0	75
—200	9.7	7	18.75	18.0	60.0	25

A—Lifters set at maximum. B—Central discharge. C—One lifter operating; three taken out. D—Same condition, except all four lifters taken out. E—Flotation feed with lifters. F—Flotation feed without lifters.

Now refer to the screen analyses, A, B, C, D, E and F, being discharges from a 4 x 4-ft. ball-mill and representative of many samples taken at regular intervals. A and B are screen analyses of the mill with and without the quick discharge. Contrary to the generally accepted idea, the central-discharge mill does not slime any more than the quick discharge, but it is apparent that in the central-discharge product the coarser sizes are absent. This is a characteristic of all screen analyses made and indicates plainly that while the central-discharge mill produces as much finished product as the other, it does not produce more slime nor as much oversize which must be returned for regrinding.

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*Sandon, B. C.

Columns C and D show the same effect, but less pronounced, for in C only one lifter was operative, while in D all were eliminated. E and F show the flotation feed from the mill arranged with and without the quick discharge after classification and indicate that the central-discharge mill, if of the right diameter and length, with the correct volume of feed, does not slime beyond what may be expected from this class of grinding.

As to the capacities of the two classes of mills, the ball-mill under consideration had a maximum capacity (original feed) of 56 tons a day with the quick discharge and 62 tons a day and at times as high as 84 tons a day without the quick discharge. This is explained by the fact that the returned oversize indicated in screen analysis A was sufficient to cut down the capacity of the mill by occupying the space that should have been filled with fresh feed, the total possible space in the mill was not filled with pulp and the balls were not acting at their full efficiency at all parts of the mill.

The following extracts from letters show evidence in favor of the adoption of the central discharge:

An operator at Cobalt writes that the adjustable quick discharge was taken out for the following reasons: "(1) Too much oversize circulating; (2) it consumed about three times as many pebbles as another tube-mill running without the quick discharge; (3) with the quick discharge there is no ore in that end of the mill (it being discharged near the periphery) and the pebbles grind on themselves and perform no useful work; (4) the quick-discharge diaphragm and linings in that end of the mill get excessive wear on account of having no ore to grind on."

From Wallace, Idaho, I have the following: "The 5 x 4-ft. central-discharge mill at the X mill will grind 125 tons a day from crusher size to pass 60 mesh, while the one here (quick discharge) was always choking up on 60 tons a day from ½ to 20 mesh. I had so much trouble with screens and liners in the mill here that the screens were taken out and the end lined the same as the feed end." The mill is now taking 120 tons a day.

From Mullan, Ida., comes the following: "We could not get feed into mill without excessive water, which made too much oversize. To reduce the oversize, we removed the adjustable (quick-discharge) feature. At this stage of our experiments we found that the mill without the adjustable (quick) discharge, ground more ore with less power and with less oversize, and we speedily changed the other 6-ft. mill. We have just purchased a ball-mill without the quick discharge."

What an operator at Kellogg, Idaho, says: "I got an increased tonnage of about 18% of a finished product for table feed, all minus 80 mesh. Before making the change (from quick to central discharge) the discharge from the ball-mill was all sizes and caused a large return feed."

Oxygen and Sulphur in the Melting Of Copper Cathodes[*]

The absorption of sulphur during the melting of cathode copper, 99.98+% copper, requires a long and expensive refining process, and the final product is inferior in purity and lower in electrical conductivity than the original cathode copper. The sulphur absorbed comes from the reduction of the sulphate of copper left on the cathode sheets in the tank houses and from the fuel used for melting. As it comes from the tank houses, even well-washed cathode copper will contain from 0.002 to 0.004% of sulphur. The fuel, whether oil or coal, always contains sulphur.

By melting cathodes under a coke oven and taking samples at half-hourly periods, the cathode copper at the end of the oxidizing period and the beginning of the poling period was found to contain practically no sulphur. Toward the end of the poling period the samples began to show copper, the percentage of which slowly increased during the casting period until a maximum content of 0.0031% S was present close to the close of the casting period. The final product analyzed 99.93% Cu, and the average conductivity of the samples was 100. The experiment demonstrated that the residue sulphur, amounting to only 15 lb. on the whole charge, came from the fuel used and the coke-covering charge. By melting under a charcoal cover, containing only 0.03% S, the final product obtained analyzed 99.966% Cu, and the conductivity was 100.5. The lower content of sulphur in the covering charcoal resulted in less absorption of sulphur by the copper.

The author compares the two changes and offers the following conclusion:

> The comparison of the two charges shows not only a lower sulphur content of the charge refined under charcoal, but also lower oxygen content and a better quality of copper. It is becoming better understood that the "surface set" on the pitch of copper is directly controlled by the sulphur and perhaps certain reducing gases, such as carbon monoxide and hydrogen, rather than by the oxygen; that sulphur raises the "set" or overpoles the copper, thus necessitating a certain amount of oxygen, which therefore depresses the "set" to counterbalance the action of the sulphur. In these two charges the "pitch" of the copper was the same, yet, owing to the lower sulphur in product No. 2, its oxygen content is also much lower than that of No. 1, affording great improvement in the quality of the copper. The refiner did not know how much sulphur was present in his final product; he simply worked the copper to the desired pitch, and the sulphur present in each charge determined the amount of oxygen necessary to give the proper "surface set" on the copper. Samples taken at regular intervals during the melting and refining of copper cathodes show:
>
> 1. The total elimination of sulphur during the "oxidation" period and before poling.
> 2. The re-absorption of sulphur by the charge when the percentage of cuprous oxide is low enough to allow the reversible reaction
>
> $$6Cu + SO_2 \rightleftarrows Cu_2S + 2Cu_2O$$
>
> to take place.
>
> 3. The advisability and importance of using a low-sulphur coke or charcoal to cover the molten bath during the poling and casting periods.

Employees of Old Dominion Copper Co., of Globe, Ariz., were offered bonuses consisting of Liberty Bonds, according to the company's report for 1917, by allowing them to pay for a $50 bond in 12 installments deducted from their wages, with the understanding that those who completed 12 months' work would be given the bond and have their payments refunded.

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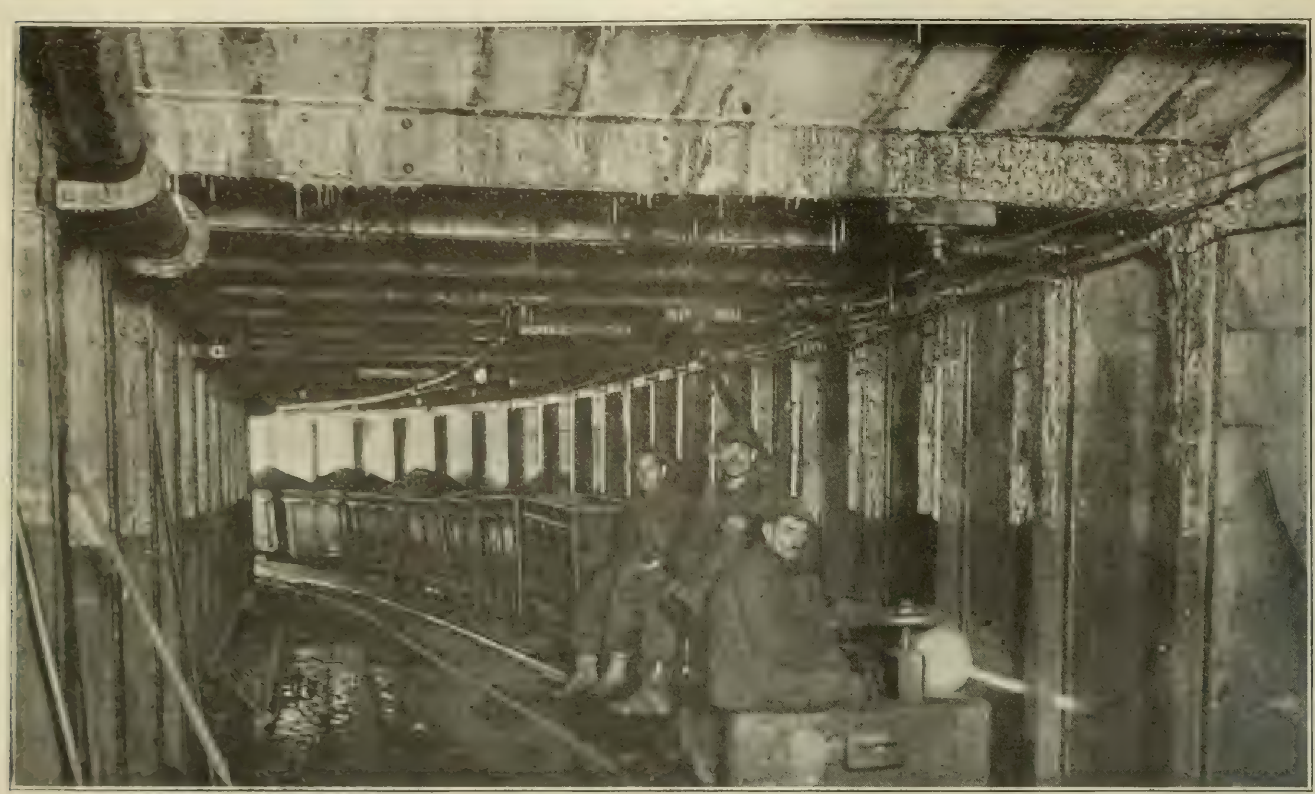
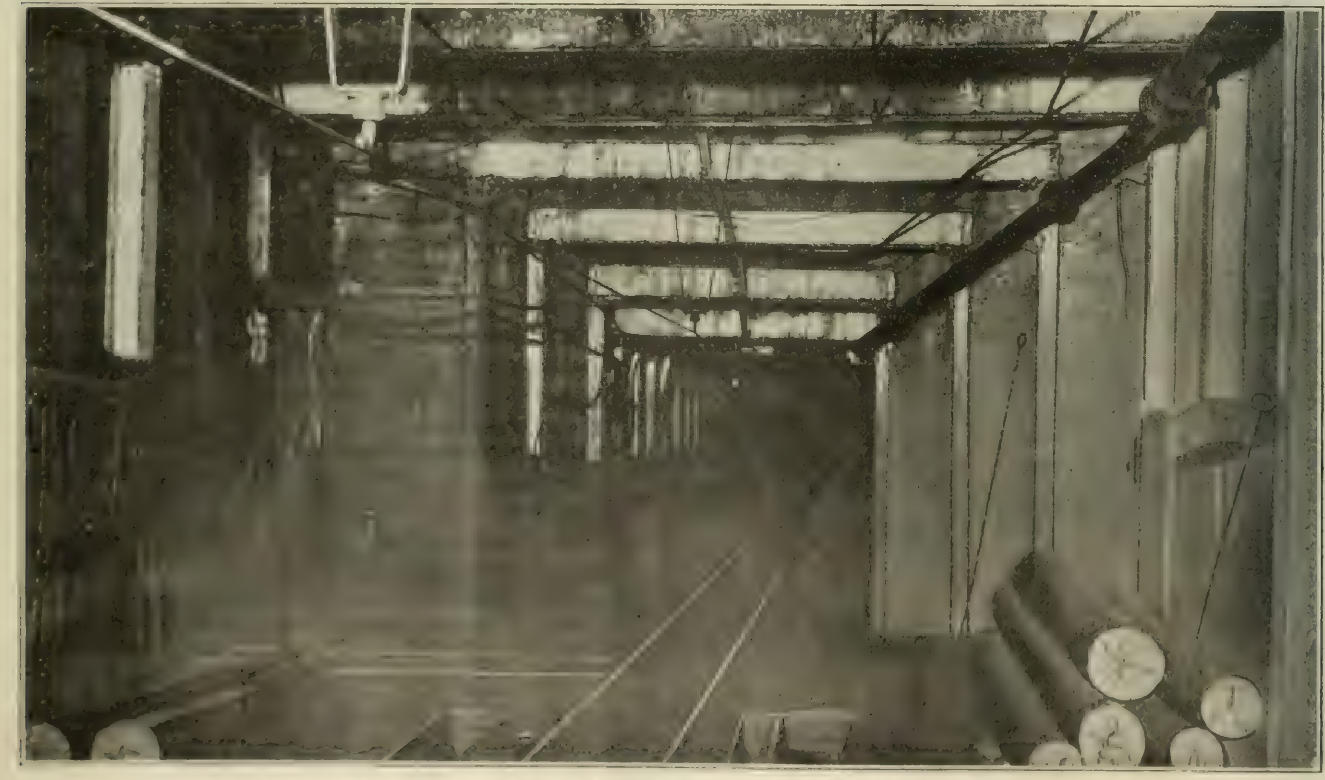
[*] Abstract of a paper by Stanislaus Skowronski; to be presented at the Colorado meeting of the American Institute of Mining Engineers.

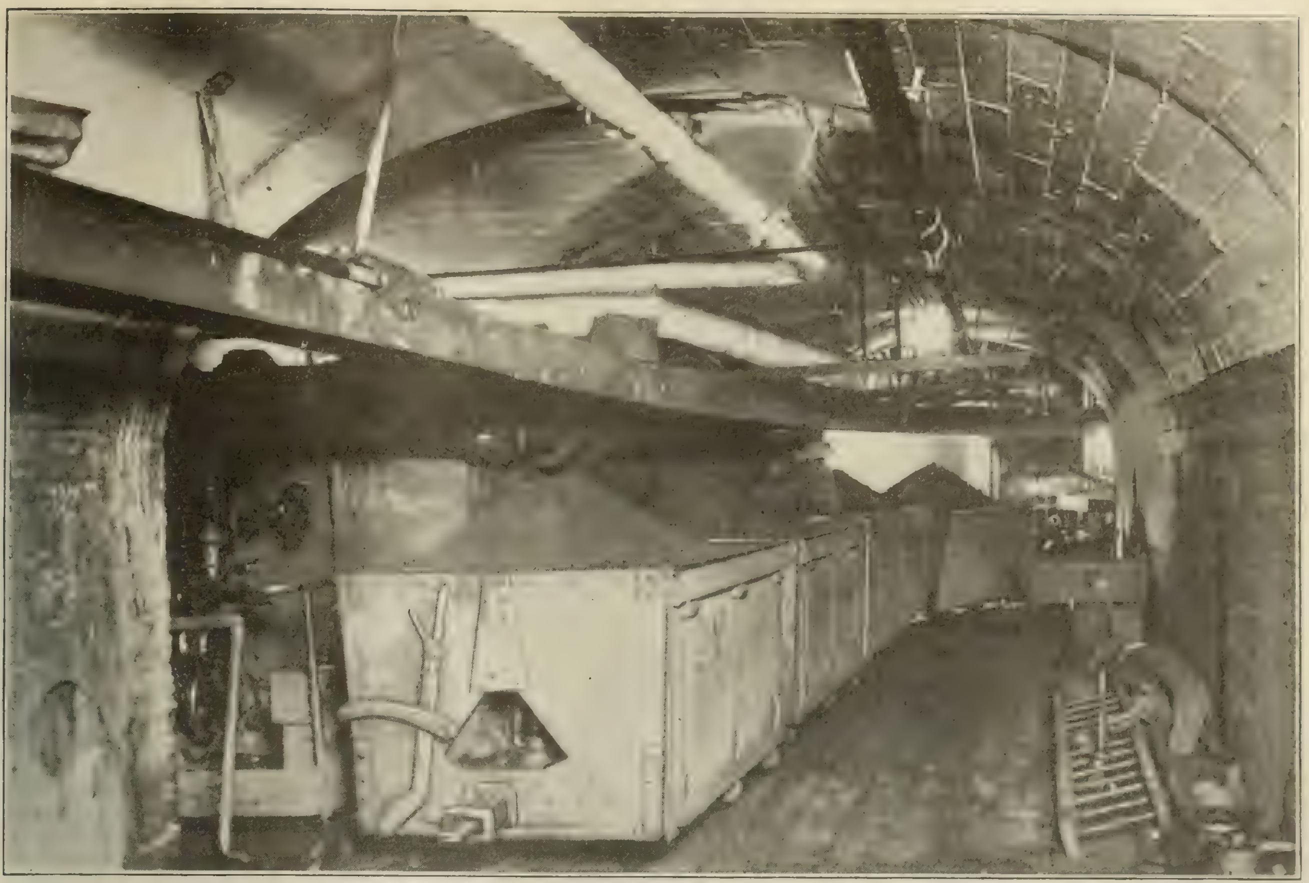
Use of Concrete in Mesabi Range Mines



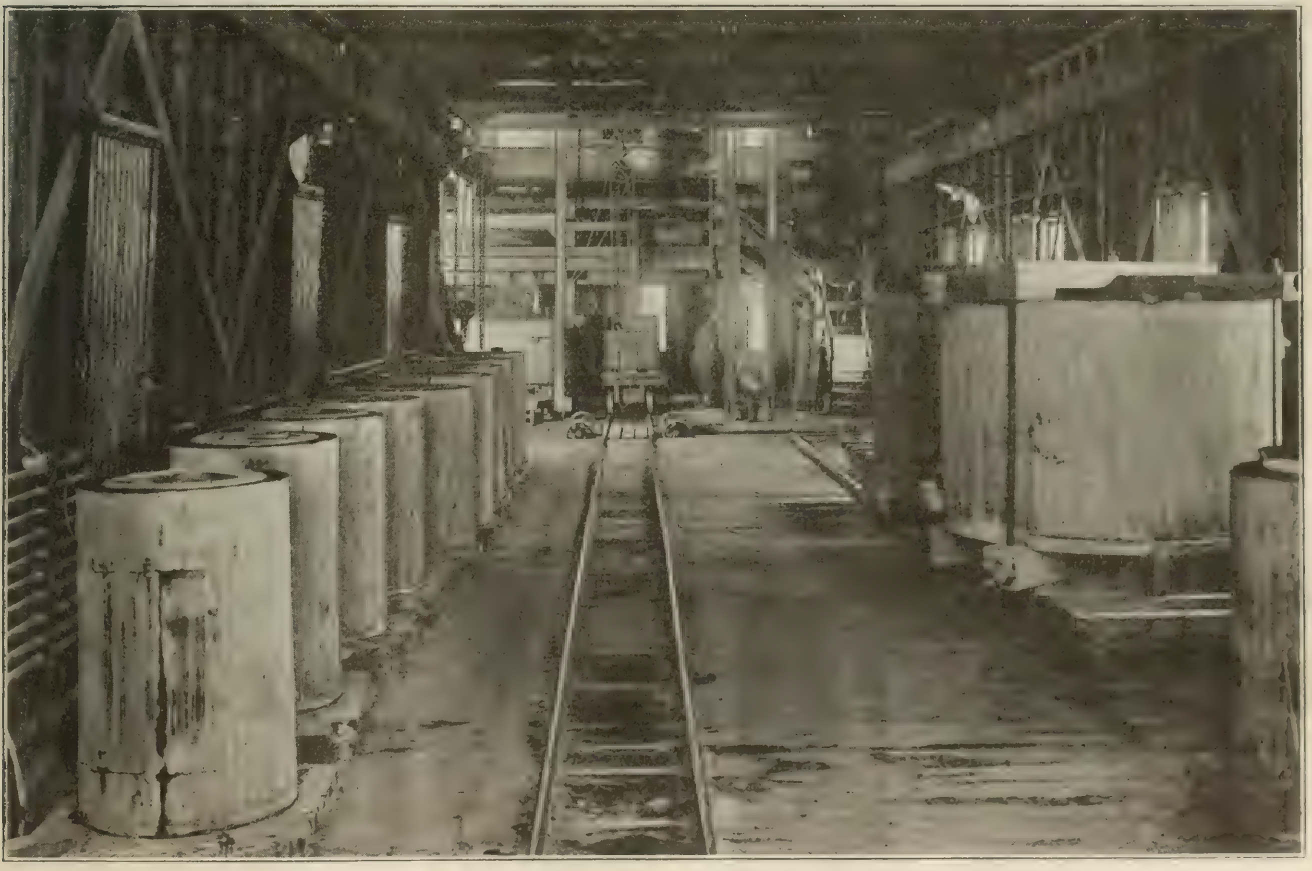
MAIN HAULAGE DRIFT AT THE LEONIDAS MINE OF OLIVER IRON MINING CO., EVELETH, MINNESOTA



STATION AND MAIN HAULAGE DRIFT AT LEONIDAS MINE



MAIN HAULAGE DRIFT AT PHILBIN MINE, HIBBING, MINN., SHOWING CONCRETE CONSTRUCTION



DRYING ROOM OF CEMENT MIXING PLANT, OLIVER IRON MINING CO., HIBBING, MINNESOTA

James Douglas

JAMES DOUGLAS, engineer, administrator, publicist, philanthropist and philosopher, died at his home at Spuyten Duyvil, on June 25, aged 81 years. After a life of extraordinary activity, which activity continued unabated until two or three years ago, failure of his strength finally compelling him to retire, and in view of his advanced years his death was not unexpected. His was a magnificent human mechanism that worked with strength finally compelled him to retire, and in view to most men. The funeral services were held in the Church of the Mediator, on June 26, after which the body was taken to Quebec, the old home, for burial in the family plot.

James Douglas was born at Quebec, Canada, on Nov. 4, 1837. He was the son of Dr. James Douglas, a prominent surgeon in the Dominion, who introduced the modern treatment of insanity into Canada when he founded the Quebec Lunatic Asylum, in the management of which for some time his son James participated.

Young Douglas followed in the footsteps of his father and studied medicine in Canada and abroad, partly in Scotland and partly in Germany. He was graduated from Queens University in Canada, studied medicine at Laval University, Quebec, and later was professor of chemistry at Morrin College, Quebec. After studying medicine for some years, young Douglas decided that he was not enthralled with the profession and began the study of theology, going to the University of Edinburgh, Scotland. In 1875 Doctor Douglas, who received his license to preach, but was not ordained, returned to Canada to assist his father, who had been unfortunate in his investments. For a time he managed the lunatic asylum in Quebec which was founded by his father.

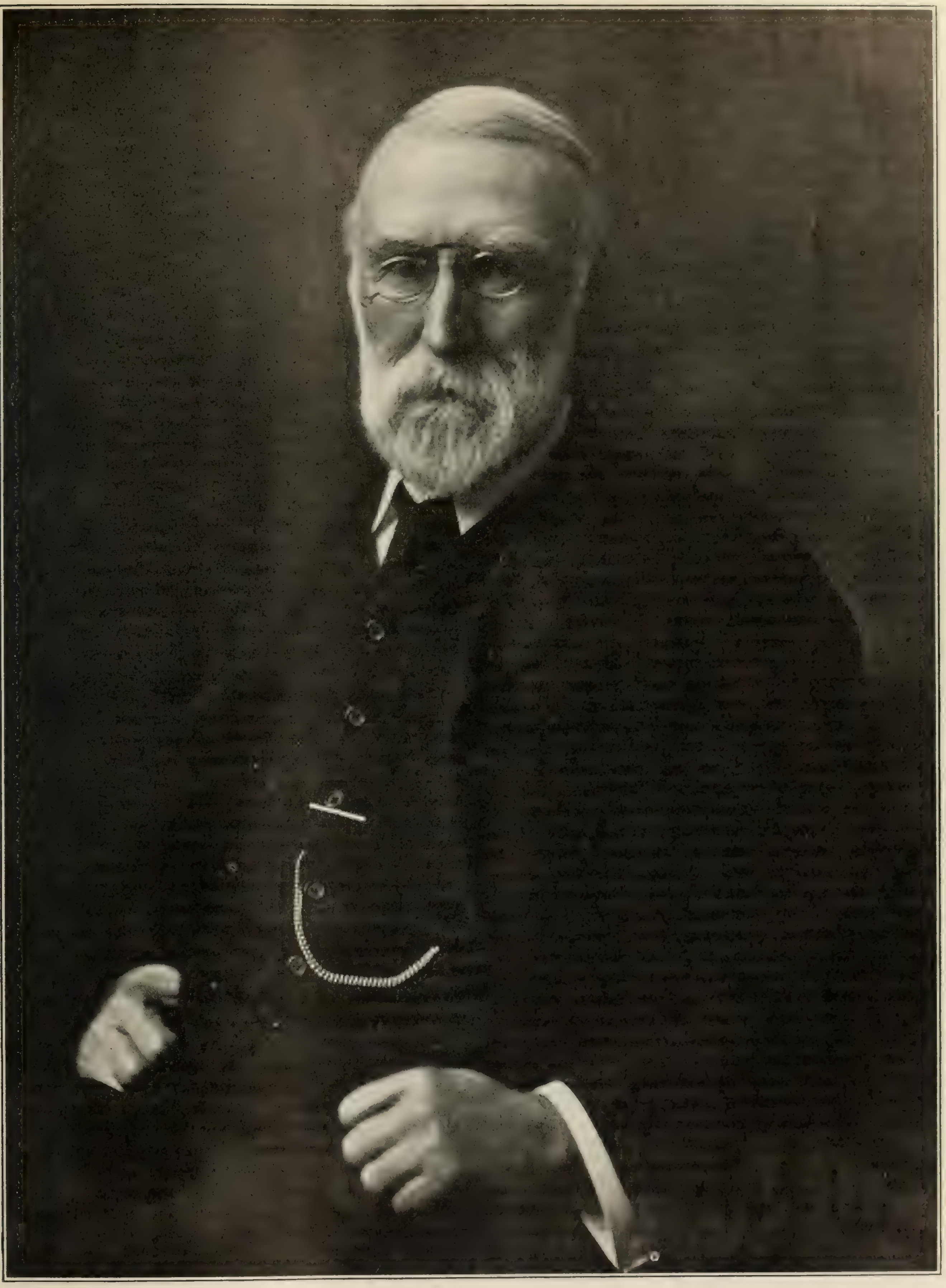
These were the years of finding himself. He had tried the professions of medicine and theology and had nearly reached the age of 40 without becoming really established or contented. What directed him into his proper field was a misguided investment that his father had made in the Harvey Hill copper mines, in Quebec. His father continued to have faith in them, and the son, becoming interested, set out to retrieve what had been lost in them. Those mines were not of a character to afford a great financial success to anybody, but they are historic, owing to their influence upon Doctor Douglas, and through him upon the mining industry of the world.

It was at this time that Doctor Douglas became associated with that brilliant scientist, Dr. T. Sterry Hunt. Together they worked out the beautiful Hunt & Douglas process of copper extraction, which was founded upon the solubility of cupric oxide in ferrous chloride, the original process being notably modified, however, in later years. This process obtained considerable, although not general, use in the United States and elsewhere. While speaking of Doctor Douglas as a metallurgical inventor, reference may appropriately be made here to his very ingenious revolving muffle furnace for ore roasting. These sidelights illuminate the versatility of this great man.

After a brief experience at the Harvey Hill mines, Doctor Douglas went to Phœnixville, Penn., to take charge of the copper extraction plant of the Chemical Copper Co., which was obtaining ore from some small and more or less uncertain mines. In the course of time, however, some parcels of cupriferous material came to the works from Arizona, which directed thither the attention of Doctor Douglas and led him to pay a visit in 1880 to that newly developing region, through which the transcontinental railways had but barely been built, and most of which was still infested by Apache Indians. The Copper Queen mine, at Bisbee, had been opened in 1880 by Martin, Ballard & Reilly, and the first copper furnace had been blown in on Aug. 20 of that year. Doctor Douglas, who, up to this time, had gained more experience than money, was attracted by the possibilities of this property and succeeded in interesting some of the partners of Phelps, Dodge & Co., an old firm of metal merchants in New York.

The story of the Copper Queen mine is a romance in itself, the telling of which would be beyond the scope of this sketch, and it is unnecessary, for it has been told at length in technical literature. Suffice it to say that the first orebody, after yielding 20,000,000 lb. of copper, was exhausted in 1884. The earliest months of that year were the gloomiest in the history of the district, of the mine, of its owners, and of Doctor Douglas. With only three months of ore supply in sight, the abandonment of the mine was in prospect. The Atlanta Mining Co., owning adjoining property, was in a similar predicament. It was wholly due to the geological studies of Doctor Douglas, his persistence and his persuasive influence upon his principals that further prospecting was prosecuted. His vision was justified by the striking of rich orebodies. His business sense led to a consolidation with the Atlanta company, which also had found more ore. From that time onward the history of the Copper Queen, which became one of the great mines of the world, was a record of unchequered success. When that assurance was realized Doctor Douglas was nearly 50 years old.

In the upbuilding of the Copper Queen company Doctor Douglas disclosed his qualities as a scientist, whose knowledge and perception ranged from economic geology to the art of metallurgy, and he added to them the gifts of a great administrator—a handler of men; one of those rare persons who can teach others to work and inspire them with the wish to do so—and, moreover, he exhibited himself as a financier, one of those who possesses the vision to promote new enterprises. It was not enough for him to make the Copper Queen one of the great mining and metallurgical companies, an immensely profitable concern. He spread out and led his associates into the Globe district, into Morenci, into Nacozari, into Tombstone, and into Burro Mountain. The fuel requirements of the several companies led to the development of a great colliery and coking plant at Dawson, N. M. The need for carrying the products induced the construction of the El Paso & Southwestern Ry., begun in 1886, which eventually became a great railway, operated in connection with the Rock Island, in which (the Rock Island) Phelps, Dodge & Co. acquired a large interest. Doctor Douglas became as eminent an authority on railway transportation as he was on mining and metallurgy. A few years ago all of these companies were consolidated in Phelps, Dodge & Co., Incorporated,



DR. JAMES DOUGLAS

of which Doctor Douglas was the president. Later the name of the operating company was changed to the Copper Queen Corporation, and Doctor Douglas resigned the presidency to his son, Walter, and became chairman of the board of directors.

Some biographer will write a great book about Doctor Douglas. This is inevitable, for he was not only a great man in our industry, but also he was one of the great men of the world. It may be left to that biographer to review the wide scope of Doctor Douglas's learning, the great list of books and papers that he contributed to literature, both technical and general, and the impressive series of honors that were bestowed upon him by scientific and technical societies.

Doctor Douglas was elected President of the American Institute of Mining Engineers in 1899 and again in 1900. In 1906 he was awarded a gold medal by the Institution of Mining and Metallurgy of Great Britain. In 1907 he received the degree of Doctor of Laws from McGill University. In 1916 he was given the John Fritz medal for humanitarian work. In 1917 he was elected an honorary member of the Mining and Metallurgical Society of America, and was elected Chancellor of Queens College, of which institution and of McGill University he had been a trustee for many years.

We of the mining and metallurgical profession know Doctor Douglas as the contributor of many of the most important papers in our technical literature. We do not know so well that he was an author of repute upon historical and philosophical subjects. Among his books of the latter character were "Canadian Independence"; "Quebec in the Seventeenth Century"; "New England and New France"; "Journals and Reminiscences of James Douglas" (his father). Besides these historical works, he was the author of many papers on economic and philosophic subjects outside of the domain of purely technical literature. Throughout his career he was a valued contributor to the *Journal*.

Doctor Douglas in 1860 married Miss Naomi Douglas, daughter of Captain Walter Douglas, of Quebec. Six children were born, of whom the following are now living: Major James F. Douglas, developer of the United Verde Extension mine, who is now serving in France; Walter Douglas, who succeeded his father as president of the Phelps Dodge Corporation.; Mrs. Edith M. Douglas, wife of Archibald Douglas, a New York lawyer of extensive mining interests; and Miss Elizabeth Douglas.

The attitude of Doctor Douglas toward his employees was ever friendly and helpful. By sympathetic treatment of the natives in Mexico, the Nacozari mine was shut down for no more than a month during the period of general disturbance a few years ago. When it became necessary to withdraw the American management and leave everything to native control, it was a source of great pride to Doctor Douglas that the natives whom he had trained were able to conduct operations as economically and as profitably as when the Americans were there. Doctor Douglas, as an economist and a philosopher, naturally avoided the mistake of pursuing a paternalistic policy. He had no sympathy with the socialistic ideas that disregard the extraordinary risks and wonderful achievements of the industrial pioneer and upbuilders of this country who reduced the cost of mining ores, extracting their products, and transporting them, together with other commodities, by railway, to phenomenally low figures. He was one of those who considered that such economic savings were for the general good, and ought to be applauded, not decried.

Doctor Douglas, through the success of the Copper Queen and of subsequent mining interests, acquired great wealth. His own tastes, however, were simple, and his mode of living was always modest. He needed relatively little money, and what he did not need he gave away. His philanthropies were many, but they were seldom heard of, for he preferred to give unostentatiously. Indeed, he seemed to be rather averse to allowing anything to be known about his gifts. But using only a small part of his income for personal necessities, he gave millions to colleges, hospitals, museums, charitable institutions, and to individuals and nearly a million for the study and alleviation of cancer.

We feel, however, that the world owes a greater debt to Doctor Douglas than for any of his philanthropies or for anything he did in upbuilding the mining industry and railway systems of Arizona and Sonora, no matter how important that feat may be regarded. Our own conception is that the world's great debt to Doctor Douglas is for his service in tearing away the veil of secrecy that used to shroud industrial operations. When everybody kept the details of his work to himself, progress was slow and more or less accidental. The chances were that in any mine or works where the doors were locked the practice inside of them ranged from indifferent to bad. The fancied secrets of the former generation were more mythical than anything else. The proper spirit was revealed by Doctor Douglas in his presidential address before the American Institute of Mining Engineers in 1899 in the following words:

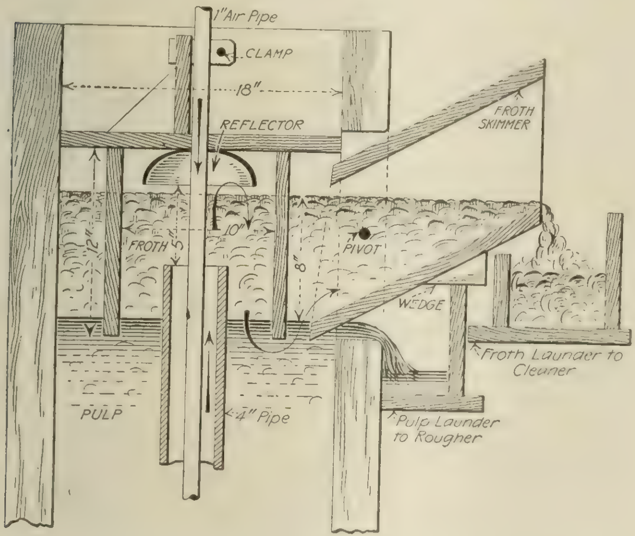
"The motives influencing the great body of writers who, without any pay, use the technical journals and such media of communication as our transactions, in order to give to the brethren of their craft the results of their often dearly earned experience, are various and complicated. But, in the majority of cases, the impulse originates in the desire for reciprocity, and in the hope that others will tell what they know, in return for what we ourselves communicate, and that therefore we shall learn at least as much as we can teach."

Doctor Douglas himself practiced what he preached. There was never any secret about operations at the Copper Queen, or at any of his enterprises. To every visitor and every applicant for information the helping hand was extended. This spirit spread among other managements. It is the time of the general acceptance of that idea that we date as the beginning of the great forging ahead of the American mining and metallurgical industry that soon put us in the position that we have held unchallenged for many years, namely, so far in the van that the rest of the world, including Germany, has been out of sight except in a few branches. Lately our French and British and Australian colleagues have been coming to us, and we have been glad to extend to them the same helping hand that we have done among ourselves. We repeat that we consider the birth of this spirit to be due more to Doctor Douglas than to anybody else, and with that inspiration he instituted an economic development for the improvement of the welfare of the world that is superior to any other one thing in modern times.

Details of Milling and Smelting

Baffling and Froth-Skimming Device for Pachuca Emulsifiers

The capacity of a flotation plant where pachuca tank emulsifiers are used can be slightly increased by the addition of a skimmer or baffle board at the top of the pachuca tank, as shown in the illustration. By removing the froth it can be sent directly to the "cleaner" unit, for the upper froth obtained in this way, at least when treating a lead ore, will be found to be as high in grade as that coming from the "roughers." This device was designed at the Sweeney mill of the Federal Mining and Smelting Co., Bradley, Idaho, by H. M. Throndson, mill superintendent, and consists of an inverted baffle-board box attached to the upper end of the air-lift pipe, and an adjustable skimmer pivoted at the discharge opening of the tank, which is of the square-box type. By means of a wedge the tilt of this skimmer is regulated so as to get the proper depth of skim or grade of froth desired. The bottom of the skimmer lip is made adjustable and can be depressed below the pulp level so as to skim off practically all the froth formed before the pulp discharges into the "rougher-" feed launder. The baffle device has a square close-fitting top connected above by uprights to a split-block guide that holds the baffle frame to the 1-in. air pipe at the proper elevation with respect to the level of the pulp. This elevation is determined by the maximum frothing produced by the splash against the bell deflector.



SECTION OF PACHUCA TANK SHOWING BAFFLE ARRANGEMENT AND FROTH SKIMMING DEVICE

From the top cover board the side baffle boards extend downward below the pulp level as a square frame of 1 x 12-in. plank. The froth escapes from the baffle box below edges and, rising to the top of the pulp level, discharges over the skimmer into a froth launder that leads to the "cleaner" machine. The pulp overflows at the opening under the skimmer to the "rougher"-feed launder.

At the Sweeney mill this device is used in connection with two 24x24-in. pachuca tanks, in which the pulp is emulsified before going to the Callow flotation cells, and about one-fourth as much froth is obtained from the two as from a 2x10-ft. Callow pneumatic cell. The device is simple, inexpensive, and easy to make, requiring practically no attention, and adds appreciably to the frothing capacity of the plant.

Coal-Dust-Fired Reverberatory Furnaces in Chile

Up to the outbreak of the war, all smelteries in Chile were using blast furnaces, with coke, imported from the United States, England, Germany and Australia, as fuel. As the war progressed, freights became scarcer and the price of coke rose gradually to impossible heights, so that it finally became a serious problem not only to obtain it, but to get it at a price allowing a profit in smelting, even with the high price of copper. Experiments had often been made in Chile with a view to making metallurgical coke from native coal, but no satisfactory results had ever been obtained, and it was invariably found that this coal did not possess the necessary properties to make it a good coking coal for metallurgical work.

The Société des Mines de Cuivre de Naltagua, which had been smelting in blast furnaces for a number of years, in view of these adverse circumstances, determined to build two coal-dust-fired reverberatory furnaces, using native coal as fuel. These, with their accessory plants, were ordered in the United States in 1916 and installed in 1917. They have been working for several months with satisfactory results.

The furnaces were designed for direct smelting of green ores running about 6% copper. This was experimental, as no similar work had been done before, and it was not known what results could be obtained from the Chile coal in smelting. Two furnaces 55 ft. long by 17 ft. wide were built, with coal-grinding, ore-crushing and ore-drying plants. They were modeled after the reverberatories in the United States, using pulverized coal, and are identical except for their short length.

In the coal plant, the slack, after being dried, is passed through an Allis Chalmers No. 2 pulverator, and is finally ground down in a 5 x 5½-ft. ball mill, where it is reduced to such a degree of fineness that 65% passes through a 200-mesh screen. The coal dust is then taken to the furnaces in screw conveyors. The ball mill will grind from 2.5 to 3 tons of coal per hour, this being a maximum. The coal used contains 16% ash, 36% volatile matter and 47% fixed carbon, the calorific value being about 6000 calories. Three 300-hp. Erie City boilers are installed in the flues and furnish the power necessary to run the plant.

It has been found that the smelting capacity of these small furnaces is about 120 tons per 24 hours, with a coal ratio of 1 to 4 (dry coal). The ore is crushed to ½ in. and dried sufficiently to drive out the moisture. In summer, the ore is passed directly to the furnaces. It has been decided to change the crushing plant so as to crush the ore to ¼ in., as this will probably increase the capacity of the furnaces, with a better fuel ratio.

The silica brick necessary for constructing these furnaces was imported from the United States. A brick plant is being built at the smeltery to make all fire and silica brick required on the property. Excellent quartz can be obtained in the district. Once the brick plant is working, the smeltery will be entirely independent of outside difficulties affecting importation from the United States or Europe, and will be able to run continuously, using only native fuel and materials.

The change in operating method marks a great advance in smelting practice in Chile, as it is almost impossible to import coke and other materials necessary for smelting. The Société des Mines de Cuivre de Catemou has also recently built a similar plant.

Pure Zinc Dust for Precipitation

By R. Wheeler[*]

Before the war zinc dust obtainable for precipitation of gold from cyanide solutions contained around 10% impurities. Authors of books on cyanide practice, and many operators as well, generally looked askant at pure zinc dust containing little or no lead, and when it did not have any, recommended its addition in some form to obtain ostensibly better precipitation—all of which caused more or less expensive refining methods, if troubles with the mint were to be avoided due to low-grade bullion.

Since using the finest possible ground and purer zinc dust containing 98 to 99.8% metallic zinc, at the plant of the Hedley Gold Mining Co., at Hedley, B. C., bullion is produced running 850 to 950 points fine gold by the sulphuric-acid treatment of the press-precipitation product, which was obtained from the treatment of a heavy, finely ground arseno-pyritic ore. The consumption of the purer dust is 30 to 40% less than that of the 90% dust, thereby reducing the amount of acid, as well as reducing the time and difficulties of melting.

Results of Pine Oil Research in Canada[†]

Incident to the increased employment of flotation at Cobalt, Ont., the greater demands for pine oil, which had to be imported from the Southern States, led to the inevitable results, extremely high price and an adulterated product. Because of these conditions, attempts were made by Tom R. Jones, of Buffalo Mines, to produce a suitable oil from the stumps of the Northern Ontario pine. Some success was attained, and in conjunction with Arthur A. Cole, president of the Canadian Mining Institute, the Dominion Government was interested in the matter, and a plan outlined whereby the Mines Branch at Ottawa, working with the Forestry Branch, would attack the problem.

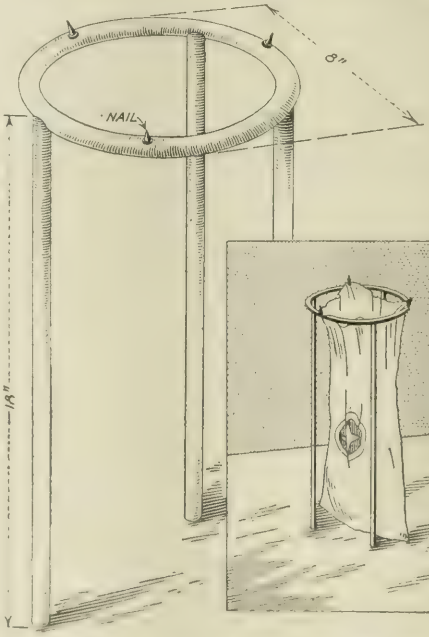
Careful experimentation and investigation of plants already established in Canada, and producing wood products, led to the conclusion that the establishment of such an interest in Canada would require a large capital outlay, and even under the most careful management an adequate financial return was not assured. Pine oil forms only a small percentage of the total products of distillation, and at present the markets for the other materials produced are very irregular. A company has been formed at Cobalt, and a small plant erected at Cassidy on the T. & N. O. Railroad.

As to a substitute, it was found that several of the hardwood distillation products made good frothing agents, and that two of the best frothing agents were products from hardwood distillation which had hitherto been wasted. These were two of the hardwood creosote oils. Recently several barrels of this material were shipped to Cobalt, and a test run under commercial conditions was made at the Buffalo mill. The full capacity of the mill was turned over to Messrs. Parsons and Gilmore, and 600 tons per day for a week was treated by flotation, using these oils exclusively. The results were entirely satisfactory.

Stand for Filling Concentrates Bags

By Frederick W. Foote[*]

An ingenious arrangement was noticed recently at an electro-magnetic separator plant. The products there are collected in metal containers and poured into sacks for shipment. The sacks, which usually weigh 100 lb. when full, are rather heavy and inconvenient to hold open during the process of filling. An iron stand (similar to that used to hold evaporating dishes over a Bunsen burner), 18 in. high and 8 in. in diameter at the top, was made, and a few nails, with the points turned outward, were placed around the rim. The nails were soldered in place. The bag is suspended inside the holder and held in place by the nails. After it is filled it can easily be detached and sewed for shipment.



STAND FOR FILLING CONCENTRATES BAGS

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[*] Mill superintendent Hedley Gold Mining Co., Hedley, British Columbia.

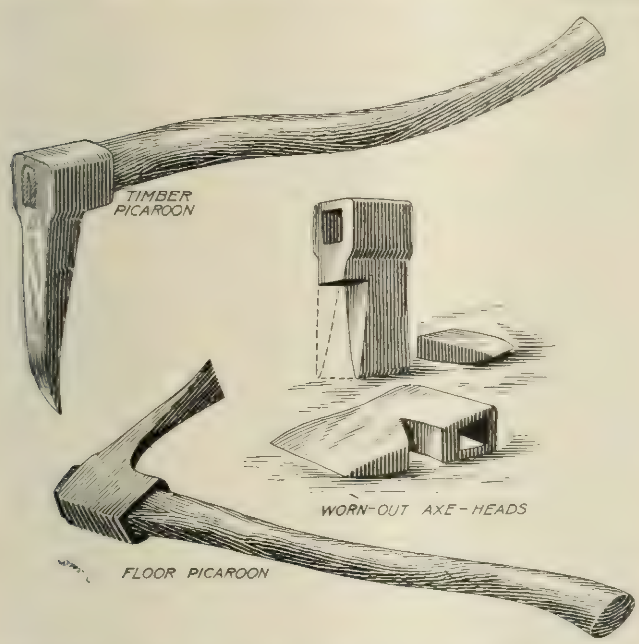
[†] Twenty-sixth Annual Report of the Ontario Bureau of Mines, 1917.

[*] Mining engineer, 80 Broadway, New York.

Details of Practical Mining

Picaroons and Picaroon-Adzes

Axes used around the mine are in time ground down to such extent that little steel remains in the bits, so that the cutting edge is gone and they are of no further use as axes. However, they should not be thrown away, as useful mining tools known as picaroons and picaroon-adzes can be made from what is left.



PICAROON AND PICAROON-ADZE MADE FROM OLD AXES

A picaroon is probably a new implement to most mining men, but a useful one and better for handling timbers or raising floors than a pick. It has a crook, so that a good purchase can be obtained in raising a plank when the floor has become wedged tightly between timbers. Owing to its hooked point, a picaroon will stick better in a timber when dragging or pulling it than a pick will. It is a tool for a special purpose and is kept sharp, while the pick, an implement of general usefulness in the stope, is usually dull, and not so well fitted for handling timbers or lifting floors. The picaroon also can be used as a hammer and is in reality nothing but a special type of light pole-pick. The type referred to, which is made by drawing the bit of a worn-out axe into a pick point with a slight hook near the end, has long been used in the mines of the Cœur d'Alene district, and it is thought to have originated at the Frisco mine, at Burke, 20 years ago.

The manner of making the picaroon depends upon the amount of metal in the axe head as well as the use to which the tool is to be put after it is made. That used by timbermen in handling timbers in the stope is made light and with a shorter point, so as not to pull out of the timbers too easily. Picaroons intended mainly for lifting floors are made with longer points and are heavier than those used for handling timbers. No new steel is welded into the axe metal to make a new point, but, instead, the metal of the axe blade is drawn out in such a manner that the bit of the axe will form the lower part of the point. Consequently, the lower part of the picaroon blade is made up of steel and iron welded together in a laminated manner so that it forms, when tempered, a tough and lasting point. If there is too much metal in the axe, part of it is cut out on the anvil before the new tool is shaped, as shown by the sketch. If there is likely to be a shortage of metal in the blade, a small V is cut in the lower side of the axe, just below the eye, and the remaining metal is driven down and drawn out to form the point, so that the steel of the bit will be kept in the lead as much as possible.

A picaroon-adze can be made from an old axe head in a similar fashion, but care is taken in drawing out the metal to keep the steel of the bit well in the lead, and all the metal is preserved so as to give weight to the tool. When the metal has been drawn out to form a point five inches long, an adze bit about an inch and a half wide is shaped, tempered and ground. A picaroon-adze will be found handy in chopping out a timber that cannot be removed with an axe or wood chisel.

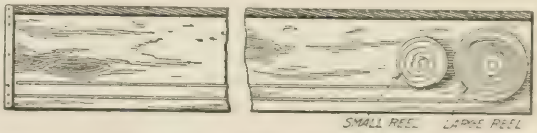
Both the timber picaroon and the picaroon-adze are fitted with an axe helve for a handle, because it is curved and can be gripped securely and easily. The floor picaroon is fitted with an old pick-handle, for this is stronger and will permit of much more prying without danger of breaking while raising floors.

At the Bunker Hill & Sullivan mine, old pick eyes, no longer heavy enough to make good picks, are used to make picaroons. One end of the pick is cut off about 2 in. from the eye, and the other is drawn out to form a light slightly hooked pick-point, which has the same general appearance as the point on the axe-picaroon, just described.

Cutting Board for Sizing Fuse

By William Crocker*

Cutting a large number of fuses to a standard length may be accomplished with the aid of the cutting board shown in the illustration. The board rests on a bench made of 2-in. plank 12-in. wide. A 1-in. board 6-in. wide is nailed on edge to the top of the bench, acting as a back. At the right end of the board two pegs are set in the center line of the bench, separated sufficiently



TOP VIEW OF FUSE-CUTTING BOARD

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*Prescott, Arizona.

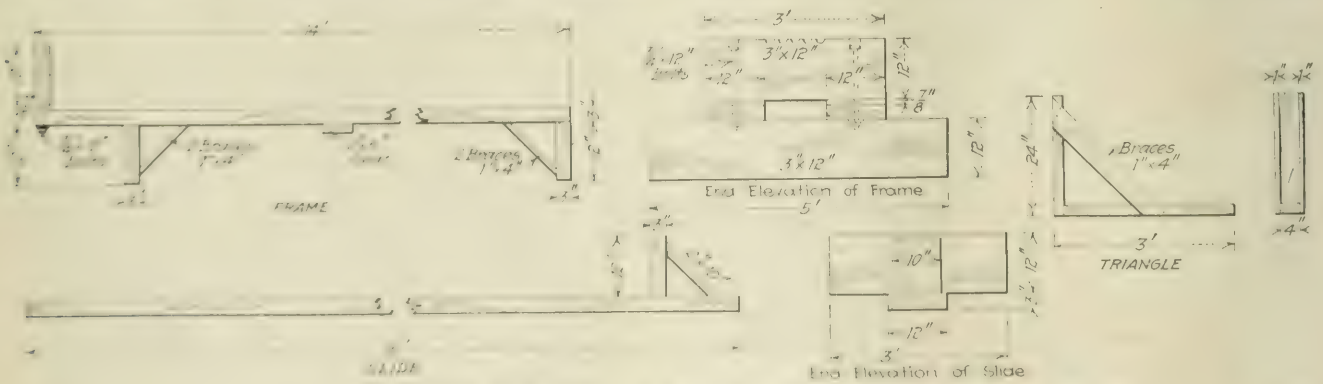
to take the inner and outer coils of a 100-ft. coil as shipped by the makers. At the opposite end a cleat is nailed to the bench and the desired length of fuse measured from the right edge of the cleat and well marked in the bench to the left of the coils. Two fuses, one from each coil, can be cut accurately at one time.

Cutting Round Timber Posts

By L. D. Davenport*

Recently it was necessary to repair one of our coal-dock trestles. The majority of the bents were of square timber, resting on a pile foundation. The piles were badly rotted at the surface of the ground, while the square timber was in good condition. The repair work consisted of holding up the square timber bents with false work and cutting off the piles 12 in. below the surface of the ground, building forms, pouring concrete mud sills and retimbering. The bents were taken alternately, as the trestle was in daily use. When the concrete had set for 10 days, round timber posts were placed from the concrete sills up to the square timber sills. There were five posts in each bent. The three inside posts were plumb, and the two outside posts were battered 1 in. to the foot. The false bents were also made with five posts. The round timber used was mining timber from 10 in. to 16 in. diameter, and much of it was far from straight.

TIMBER CUTTING FRAME IN USE NEAR HIBBING, MINNESOTA



DEVICE FOR CUTTING ROUND TIMBER POSTS

To facilitate cutting off the posts, either square or with the proper bevel, the device shown in the sketch was built and in effect is a large-size miter box. In operation, a ¾-in. hole is bored in the center of each end of the post to be cut off and a short pin of ¾-in. round steel placed in each hole, so that the steel projects about 6 in. The post is then put on the device with the pins resting on the notch in the slide at one end and on the center notch in the frame at the other end. The two triangles are then tacked on either side of the post, square with the frame, where they serve as a guide for the crosscut saw. One end of the post is then sawed two-thirds of the way through, and the triangles are moved to the other end, where a second cut is made. The post is then wedged up at each end, the pins are removed and the cuts finished.

When a batter post is to be cut, one pin is placed in the center notch of the slide and the other in one of the outer notches in the frame, according to the length of the post (before it is cut) and the batter desired. For example, with a 9-ft. post and a desired batter of 1 in. to the foot, the pin at the frame end will be set 9 in. from the center notch. This device is easily made, insures accurate cutting and saves considerable time, especially when the timber is crooked.

Making Grizzlies from Old Rails

In these days it is well to remember that efficient grizzlies can be made out of discarded rails. At mines where it is not especially important to get all the fines out of the coarse ore, the rails can be used just as they are by simply sawing them off to proper length. But even where it is important to get the fines out as thoroughly as possible when dumping over a grizzly, as at a lead mine, efficient grizzly bars can be cheaply made out of old rails.

At the Hecla mine, at Burke, Idaho, an oxy-acetylene blow-pipe is used to cut off the flanges of discarded 85-lb. rails coming from the railroads which serve the mine. The rails are cut to 15-ft. lengths, and then with the oxy-acetylene flame the flanges are cut off even with the line of the web, but so as to leave three wings to each grizzly bar, one at each end and one at the middle. These wings should be 6 in. long and the full width of the rail flange and should be bored for bolting the bars in place. The pieces of flange that are cut off in doing this are also bored, and then made to serve as bars on the fine grizzlies by stringing them on rods with washers between.

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*Chief engineer, Oliver Iron Mining Co., Hibbing, Minnesota.

Assayer and Chemist

Determination of Tin in Concentrates

By A. M. Smoot*

A new method of analysis for stanniferous tungsten concentrates by M. Travers was described before the Academie des Sciences, Sept. 24, 1917. The method, which was stated to have given satisfactory results even in the analysis of ores as rich in tin as 50%, is reported in abstract by *Génie Civil* as follows:

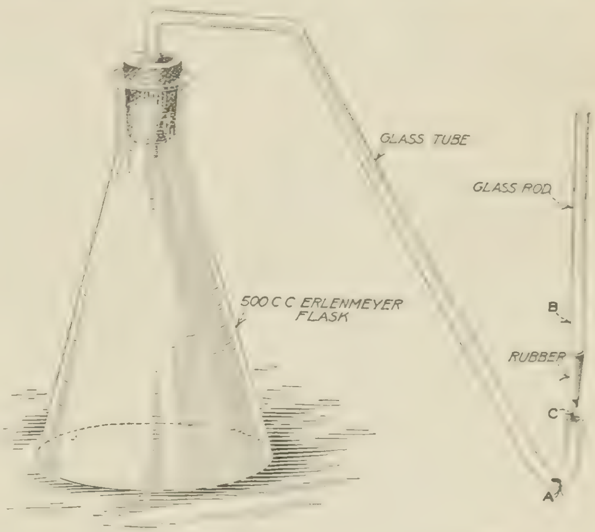
> The finely pulverized ores are fused with anhydrous sodium sulphite. The attack is rapid and perfect, even for minerals containing 50% tin. The fused mass, dissolved in boiling water, is diluted to 780 or 800 c.c. and freely acidulated. The brown stannous sulphide precipitates, entraining a little silica and sulphides of iron or of manganese, but no tungstic acid. The stannous-sulphide precipitate is purified by dissolving in yellow ammonium sulphide, and on re-precipitation one has a yellow stannic sulphide which may be calcined to the state of SnO_2. Tungsten is determined simultaneously by fusion of another portion with anhydrous sodium sulphite. The melt is decomposed directly with strong aqua regia; if titanium is also to be determined, sulphuric acid is used. Most of the tungstic acid separates, mixed with silica. The filtrate is treated with ammonia in quantity insufficient to dissolve the tungstic acid. The ferric-hydroxide precipitate, containing the remainder of the tungstic acid, is washed free from sodium salts and dissolved in HCl (1:1). This solution is evaporated to dryness to render the tungstic acid insoluble and may then be separated from silica in the usual way.

Not being familiar with the action of sodium sulphite as a fluxing agent for tin-tungsten concentrates, I have made a few tests, the results of which show that sodium sulphite is an excellent fluxing agent for tin-bearing tungsten ores. A rather high heat is required, but decomposition of the ore is rapid and complete, tin and tungsten passing into solution when the fusion is leached with water. Even high-grade cassiterite concentrates containing upward of 70% Sn are completely decomposed by a single 10-min. fusion and 60% WO_3 wolframite concentrates are equally well attacked.

The abstract in *Génie Civil* states that when the aqueous solution of the fusion is made slightly acid, brown stannous sulphide is precipitated, entraining a little SiO_2 and Fe and Mn sulphides, but free from WO_3. My experiments show that, in common with all other alkali sulpho-stannates, the solution yields stannic sulphide when it is acidulated, not stannous sulphide. The precipitate contains SiO_2, but only traces of Fe; considerable WO_3 is also entrained when large amounts of it are present in the solution. On dissolving the stannic sulphide in yellow ammonium sulphide, filtering off the iron sulphide, etc., and again acidulating, stannic sulphide is re-precipitated which appears to be nearly free from WO_3, but probably contains a little SiO_2. A test made on a mixture of cassiterite and wolframite concentrates containing 0.0880 gram SnO_2 gave 0.0900 gram SnO_2 by this method. The SnO_2 weighed was not quite pure and the results, as might be expected, are a trifle too high.

The method could be improved by adding tartaric acid or sodium tartrate to the alkaline solution of the fusion before acidulating with a mineral acid; this tends to prevent, or at least diminish, co-precipitation of WO_3. In exact work, especially in the determination of small amounts of Sn in wolframite concentrates, it would be necessary to examine the final tin oxide carefully for impurities, particularly for SiO_2. Arsenic and antimony would also interfere, but they seldom occur in appreciable quantities in commercial tungsten ores.

The method is worth the attention of those interested in the analysis of tin-bearing tungsten ores. Similar methods based on fusion with anhydrous sodium thio-sulphate and with a mixture of sodium carbonate and sulphur are in use. The advantage of anhydrous sodium sulphite seems to be its more rapid and complete action on the ore, possibly due to the higher fusion heat required and to the fact that less free sulphur is produced when the solution of the fusion is acidulated, and there is less danger of entraining the tungstic acid.



CRAIG'S IMPROVED CO_2 APPARATUS

The method practiced in Ledoux & Co.'s laboratory for the determination of small amounts of tin in tungsten ores and concentrates may be of interest in this connection. It depends upon the practically complete removal of WO_3 before separating tin and is conducted as follows:

Treat two grams of the ore, pulverized in agate to 200 mesh and finer, in a 350-c.c. beaker with 100 c.c. of strong HCl. Let the mixture stand for an hour or so at about 50° C., frequently stirring to prevent the ore from "caking"; slowly evaporate the solution to a volume of, say, 50 c.c. and then add 5 c.c. HNO_3 and again evaporate, with frequent stirring to break up crusts of WO_3, to a volume of about 15 c.c. The small amount of HNO_3 used is practically all decomposed by reaction with HCl and is expelled as nitrogen oxides.

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*Chief chemist, Ledoux & Co., 99 John St., New York.

By this method of attack the ore is decomposed more rapidly and thoroughly than by the conventional boiling with aqua regia. Tungsten is separated as hydrated WO_3, iron, manganese and lime pass into solution, silica and tin oxide (cassiterite) remain for the most part insoluble with the WO_3, but a little tin may pass into solution, especially if tin sulphides are present.

Add 100 c.c. of water to the solution and boil for a few minutes. Filter and wash the residue thoroughly with dilute (5%) HCl and save the filtrate, which may contain a small amount of tin. Wash the residue of tungstic oxide, silica and insoluble residue from the paper into the original beaker with a small stream from a wash bottle; add 15 c.c. of strong $NH_4(OH)$ and heat until the tungstic oxide dissolves; filter through the original filter paper and wash thoroughly with dilute $NH_4(OH)$ to remove as much tungstic oxide as possible. The remaining residue may contain a few miligrams of undecomposed tungsten mineral, but this makes no difference, as at least 95% of the tungsten is removed if the operations have been conducted properly. Ignite the residue in an iron crucible, add about ten times its weight of Na_2O_2 and fuse at a red heat. The fusion requires only a few minutes. Dissolve the fusion in water and boil to decompose the excess of Na_2O_2; then add 5 grams of tartaric acid and 20 c.c. of HCl. After a few minutes everything should pass into solution, leaving a clear liquid. Add this to the original filtrate from the tungstic oxide and insoluble residue.

TIN PRECIPITATED WITH HYDROGEN SULPHIDE

The solution now contains all the tin and only a modicum of tungsten. Pass a rapid current of H_2S into the liquid for 15 min. Tin sulphide is precipitated free from tungsten; it may contain copper or any other members of the H_2S group, together with a little silica and free sulphur. Filter and wash the precipitate with very dilute H_2SO_4. Ignite the precipitate in an iron crucible, converting tin sulphide to oxide. Add about 10 times the weight of Na_2O_2 and fuse again. This fusion requires about one minute. Cool and dissolve the fusion in water, boil to decompose the excess of peroxide and add 5 c.c. of HCl. The solution should be clear except for the possible separation of a little silica. Add 5 or 6 grams of pure granulated zinc and let the mixture stand for a short time. As the zinc dissolves, iron is reduced and tin is separated as metal. Before all the zinc is dissolved, filter the solution through a porcelain Gooch crucible containing a thin asbestos pad; wash once or twice with water. This filtration should be conducted rapidly. Remove the asbestos pad containing the tin and excess zinc to the beaker which contained it, wash any precipitate adhering to the crucible into the beaker, add 100 c.c. of HCl (1:1) and warm. The excess of zinc rapidly dissolves and also the tin, which passes into solution as stannous chloride.

Transfer the liquid to an Erlenmeyer flask fitted with a rubber stopper supplied with an outlet and inlet tube so that a current of CO_2 may be passed through the flask; dilute to 200 c.c., add a coil or two of pure nickel wire, close the flask and start CO_2 through it; heat to boiling and boil for 10 or 15 min. to insure complete reduction of all tin to the stannous condition. Cool, still maintaining a current of CO_2, and, as soon as the solution is cold, remove the CO_2 connections and the nickel wire coils. Add starch indicator and immediately titrate the stannous tin with $\frac{N}{20}$ iodine solution. If preferred, soft-iron wire rather than nickel may be used to reduce the tin. The boiling may be continued, in this case, until the iron is all dissolved, thus avoiding the necessity of removing the wire coils.

CRAIG'S IMPROVEMENT OF CO_2 APPARATUS

To avoid the complications of cumbersome CO_2 apparatus, and the paraphernalia connected therewith, the old method is used of boiling in a closed flask fitted with a single tube leading into a strong solution of $NaHCO_3$ (made with boiled water, free from oxygen). This plan was not without drawbacks until Archibald Craig devised a little modification.

The apparatus is shown in the sketch. At the point *A* in the outlet tube a small hole about 1 mm. in diameter is blown in the glass. A glass rod, *B*, is drawn out a little at the end to reduce the diameter and is covered with a small piece of rubber tubing to form a light-fitting stopper for the open end of the tube *C*. The solution to be reduced, together with the iron wire, is placed in the flask, which is then stoppered and placed on a hot plate. Steam from the boiling solution and hydrogen from the action of the acid on the iron rapidly displace the air in the flask, the gas and steam escaping through *C*. When the iron is nearly all dissolved, the solution meanwhile boiling rapidly, a small beaker containing 50 c.c. of strong bicarbonate solution is slipped under the bend of the tube *C*. When the iron is all dissolved and nothing but steam escapes, the plug is inserted in *C*, the apparatus is lifted from the hot plate and the flask is placed in a shallow pan through which cold water circulates. Condensation of steam immediately causes some bicarbonate solution to enter the flask through the small hole at the bottom of the bend. CO_2 is at once generated, establishing equilibrium. Small quantities of bicarbonate solution pass into the flask, generating CO_2 as condensation proceeds. The whole operation is smooth and automatic; it requires no attention whatever after the flask is placed in the cooling pan. A dozen or more flasks may be boiled and cooled at one time without the least trouble, whereas without the plug and the small hole at the bend the action is jerky and often violent because too much bicarbonate is sucked into the flask at one time, there is a sudden and violent evolution of gas and very likely the determination is lost. This simple little apparatus is most useful in all tin and many other determinations requiring reduction in an air-free atmosphere.

The method sounds more cumbersome than the fusion methods, but as a matter of fact it is not. A dozen determinations may be started and carried forward at the same time, since the rather long acid treatments and evaporations require little of the chemist's time. The fusions with Na_2O_2 are short, the filtrations required are only on small volumes of liquid, and are easily made, whereas in the fusion methods the volumes are large and the filtrations slow. On the score of accuracy the acid digestion method should be superior for determining the small amounts of tin usually found in tungsten ores and concentrates. Arsenic, antimony and small amounts of copper do not interfere with the iodine-titration method, and silica need not be considered.

Improved Test for Tungsten

By Roy F. Heath*

The usual test for tungsten is to flux some of the sample finely ground with sodium carbonate, leach with boiling water, acidify with hydrochloric acid, and add metallic zinc or tin, which, if tungsten is present, will cause a series of characteristic changes in color from blue and violet to wine and red. The first change is the most distinctive, namely, that of the solution nearest the metallic substance turning blue or violet. This often occurs so rapidly that it is imperceptible, and the other changes are often insufficient to lead to identification.

The test here described is characteristic and easily carried out: Grind the sample to 60 mesh, take five grams, add 25 c.c. strong nitric acid, digest and boil; add hydrochloric acid if necessary to decompose the ore further; boil, dilute with water, filter off insoluble silica, tin oxide, etc. The decomposition thus collected is usually sufficient for most ores. Take about 15 c.c. of the filtrate in a test tube, add 5-10 c.c. glacial acetic acid and add slowly 8-12 c.c. of test solution made as follows: copper sulphate, 5 grams in 15 c.c. water; stannous chloride, 5 grams in 10 c.c. water; and potassium iodide, 2 grams in 10 c.c. water.

Mix thoroughly and dissolve the precipitate that forms with ammonium hydroxide, which will require about 100 c.c. or more. A fine blue-white precipitate, a mixture of stannous hydroxide and cuprous ammonium sulphate, will settle out, which is soluble in the reagent. If tungsten is present, a characteristic red ring will appear below the solid precipitates. At times the ring is immediately next to the lowest precipitate, and again it may be one-half to one centimeter below. It shows up best against the light.

The test solution should be added slowly down the sides of the test tube. Do not shake the latter, but let the precipitates rise to their height, when, if tungsten is present, the red ring will appear. The usual metals present with tungsten ores do not interfere with this test. The test solution should be kept in a corked bottle and be shaken before using.

Taking Aliquots in Standardizing

The inaccuracy involved in taking aliquot parts of the standard when standardizing solutions, which is due to temperature fluctuations and unavoidable errors of manipulation in the use of graduated instruments, may be avoided, according to C. F. Miller (*Journ. Ind. and Eng. Chem.*, November, 1917) by the following method, which he claims is both convenient and practicable:

About five times as much of the standard as is desired for each titration is weighed out carefully and dissolved in a quantity of water slightly exceeding five times the capacity of the pipette to be used in taking the aliquots. (The pipette need not be standardized, nor is it even necessary to know its exact capacity.) Five portions of the solution are now carefully drawn in an identical manner, and the remainder, together with the rinsings from the pipette, is transferred to a tared platinum dish, evaporated, dried and weighed. A simple calculation gives the exact weight of substance used for each titration. The method can be used only for such substances as Na_2CO_3, etc., which are soluble and separate from the solution again in a weighable form upon evaporation.

Determination of Tungsten

The following method of determining tungsten is given by A. H. Low in *Chemist Analyst* for February, 1918:

Weigh 0.5 gram of the finely ground ore into an 8-oz. pear-shaped flask (copper-flask). Add 2 grams of anhydrous sodium sulphate and 5 c.c. of strong sulphuric acid. Heat over a free flame, best with the flask in a holder, until the free acid is all expelled and the mixture is reduced to an almost red-hot melt. Allow to cool while rotating the flask slowly so as to cause the melt to solidify on the sides, to prevent cracking the flask. When cool, add 25 c.c. of strong hydrochloric acid and 5 c.c. of strong nitric acid. Boil until the bulk is reduced to about 12 c.c. Add 25 c.c. of hot water and 3 c.c. of cinchonine solution and cool under the tap, or otherwise, to room temperature, or cooler. The cinchonine solution is made by dissolving 25 grams of cinchonine in 200 c.c. of 1:1 hydrochloric acid (quinine may be substituted for cinchonine if desired). Filter the cold mixture through a 9-cm. filter, returning the first portions if at all cloudy. The flask may be rinsed out with cold water if done quickly while the filter still contains liquid.

Wash, filter and precipitate 10 times with dilute cinchonine solution (5 c.c. of the above solution diluted to 100 c.c.) contained in a small wash-bottle. The flask may still retain a little WO_3 adhering to the sides. Spread the filter on a watch-glass and wash the contents back into the flask with hot water, using as little as possible. Pour ammonia over the filter, to dissolve any adhering WO_3, and again wash into the flask. Add a little more ammonia to the mixture and then boil the whole to very small bulk, expelling all the free ammonia. Again filter through a 9-cm. filter, using hot water to rinse out the flask. Receive the filtrate in a similar flask. Now place sufficient warm dilute (1 : 1) ammonia in the original flask and use this solution to wash filter and residue 10 times, pouring on about 5 c.c. for each wash.

Boil the filtrate to very small bulk, even to dryness does no harm. Ad 1 gram of sodium sulphate, 4 grams of ammonium sulphate and 5 c.c. of strong sulphuric acid. Repeat the original heating until all organic matter is burned off and the ammonium sulphate is volatilizing freely. Cool as before and repeat the previous operations at this point until the precipitate is on the filter ready to wash. A little WO_3 may again adhere in the flask. Pour 5 c.c. of strong ammonia into it and boil until all the ammonia odor is gone. Now add 2/3 c.c. of hydrochloric acid, about 1 c.c. of the dilute cinchonine solution and cool under the tap. Dilute a little if thought necessary and pour through the still unwashed precipitate on the filter, then wash the latter 10 times with the dilute cinchonine solution. Ignite filter and precipitate in a weighed platinum dish until the carbon is all burned off. Cool, add a few c.c. of hydrofluoric acid and evaporate to dryness on a water-bath. Again ignite, cool and weigh as WO_3.

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Events and Economics of the War

The effort on the part of certain Senators to extend the draft age limits has been abandoned, owing to the opposition of Secretary Baker. A plan for aiding Russia is said to have been determined upon by the President. Fuel Administrator Garfield asked that coal mine employees be exempted from further calls in the draft. The Army, fortifications and sundry civil appropriations bills, totaling $20,000,000,000, were passed by the Senate on June 29. Representative Kitchin, of North Carolina, reported a new bill to the House, authorizing an $8,000,000,000 Liberty Bond issue. Profiteering in various industries was charged by the Federal Trade Commission in a report to the Senate. Western Union Telegraphers have been instructed to strike on July 8. Eugene V. Debs, former Socialist candidate for President, was arrested on June 30 charged with sedition. The President asked for authority to take over all telephone and telegraph lines

Abroad, the Italians have held their ground after driving the Austrians across the Piave; with Allied aid they captured several positions on the mountain front; various other gains by local attacks were made by the Allies in France while awaiting a renewal of the German offensive. The death of ex-Czar Nicholas of Russia was reported but not confirmed. Kerensky is said to be in London. The Canadian hospital ship, "Llandovery Castle" was torpedoed on June 27.

Some Ramifications of Work of Army Ordnance Department

Few citizens have any conception of the various ramifications of the work of the Army Ordnance Department, the idea generally prevalent being that it has something to do with guns and ammunition. As a matter of fact, the Ordnance Department comes in contact and deals with practically every industry in the country, and is daily placing orders with firms all over the United States for materials needed for the successful prosecution of the war. These orders cover a wide range and are placed in quantities that are frequently staggering to the average mind. Commodities formerly ordered in hundreds are now ordered in millions; those formerly placed in ounces, now ordered by the ton. A detailed list of the orders placed even for a short period would occupy too much space, but it may be of interest to those connected with the machines and metals trades to learn of some of the items, orders for which are placed by the Ordnance Department with these most important industries:

Compressed gas reservoirs, openhearth steel, steel bars, pig tin, sheet brass and copper, steel wheels, miscellaneous light and heavy towers with anchors and templets, alloy sheet steel, 1½-in. manganese soft aluminum wire for manufacturing meat cans, copper tanks, gratings, angle iron frames, needle and globe valves, wire, cutter and stapling machines, aluminum sheets and rivets, copper-clad wire rope, screw stock, soft steel wire, brass discs, soft sheet steel, block tin, openhearth sheet steel, ingot and sheet aluminum, ingots of nickel-silver (formerly called german silver), hot-rolled low-carbon openhearth steel, Lake Superior copper, 62½-ton six-wheel switching locomotives, 38-ton 4-wheel saddle-tank locomotives, 40-ton 4-wheel saddle-tank locomotives, parts for locomotives, clam-shell buckets, locomotive cranes, gravity conveyors, 2-wheel dock trucks, 40-ton flat cars, 20-gallon chemical engines, 40-gallon safety fire-bucket tanks, storage-battery trucks, with adjustable and stationary crane hoists; sewing machines, bench skiving machines, and electric drills.

Bureau of Mines Work on Gases Taken Over by War Department

Acting upon his decision that measures for the use of gas in warfare should be coördinated under the War Department, the President on June 26 ordered the transfer to that department of the chemical section of the Bureau of Mines. The entire gas experimental work will be under the direction of Major General William L. Sibert, who has recently returned from France.

The Bureau of Mines has been intensely active in experimenting with new gases and gas masks and has established a special chemical laboratory at American University, in Washington. A large number of American chemists have given the Government the benefit of their experience in this respect. A tribute to Van. H. Manning, director of the Bureau, was paid by Secretary Baker in a letter to the President in which he said: "I do not know how the work could have been better done than Dr. Manning did it, and the present suggestion that the section now pass under the direction and control of the War Department grows out of the fact that the whole subject of gas warfare has assumed a fresh pressure and intensity, and the director of it must have the widest control, so as to be able to use the resources at his command in the most effective way possible. The proposal does not involve the disruption of the fine group of scientific men Dr. Manning has brought together, but merely their transfer to General Sibert's direction."

Would Save Steel in Big Gun Shells

According to a dispatch from Paris to the *Times*, General Percin, who commanded the Lille military district at the beginning of the war and is regarded as one of the leading artillery experts of France, emphasizes the advisability of economizing as much as possible the consumption of munitions, in view of the fact that America is now furnishing less and less steel, owing to the necessity of sending her troops abroad.

Before the war, he points out, Germany produced four times more steel than France, but now, since she has seized the French industrial plants in the north, she is producing fifteen times as much and possesses 450 blast furnaces against 30 in France.

As a means of economizing steel, he urges the greater use of weapons like the Archer gun, instead of heavy artillery. The Archer gun, says General Percin, at a range of 600 yards, will hit a target 40 times as often as a six-inch gun firing at four-mile range. As the bomb fired by the Archer gun represents only half the weight of steel, though containing about the same quantity of explosive, it is evident, he says, that such guns produce the same destructive effect with one-eightieth of the quantity of steel.

On this basis General Percin argues that the destruction of 375 miles of trenches by Archer guns would cost only £6,000,000, as compared with £480,000,000 by heavy artillery. The necessary steel, he asserts, could be produced in a week, which is industrially possible, instead of two years, which is industrially impossible. General Percin argues that small guns should be used for the work of destruction and the heavy artillery devoted to the protection of advancing infantry, neutralizing mine-throwers, and disorganizing installations of machine guns in shell holes.

Fix Price for Sulphuric Acid

The War Industries Board announced on June 27 that, as a result of a meeting of the manufacturers of sulphuric and nitric acid with the price-fixing committee of the War Industries Board, maximum prices have been agreed upon and approved by the President, taking effect immediately, and expiring on Sept. 30, 1918, as follows:

Sulphuric acid 60° Baumé, \$18 a ton of 2000 pounds.
Sulphuric acid 66° Baumé, \$28 a ton of 2000 pounds.
Sulphuric acid 20% oleum, \$32 a ton of 2000 pounds.
Free on board manufacturer's works in seller's tank cars.
In carboys in carload lots, ½c. a pound extra.
In carboys in less than carloads, ¾c. a pound extra.
In drums, any quantity, ¼c. a pound extra.
Nitric acid 42° Baumé, 8½c. a pound, free on board manufacturer's works in carboys.

A schedule of maximum prices on mixed acids is being prepared, and will be announced later. The above maximum prices are agreed upon for the public as well as the Government. It is understood and agreed that any deliveries made after Sept. 30 will be subject to any revision in price which the Government may make.

Tin Movement as Affected by War

A compilation made by the National City Bank of New York shows that many commodities from abroad that formerly passed through many hands before reaching the United States now come to this country in greater quantities direct from the countries producing them. Among the articles mentioned in the list is tin.

This metal, a product of the Dutch East Indies and the Malayan Peninsula, formerly arrived in large quantities from the Netherlands and England, but fell off markedly in more recent years, while the quantity received direct from the place of production shows striking increases. From the Netherlands, for example, the importation of pig tin into the United States in 1912 amounted to over 4,000,000 lb., and in 1913, 3,500,000 lb., and from the Dutch East Indies nothing. With the opening of the war, however, the imports of tin from the Netherlands fell to 750,000 lb. in 1914, 500,000 in 1915, and nothing in 1916, while the imports direct from the Dutch East Indies grew from nothing in 1913 to 3,500,000 lb. in 1915, 14,000,000 lb. in 1916, and 31,000,000 in the calendar year 1917. In the case of the United Kingdom and its colony, the Straits Settlements, the quantity sent direct from England to the United States fell from 66,000,000 lb. in 1912 to 40,000,000 in 1917; while the quantity arriving direct from the Straits Settlements, the place of production, increased from 33,000,000 lb. in 1912 to 82,000,000 in 1916, and 53,000,000 in 1917.

Storage of Fuel Oil Advised By Fuel Administrator

Companies using fuel oil for operating purposes are being asked by the Oil Division of the U. S. Fuel Administration to store all they can now and to create a reserve storage for the coming winter use, if possible. This does not mean, it is said, that delivery of all oil ordered now can be guaranteed, though an effort will be made to take care of essential industries attempting to secure such reserve supplies. Thirty days' storage is named as the minimum by C. G. Sheffield, assistant to the head of the Oil Division, and 60 days' supply of fuel oil is deemed preferable. Express movement of tank cars on the railroads is affording excellent service to the oil industry. In general, conditions are good for delivery of fuel oil during the summer.

Plans are being considered also by the Oil Division for determining the most satisfactory method of conserving gasoline. It is not expected that it will be necessary to restrict normal consumption for freight vehicles, and, provided there is reasonable conservation by all concerned, it is thought that it will be unnecessary to interfere seriously with pleasure cars and motor boats. However, it is emphasized that the paramount use for gasoline is for war purposes, all of which requirements will be supplied.

Power-Plant Efficiency in Charge of H. W. Knott

The U. S. Fuel Administration has announced the appointment of Henderson W. Knott to manage the field force of engineers and inspectors which is at work among the power plants of the country, carrying out a campaign of instruction and inspection designed to bring the use of fuel for the production of power to the highest possible efficiency and economy. Mr. Knott has been the general manager of the Morgan Crucible Company, of New York.

The appointment of Mr. Knott is a part of the plan, originated by David Moffat Myers, advisory fuel engineer of the Fuel Administration, to have each of the 250,000 steam plants in the United States visited by a competent man who can make suggestions and report in connection with the questionnaire originated by Mr. Myers, working with committees from the four great engineering societies. This work will naturally require a large number of inspectors who will devote their time to the work and visit the plants in person.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Trade Commission Reports on Profits

Profits accruing to 21 copper-producing companies during 1917 ranged as high as 107% on the investment involved and averaged 24.4%, according to a Federal Trade Commission report to the United States Senate.

No unusual profits were made in the zinc industry, with the exception of the New Jersey Zinc Co. The International Nickel Co. is absolved of the charge of profiteering. The Union Sulphur Co. and the Freeport Sulphur Co. each "took advantage of the existing situation to raise their prices," says the report. The commission's reference to copper follows in full:

> Very large earnings have been made in the copper industry on the whole, although it should be noted that they have been due in part to an unusually heavy demand for this metal, which is used almost exclusively for war purposes, directly and indirectly. The commission's figures show that 21 companies, including a large proportion of high-cost companies, made profits in 1917 which ranged from 1% to 107% on their investments. The average profit was 24.4%. Probably over 70% of the production is marketed at profits over 20% on investment. These same companies show an average profit of only 11.7% in 1913, which may be considered to be a normal year. Thus the average profit in the industry has more than doubled. The range of profits in 1913 was from 1 to 56 per cent.
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> The profits used in these computations do not include Federal income or excess-profits taxes, and, therefore, represent sums actually retained by the companies for addition to surplus or dividends.
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> There does not appear on the whole to have been any concerted action in this industry in putting prices up in the first instance. The war scramble among the Allies shot the prices of copper and other metals to almost unheard of levels. But there are certain strong interests among the producers and marketers which predominate in certain stages of production, and these appear to have taken steps to maintain prices at unnecessarily high levels. In the first place, the smelters, and notably the American Smelting and Refining Co., have continued to hold in force certain deductions for risk of carrying copper bought from mines, which risks have ceased to exist. These deductions were put in force during the early period of the war, before the price was fixed by agreement with the War Industries Board.
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> Their present maintenance amounts to profiteering at the expense of the miners, especially the small producers. On the other hand, some of the larger and richer mines have contracts entered into before the war running for periods as long as 20 years, which are extremely advantageous to them and which are now causing some refineries to operate at a loss.

With regard to zinc, the report says:

> Most of the evidence in the commission's possession indicates no unusual profits in the zinc industry, with the exception of the operations of the New Jersey Zinc Company. Basing percentage on the capital stock issue of $35,000,000, the following net earnings and dividends are shown for the New Jersey Zinc Co., according to published statistics: 1916, profits, 72.5%, dividends 76%; 1917, profits 56%, dividends 46%. The Federal Trade Commission's figures as to these same net earnings and dividends are available only for 1916, and indicate profits of 95.9%, with dividends of 76 per cent.
>
> These large earnings do not indicate excessive profits on metallic zinc. The company's profits on common spelter are very low, and on Grade A spelter, while high, are due to the fact that it possesses a natural monopoly of a certain high-grade ore, the product of which cannot sell for less than the zinc produced by competitors. In fact, the whole explanation of the New Jersey Zinc Co.'s large profits lies in its possession of an orebody of unusual richness and purity.

The operations of the International Nickel Co. are commented on as follows:

> The dominating factor in the nickel industry is the International Nickel Co., which produces practically the entire output of that metal in this country. The profits of the International Nickel Co. in 1916 were $13,557,000, and the dividends were $10,575,000, which sums amounted to 40% and 31%, respectively, based upon the investment as computed by the commission. Taking the total capitalization and surplus of the company as a basis, the net earnings would be 20% and the dividends 15.6%. In 1917 the profits on the commission's basis were 30% and the dividends 24%, and on the basis claimed by the company the profits were 15% and the dividends 12 per cent.
>
> This company has a natural monopoly based on the ownership of the Canadian mines from which the nickel ore is derived. It has, however, maintained prices on a pre-war basis. Consequently, while prices are high and the profits very large, the increase in profits has been due to the increased war output rather than to advances in price. Therefore it does not seem that any profiteering can be charged unless in a negative sense, that is, the company might have been satisfied with smaller profits in war times. This is especially worthy of consideration, inasmuch as practically the entire output of the company is taken for war uses.

The following information was presented in connection with the investigation of the sulphur-producing companies:

> Two companies produce all the sulphur in this country—the Freeport Sulphur Co. and the Union Sulphur Co. The cost to the Freeport company in 1917 was $6.15 per ton; in 1918 it is estimated that increases will bring the cost up to not over $9.50 per ton. In the first half of 1917 the Union company's costs were $5.73 per ton. The average realization of the Union company in the first half of 1917 was $18.11 per ton, making a margin of $12.38 per ton. The manufacturers of sulphuric acid are paying in the neighborhood of $25, and some as high as $35 per ton, making margins of over $15 per ton for sulphur companies. The Freeport company's balance sheets show an operating profit for the 11 months ending Oct. 31, 1917, of $4,301,310, or 236% on investment. On Nov. 30, 1916, the company's balance sheets show dividends declared of $925,000; on July 31, 1917, $1,850,000; and Oct. 31, 1917, $2,600,000. Its surplus increased from $1,254,000 in November, 1916, to $2,543,000, in October, 1917.
>
> These companies may be said to have a natural monopoly of sulphur. Since they have placed their operations upon an established basis, they have always made large earnings. They have taken advantage of the existing situation to raise their prices.

An effect of price-fixing is described as follows:

> In the case of basic metals, as in steel, when the Government announced a fixed price, it was made so high that it would insure and stimulate production. This has resulted in giving a wide range of profits. Under the device of cost plus a margin of profit, these profits are necessarily great in the case of the low-cost mills. Thus while the market was prevented from running away, as it would have done undoubtedly if it had not been regulated by a fixed price, the stronger factors in the industry are further strengthened in their position and enriched by profits which are without precedent.

Employment Service for War Industry

Commenting on the present labor situation, Felix Frankfurter, chairman of the War Labor Policies Board, said: "Feverish competition for labor rushes men and women from place to place, with the result that the national energies are wasted and the patriotism of the individual workers is frustrated. The labor turnover in the war industries has become intolerably great. Various departments of the Government, under the chaotic private labor-recruiting system, have been 'stealing labor' from each other. Essential industries have been bidding for workers employed in, and needed by, other essential industries. Only a national supervision of labor can destroy the menace.

"The War Labor Policies Board has decided to ask all employers engaged in war work to abandon competitive labor recruiting and to make the offices of the U. S. Employment Service their exclusive agents. At the outset, this arrangement is intended to be applied to unskilled labor. All war industries must first be supplied promptly and adequately with competent workers."

Taxation Discussed Before Committee on Ways and Means

A careful selection of witnesses representing a large number of industries has enabled the House Committee on Ways and Means to obtain some of the best thought in the country on taxation. The hearings were much more extended than is usually the case. Many urged a large income tax. Typical of these arguments was that of William Kent, a member of the Tariff Commission, an excerpt from whose statement follows:

"Revenue can come only from one source, if it is to be permanent revenue, and that is production. Therefore, in framing any tax legislation, the primary thing to render that source permanent is to see that production is not crippled or destroyed; that enough is left to continue that production and enough is left to furnish funds for the increase of that production. When, in a time like this, we come to applying what we might call the corrective, remedial idea of taxation, it should be along the line of driving people into production, of driving land into production and of increasing the fund thereby out of which permanent revenues can be obtained.

"It is my belief that one-third of the revenue to pay for this war can be raised. If more could be raised, I should be in favor of raising it, provided always that it can be raised without destroying production. I hope to see every means taken that will drive people and resources into production."

Representative Slemp, of Virginia, while appearing in the interest of the coal-mining industry, set forth clearly many incontrovertible facts which apply to all mining enterprises. Extracts from his remarks follow:

"Differing from manufacturing establishments, considerable capital expenditures must be made from time to time to maintain a coal mine at a steady rate of output. As the mine ages and the coal area nearest to the tipple is depleted of its minable coal, it becomes necessary to lay additional amounts of rail, to provide more copper, switches, frogs, timber and everything that goes toward extending the tram system. There must be additional cars and motors. As the mileage of the trips increases, the efficiency of the cars decreases. The turnover becomes lower

"There are new factors which all operators must face. It requires more housing today per unit of coal mined than it did three years ago. The single men who have been boarders with the married men no longer form so large a proportion of the mining force. They have been reduced by the draft and volunteer enlistments. They have been attracted in greater numbers to other industries than have the married men. The cost of houses has advanced. Standards of living have advanced. Miners are not content with the class of house which they were willing to rent in 1914. The coal-mine laborer of today does not want to live in a shack. Competition for mine labor has been so keen in the last two years that increasing rents has been out of the question.

"A standard three-ton mine car could be purchased in 1915 for $96. To replace that car late in 1917 took $240. Car repairs through the increase in labor and materials are affected at double the former cost. The electrical equipment situation is even worse. Any operator purchasing new mine machinery will have to depreciate its cost at least 50% before a reduction to normal prices comes, or he will find himself with equipment on hand that has been in use for a considerable period and yet stands on his books at a higher cost than he will be asked to pay for new equipment if prices decline to the 1916 basis. Unless operators are allowed to make some such liberal allowance for depreciation, they cannot afford to buy the equipment which is necessary, not to enlarge their output, but to keep their output up to its existing standard.

"If the operator is not permitted to make some reasonable allowance for advanced work, the temptation will be great for him merely to mine such coal as is obtainable with existing development and equipment. The mine operator has the problem of other lines of industry as well as those above outlined."

Training Engineer Officers

Training of the 2000 candidates for commissions as captains and first lieutenants in the Engineer Corps will be undertaken at Camp Humphreys, 17 miles south of Washington on the Potomac River. Facilities at Camp Humphreys, in addition to the military arrangements, include 15 special schools, at which men are instructed in such operations as mining, quarrying, gas and flame defense, barbed-wire fortification, water supply and railroad communication.

The candidates for commission will be given instruction at all the special schools, after which they will take a course in sapper work, so that they may be fitted to command sapper troops if the necessity should arise. A campaign is now under way to interest men of technical training and experience to enter the officers' training camp, to open about August 1.

Platinum Licenses Ordered in New Bill

If the conferees do not change a Senate amendment to the Sundry Civil bill, those handling platinum must be licensed. The licensing will be handled by the organization created to administer the Explosives Act. The wording of the amendment is as follows:

"Platinum and compounds of platinum are hereby made subject to the terms, conditions and limitations of said act of Oct. 6, 1917 (the Explosives Act), and the Director of the Bureau of Mines is hereby authorized, under rules and regulations approved by the Secretary of the Interior, to limit the sale, possession, and use of said material.'

What's a Regiment Without a Band?

Oh, the windjammers, the windjammers,
The regimental bands!
Their eager blare's one battle prayer
Each "doughboy" understands!
While they may use no bay'nets,
Throw no bombs, nor catch Von Hin,
It's the puffin', sweatin' bandsmen
That will lead us to Berlin!
Howard W. Gleason, in *The Sun.*

To Berlin—that's where they are headed for; so why not give then a band so they can do the trip in style worthy of the industry they came from? Marching gets humdrum after awhile. A band lightens the pack and shortens the way and drives all ordinary troubles into the limbo of forgetfulness. When the boys of the Twenty-seventh heard they were to have a band they became all puffed up in anticipation, for it is not customary for engineer regiments to have them. Just why this is we don't know, but, at any rate, with the new instruments received plus those they already have, the mining regiment will have a "very sizeable band," as Lieut. Col. Perry puts it. So eager were the boys for the music that they agreed to carry the instruments themselves in addition to their regular packs. The bandsmen of the Twenty-seventh will be fighters as well as miners, unlike Gleason's windjammers, cited above, and are equipped for the purpose. Their daily schedule will be exceedingly full.

Interest up to June 26 on bank deposits of the Comfort Fund has amounted to $82.61, which has been added to the following list of contributions. Let us add your contribution likewise to the list:

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles le Vasseur (second contribution)	5.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Sebold	10.00
H. A. Kee	10.00
W. S. Grepher	5.00
Marion L. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Francis Thomson	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burral	25.00
Livingston Wernecke	5.00
Oscar Lachmund (fifth contribution)	10.00
E. P. Mathewson	50.00
Interest to June 26	82.61
Total	$15,285.11

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Because of the work involved in administering the Comfort Fund, contributions are acknowledged only by publication in the *Journal*.

Engineers' Response to War Demands

That the part which engineers are playing in the war is a great one was affirmed by Maj. Gen. William M. Black, Chief of Engineers of the United States Army, who recently spoke at a meeting of the American Institute of Electrical Engineers. At the outbreak of the war, there were in the Engineer Corps of the Regular Army about 300 officers and approximately 3500 enlisted men. At the present time there are about 8000 commissioned officers and 200,000 enlisted men who were formerly engaged in work of an engineering character. It is probable that this does not represent much more than one-half of the number of the profession now serving in the Army.

War was declared April 6, 1917. By the middle of July nine regiments of railroad engineers had been raised and organized and two had actually started for France. In each regiment were two officers of the Corps of Engineers of the Regular Army—the Colonel and the regimental Adjutant. The remaining officers were all from the Engineers' Reserve Corps, some receiving their commissions only when on the point of sailing. Of course, few of the officers had had any previous military training, and the tasks of organization were difficult.

Since then there have been organized five corps regiments, consisting of sapper, searchlight, and sound ranging troops; forty-three sapper regiments and trains, two mounted battalions and trains, five pontoon trains, four inland waterway companies, forty railway regiments and battalions, including all classes of standard gage and light railway troops necessary for the construction, operation and maintenance of railways; one railway transportation corps, one highways regiment, one gas and flame regiment, one gas training service, five forestry and auxiliary forestry regiments, one surveying and printing battalion, one military mapping service, two supply and shop regiments, one water supply regiment, one quarry regiment, one mining regiment, one electrical and mechanical regiment, two crane operating companies, one camouflage battalion, eighteen truck and auto companies, and forty-four depot detachments.

The great part of these organizations is now overseas. Some are serving with the British Army, some with the French, but the majority are with our own troops in service, both at the front and in the rear.

This service of the rear is of great importance and magnitude. Picture to yourself what is required to transport, house, supply and maintain a million men 3000 miles from home, producing nothing and in their work expending enormous amounts of materials.

Taking the question of storage alone, the provision of space required for an army of 1,000,000 for 90 days aggregates 20,000,000 sq. ft. of floor space of covered storage and double that amount of uncovered storage space, with the necessary railway tracks, for receipt and shipment and for classification yards aggregating about 650 miles.

Add to this an equal mileage of highways, adequate provision for water supply, sewerage, and electric lighting, and you can realize the work involved in this one item. Add to this, further, the constructions which have been built at the ports of debarkation, (at one of which 375,000 sq.ft. of wharf space had to be provided), the hospitals, barracks, shops, and the lighting, water, and sewerage systems required, and some conception of the actual new construction work can be formed.

It is estimated that the supply of the Army requires the transportation to the front of 25 lb. a man a day. This makes heavy demands on the French railway systems, good as they are. These have had to be supplemented in all but the main-line trackage, and a large amount of motive power and of rolling stock has had to be supplied and operated.

Licensing of Engineers Interests Engineering Council

At the regular meeting of the Engineering Council on June 20, a special report by the public-affairs committee on the licensing of engineers was debated at length. It was decided to create a small special committee, with carefully selected membership, to study this important question thoroughly with a country-wide view. It is intended that the Engineering Council shall in due time be prepared to advise engineering organizations in any of the states upon this matter. Engineers who have knowledge of proposed legislation are requested to communicate with the secretary of the council. Information or rumor has already been received of possible action by the legislatures of Iowa, Ohio, Indiana and Michigan. As is well known, a few states have passed licensing laws.

Talc Production in 1917

The total output of talc in the United States during 1917 was 198,613 tons, valued at $1,889,672, according to figures compiled by the U. S. Geological Survey. Thirty-seven producers reported, of which seven were in California, six in Georgia, one each in Maryland, Massachusetts, and New Jersey; four in New York, six in North Carolina, two in Pennsylvania, five in Vermont, and four in Virginia.

Heretofore New York has been been the first state in quantity and value of talc produced, but in 1917 its output was less than that of Vermont, although on account of the fibrous character of the talc produced in New York and its consequent high value for making paper, the total value of the output in New York is still greater than that of any other talc-producing state.

The quantity of talc imported for consumption in 1917 was less than 10% of the domestic output, but a larger proportion of it is of high grade. More than half of the talc imported comes from Canada and is of a grade that commands a higher price than the domestic product.

June Mining Dividends

Dividends paid in June, 1918, by 40 United States mining and metallurgical companies making public returns amounted to $24,662,838, as compared with $38,365,938 paid by 49 companies in June, 1917. Holding companies allied to mining paid $323,433, as compared with $768,433 in 1917. Canadian, South American and Mexican companies paid $2,288,942 in June, 1918, and $1,892,601 in June, 1917.

The totals for the first six months of the year 1918 are as follows: Mining and metallurgical companies, $89,851,922; holding companies, $1,076,866; Canadian, Central American, South American and Mexican mines, $9,390,953.

U. S. Mining and Metallurgical Companies	Situation	Per Share	Total
Ahmeek, c	Mich	$2 00	400,000
Allouez, c	Mich	1 50	150,000
Am. Sm. and Ref., com	U. S.-Mex	1 50	914,[illegible]70
Am. Sm. and Ref., pfd	U. S.-Mex	1 75	875,000
Argonaut Cons., g	Calif	05	10,000
Caledonia, l. s.	Ida.	.03	78,150
Calumet & Arizona, c	Ariz.	2 00	1,284,960
Calumet & Hecla, c	Mich.	15 00	1,500,000
Centennial, c.	Mich.	1.00	90,000
Chino, c	N. M	1 00	869,980
Cons. Ariz. Sm., c	Ariz.	.05	83,150
Cons. Interstate-Callahan, z	Ida.	.50	232,495
Copper Range, c	Mich.	1 50	591,598
Cresson Cons., g	Colo.	.10	122,000
Davis Daly, c	Utah	.50	300,000
Eagle & Blue Bell, l. s	Utah	.10	89,315
Federal Min. & Sm., pfd	U. S.	1 75	209,757
Golden Cycle, g	Colo.	.03	45,000
Homestake, g	S. D.	50	125,580
Internat. Nickel	U. S.-Can	1.00	1,673,384
Iron Cap, c	Ariz.	.75	108,608
Is.e Royale, c	Mich.	.50	75,000
Kennecott, c	......	1.00	2,787,028
Magma, c	Ariz.	.50	120,000
Nevada Con., c	Nev.	.75	1,499,593
New Jersey Zinc	U. S.	4.00	1,400,000
North Star, g	Calif.	.20	50,000
Old Dominion, c	Ariz.	1.00	297,071
Oroville Dredg., g	Calif.	.12	82,385
Osceola, c	Mich.	2.00	192,300
Phelps Dodge	U. S.-Mex.	6.00	2,700,000
Quincy, c	Mich.	2.00	220,000
Ray Con., c	Ariz.	.75	1,182,384
St. Joseph Lead	Mo.	.50	704,733
Tamarack & Custer, l.s	Ida.	.03	53,287
Tintic Standard, l.c	Utah	.06	70,480
Union Cons., s	Nev.	.05	10,000
United Eastern, g	Ariz.	.05	68,150
Utah Copper	Utah	2.00	~~3,248,980~~
Yellow Pine, z.l	Nev.	.06	~~60,000~~
Yukon Gold, g	U. S.	.02½	87,500

Canadian, Mexican and So. American Companies	Situation	Per Share	Total
Cerro de Pasco, c	So. Am.	1.25	1,009,474
Esperanza, g.s.	Mex.	.24	109,200
Hedley, g	B. C.	.15	36,000
Hollinger, s	Ont.	.05	246,000
Kerr Lake, s	Ont.	.25	150,000
Lucky Tiger-Comb., g	Mex.	.10	71,534
McIntyre Porcupine, g	Ont.	.05	180,514
Mex. Mines of El Oro, g	Mex.	.96	174,960
Min. Corpn. of Can., s	Ont.	.18¾	311,260

Holding Companies	Situation	Per Share	Total
General Dev.	U. S.	1.00	120,000
Yukon Alaska Trust	......	1.00	203,433

Increase in Asbestos Production

The total quantity of domestic asbestos sold in 1917, according to the U. S. Geological Survey, was 1683 short tons, valued at $506,056, an increase of about 13% in both quantity and value over 1916. Most of the domestic asbestos comes from Arizona, where the proportion of crude spinning fiber to that of lower grades is much larger than in Canada, so that the average price of American fiber in 1917 was $301 a ton, whereas the average price of that in Canada was only about $50.

Some years ago the opinion was expressed that as the Arizona fiber contains less iron than that mined in Canada, it is therefore better adapted to use for electrical insulation than the Canadian fiber. This impression has recently been confirmed by analyses made by R. E. Zimmerman, of Pittsburgh, whose investigations also indicate that the harshness of certain parts of the Arizona asbestos is due to thin films of calcite among the fibers. The demand for imported asbestos for use in filters is being supplied by amphibole asbestos obtained from residual deposits of the crystalline rocks of Maryland.

Editorials

"Profiteering"

THE report on "profiteering" addressed to the President of the United States Senate by the Federal Trade Commission in response to a Senate resolution asking for detailed information on this subject, issued on June 29, was manifestly timed for political purposes, especially in connection with the new tax legislation. It is as extraordinary a document as was to be expected from a public body possessing the unbalanced mental constitution of this one. Unfortunately it is likely to have a misleading and disturbing effect upon the public, which does not know, or has forgotten, how the Federal Trade Commission was discredited in the matter of fixing coal prices about a year ago. In our opinion this body was more responsible than any other one agency for setting in motion the wheels that produced the calamity of last winter.

The present report on the subject of "profiteering" does not read to us like an unprejudiced report. According to it, profiteering exists, and "much of it is due to advantages taken of the necessities of the times, as evidenced in the war pressure for heavy production, but some of it is attributable to inordinate greed and barefaced fraud." In the industries that are enumerated—flour milling, coal mining, petroleum refining, meat packing, steel, copper, nickel, sulphur, lumber, canned milk, and salmon canning—the commission finds in almost each case that too large profits are being realized. Its common method of stating the case may be illustrated by its remarks in connection with copper, as follows:

"The commission's figures show that 21 companies, including a large proportion of high-cost companies, made profits in 1917 which ranged from 1% to 107% on their investments. The average profit was 24.4%. Probably over 70% of the production is marketed at profits over 20% on investment." It will be noted from this that the commission has not reviewed the whole industries, but has taken samples, so to speak, more or less large, which in the case of copper include "a large proportion of high-cost companies"; but it is not given to us to know what proportion, or anything more respecting the details. This is something like what would be the report of a mine sampler who said that the vein was of spotted character, wherefore he had thrown into his sample what he considered to be a proper proportion of gangue material or metallics, according to his disposition. Furthermore, in computing the percentage of profit, the commission figures upon what it considers "investment." It does not permit us to review its figuring as to that all-important and highly complicated factor.

Presumably, the commission bases its figuring upon what was originally put into a business, disregarding capital earned and reinvested. Indeed, it specifically condemns the meat packers for having capitalized their surplus earnings of the past, their earnings when figured on that basis being at a much lower rate than what the commission figures. It is allowed to leak out, moreover, that the companies do not agree with the commission respecting investment. Thus, the commission says that in 1917 the profits of the International Nickel Co. on the commission's basis were 30%, but on the basis claimed by the company they were only 15%. Of course, the general public, and even many Congressmen, will not understand that in the figuring of investment the company may be right and the commission wrong; and if the latter, all of its sensational deductions are exploded. As between the companies and the commission in this fundamental matter, we are disposed to uphold the intelligence and sincerity of the companies, rather than those of the commission.

Dismissing this fundamental matter, the bone of complaint by the commission is that in any industry while one concern may realize a profit of only 1%, other concerns earn 100% or more. In practically all of the major industries it found that condition to exist. However, the mental obliquity of the commission is well illustrated by its remarks regarding zinc, as to which industry "the evidence in the commission's possession indicates no unusual profits . . . with the exception of the operations of the New Jersey Zinc Co." Then it proceeds to extenuate the New Jersey Zinc Co. and explains that its large profits result from its possession of an orebody of unusual richness and purity. That is true enough, but similarly, in the copper industry, the large profits of Anaconda accrue from its development of unusual metallurgical talent and its expenditure of millions of capital in order to put its new and dearly earned knowledge to account; the immense profits of Utah result from the bold imagination of engineers and financiers, who risked fortunes scarcely more than 10 years ago in the exploitation of what was then a mountain of worthless material, the success of the enterprise becoming assured but relatively recently, after many years of travail; the United Verde Extension company was rendered very profitable by the discovery of a mine of "unusual richness" in a district wherein previous prospecting, unusually expensive and hazardous, had been fruitless.

In speaking of the brimstone producers, the commission tells an absolute untruth when it says that these companies—the Freeport and the Union—"may be said to have a natural monopoly of sulphur." They have no such thing. Exploitation of sulphur deposits in Louisiana was begun about 30 years ago, and large sums of money were lost in the attempt to mine them. Success did not come until after many years of trials and tribulations. The Union Sulphur Co. was organized to extract the sulphur by a new, revolutionary method, which at the time of its introduction was pronounced chimerical by many experts. Such monopoly as ever existed in this industry was due to patent rights, but, either through the expiration of such rights or by the generous release of them by the Union Sulphur Co. during the time of war, the Freeport company in Texas was enabled to become a large producer and large competitor. Nor was the field restricted to those two companies, for even now other companies, one of them a strong one and claiming the possession of a larger deposit of sulphur than Freeport, is prosecuting plans for production as rapidly as priority orders will permit it to do so.

With regard to the matter of price-fixing, the commission tries to ride two horses and falls off completely. On the one hand, it thinks that price-fixing has increased profits and enabled the stronger companies to be "enriched by profits which are without precedent," and therefore finds fault. And on the other hand, it declares that the petroleum companies have made large profits owing to there having been no price-fixing and "as yet no Government interference with the law of supply and demand."

Really, the burden of complaint of the Federal Trade Commission is that in our industries there are any profits that reflect the results of anything better than low-grade or mediocre management, the kind that would mean stagnation in our industries and not unlikely would mean our losing the war. The commission says, naïvely: "The outstanding revelation is the heavy profit made by the low-cost concerns under a Governmental fixed price for the entire country." What else did the commission expect? Does it think the proper thing would be to fix a price for each producer, according to his particular cost of production? Such a program as that would, indeed, halt the wheels of commerce and industry and spell disaster.

What we are really getting at, what Congress will get at if it is able to see through the hallucinations and dishonesties of the commission's report, is that the uneconomic policy of price-fixing should be abandoned and that the unusual profits realized by capital that are directly attributable to the war should be equalized by taxation, by a true system of taxing war profits. This is what conservative economists, as distinguished from the emotional and opportunist, have been arguing from the beginning. Congress may well take note that the Federal Trade Commission last year advised the Administration disastrously with respect to what coal prices ought to be. It will do well to be suspicious of the present advice of this discredited doctor.

The Value of Practical Details

ONE of the best examples of the advantage in mining for a man of wide practical experience to travel from property to property in order to study mining practice of the different camps and describe them in detail for the benefit of mining men as a whole is to be found in "Details of Practical Mining" this week. A tool known as a picaroon, which is of great service in handling timbers underground, especially heavy stulls, is described. Made from worn-out axes, the picaroon has been in use for at least 20 years in the mines of the Cœur d'Alene district. And in spite of the great utility of the device, it has not been used, as far as we know, in other mining camps. One reason, perhaps is that foremen do not change often from district to district, and rarely do mining companies send their foremen to see what mines in other parts of the country are doing. Mine managers and superintendents travel, but such details as these are frequently passed by, as the visiting engineer usually is trying to cover the ground so rapidly that he sees only the larger points in the practice of a district and neglects many of the details, except when some phase of the practice makes an especial appeal to him. Only a man who studies the practice in detail, in the different camps of the country, appreciates these minor points and sees the importance of describing such an apparently trivial device as the picaroon. New ideas are constantly appearing in the mining field; old ideas, which to some are new, may be the means of solving a troublesome problem, and therein lies the value of a practical details department.

The American General Staff

IN THREE important elements the Allies have never since 1914 been inferior to the Central Powers: (1) morale and fighting qualities; (2) numbers of trained soldiers; (3) material resources. The inferiority resulting from separate commands has recently been cured by the Versailles Council and the appointment of a supreme commander-in-chief. But the great superiority of the Central Powers lies in the great German General Staff. All their successes have come from this institution. No attempt has been made by any of the Allies to duplicate it, and there can be no victory until this has been done; nothing but a continued wasting of men and resources.

This organization absorbed through careful selection all the most capable and trained thought in the province of war. Strategy, preparation—every problem that can be solved back of the lines—is its province, and to the field commander is left only the task of translating its plans into acts. Modern warfare is too complex and too vast to be conducted successfully by any other system, but the Allies still preserve the archaic method of selecting an individual as commander-in-chief and leaving it all to him. There can be no victory so long as this fatal policy of trying to win by exalting an individual and opposing him to this kind of an organization continues. The result has been that during four years of warfare the initiative has generally been with the enemy. Trench warfare, trench mortars, long-range artillery and "pill-boxes" have all been theirs. They have taught the Allies, who have, under fire, only bravely imitated them for the purposes of defense. What have the Allies had to show except the tanks?

It is possible, in this country, by reason of the President's position as commander-in-chief of the Army, to duplicate in all important essentials the German General Staff, and so incorporate into it all of the boards recently constituted, together with such features of their organizations as may be adopted.

An illustration of one of the gravest defects in the Allied armies resulting from clinging to ancient methods in constituting military units is the failure to provide for the proper number of engineers and expert construction men in their regiments. In modern warfare at least four-fifths of the work of the army calls for engineering and construction, while not more than one-fifth is strictly military. The result is that the overwhelming amount of this construction work to be done finds the Allies, trained strictly to fighting, to be both inexperienced and without the necessary training or organization to meet the new construction requirements.

The Germany army is the only one that from the beginning of the war has adapted itself, by reason of the intelligent direction of its general staff, to this revolutionary condition of modern warfare. At no time in pure fighting has it been superior to any of the Allies, but its superior efficiency lies in its superior organization for purely construction work. Every German regiment contains a certain percentage of engineers and trained construction officers, and every soldier is qualified in construction work.

The Price for Copper

THE War Industries Board on July 2 advanced the price for copper to 26c. This is a recognition that we need more copper and that the way to get it is to give a stimulus that will lead to the utilization of antiquated furnace capacity and will afford an incentive to those mines to continue production that heretofore have been doing no more than break even. This is the argument that we have emphasized all along. That favorable attention has been given to it is a hopeful sign. The Government now recognizes that a fixed price is restrictive of production. An arbitrary price that is subject to change, and may in fact experience a change, possesses different qualities from one that is supposed to be finalized.

The Index—Volume 105

WE INTEND to publish the Index to Volume 105 early in August. Believing that many who receive the Index do not bind their copies, and in compliance with the Government's request to conserve paper, we will send the Index only to those requesting it.

If you want a copy of the Index send in your request promptly. A postcard will do.

The gas service of the U. S. Bureau of Mines has been transferred by order of the President to the War Department, it being considered that greater unity of purpose can be accomplished by having this essential branch of modern warfare under the Secretary of War rather than under the Secretary of the Interior. In making the change, both the President and the Secretary of War addressed highly appreciative letters to Mr. Manning, Director of the Bureau of Mines, recognizing the important service that he has rendered to the country in organizing and developing this work. Their testimonials are highly merited, and the well-deserved honor coming to the head of the Government's Bureau of Mines will be warmly acclaimed in our industry.

BY THE WAY

Our friend D. M. Riordan, of San Francisco, has issued to the many who love him the following notice·

TO ALL TO WHOM THESE 'ERE PRESENTS MAY COME

Greetings, Health and Apostolic Benediction:

The purpose hereof is to proclaim, announce, and also give notice, that from about the 20th of June until about the 5th of July, I shall as a rule not be "on deck" at the office in the Underwood Building. My whereabouts will be as difficult to locate as I can make it, except to one or two who may be with me; they, however, will probably know that I am somewhere in their vicinity, every waking minute.

The proximate cause of this announcement is that, between the aforesaid dates, I will try to "get by" the 70th mile-post on the Journey from Whence to Whither—my baptismal record being kept in Watervliet, N. Y., dated July 1st, 1848, and indicating that my discovery of America on the banks of the Hudson took place some days previously.

So "fur" the "going" has been good—that is to say, purty good; some rocky road; some corduroy; some swamp, and some hill-climbing, and some heart-breaking, dead-level sandy wash, and a pitiless sun that just wouldn't set, but seemed to stand still in a brazen sky, at times. But, on the whole, probably better'n I deserved; and, ef I do say it as shouldn't, better, a great deal better, than that of a good many wayfaring men I have met who deserved better than they got. So I have no cause for complaint, and am blessed with abundant reason for rejoicing, for thankfulness to the Giver of all good; for health, for hopeful and helpful companionship, for the blessings of Emancipation from many things once foolishly desired, until granted, then graciously withdrawn, leaving me disciplined, disappointed, and sometimes bewildered; but in the end with sorrow and regret turned to gladness and interior peace.

During this 70-year Journey, I shall have worked, man and boy, 60 years; and, calling the Journey the "Week of Years," of which the Book speaks, and each decade thereof a Day, I shall have worked six full days of the Week. And I think if I keep at my tasks 20 years more, spending in leisurely fashion the afternoon of the Sixth Day, I will be putting in a little overtime, and should thereafter be entitled to a Sabbatical period, to do the things I like and enjoy doing, thus keeping busy, and I trust useful, up to the end.

We used to think that Mr. Riordan belonged with us in New York, whither he had naturally gravitated after a stirring career in the West, but San Francisco lured him away. Many will join us in extending to him felicitations upon his anniversary of July 1, said felicitations to be delivered not before July 5.

Mr. Hoover is going to England, and during his stay in that country will be the guest of the nation, whose hospitality, with singular appropriateness, will be made manifest and effective through the agency of the British Food Ministry. In the first half of the year 1914 Mr. Hoover was comparatively unknown to his fellow countrymen. Since then he has become a national figure, says the *Sun*. He has risen from the obscurity which compelled his identification by the name of Herbert C. Hoover, through the stage in which he was known as Herbert Hoover, to the high place in which he is immediately recognized when Mr. Hoover is mentioned. It is not improbable that he may eventually attain that enviable distinction which confers on a man the supreme privilege of being hailed among his fellows by his unadorned surname, shorn of all prefixes and suffixes. He is unquestionably headed that way. At this moment, rendered auspicious by the extraordinary honor to be conferred on Mr. Hoover by the British Government, the *Sun* salutes him with affection and admiration. He is as well thought of at home as he is abroad. His fellow countrymen testify to their respect and affection for him by obeying his injunctions cheerfully and without repining. He has accomplished a maximum of good with a minimum of friction. In cutting down our rations he has earned our good will, just as he earned the good will of the Belgians by increasing their rations.

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons if so requested.

COPPER

9386—ANALYSIS—Determining Copper Minerals in Partly Oxidized Ores. Felix Cremer. (Met. and Chem. Eng., June 15, 1918; 2½ pp.)

9387—ARIZONA—Electric Power for Mining in Yavapai County, Arizona. (Eng. and Min. Journ., June 22, 1918; 3¼ pp., illus.) 20c.

9388—COST of Australian Copper. Robert Slessor. (Eng. and Min. Journ., June 15, 1918; ¾ p.) 20c.

9389—MEXICO—La Negociacion Minera "The Moctezuma Copper Co." Marcelo Pena. (Bol. Minero, Feb., 1918; 7 pp.)

9390—ONTARIO—Statistical Review of the Mineral Industry of Ontario for 1916. Thos. W. Gibson. (Ann. Report, Ont. Bureau of Mines, Vol. XXVI, 1917; 66 pp., illus.)

9391—POWER—The Electrical Power Installation of the Braden Copper Co., Part II. (Teniente Topics, Vol. II, No. 8, Dec., 1917; 9 pp., illus.)

9392—PRICE for Copper and the Supply. Editorial. (Eng. and Min. Journ., June 1, 1918; 1¼ pp.) 20c.

9393—PRODUCTION of Copper in 1916. B. S. Butler. General Report. (Mineral Resources of the U. S., 1916—Part I, Apr. 22, 1918; 55 pp.)

9394—REFINING—Oxygen and Sulphur in the Melting of Copper Cathodes. Stanislaus Skowronski. (Bull., A.I.M.E., Mar., 1918; 5 pp., illus.) 40c.

9395—ROASTING—The Humboldt Roasting Plant. A. A. Watson. (Min. and Sci. Press, Mar. 9, 1918; 3½ pp., illus.) 20c.

9396—SMELTING—Matte Settlement and Slag Disposal at Grand Forks. Walter B. Bishop. (Min. and Sci. Press, June 15, 1918; 5 pp., illus.) 20c.

9397—SMELTING METHODS at El Paso. Courtenay De Kalb. (Min. and Sci. Press, May 18 and 25, 1918; 15 pp., illus.) 40c.

9398—UTAH—Notes on Gold Hill and Vicinity, Tooele County, Western Utah. J. F. Kemp and Paul Billingsley. (Econ. Geol., June, 1918; 27 pp., illus.) 60c.

GOLD AND SILVER—GEOLOGY

9399—ALASKA—The Cosna-Nowitna Region, Alaska. Henry M. Eakin. (Bull. 667, U. S. Geol. Surv., 1918; 54 pp., illus.)

9400—CANADA—The Origin of the Gold Deposits in the Canadian Precambrian. R. C. Wallace. (Bull. 74, Can. Min. Inst., June, 1918; 3 pp.)

9401—DEPOSITION OF GOLD in Nature, Further Studies on the. Victor Lenher. (Econ. Geol,. May, 1918; 23½ pp., illus.)

GOLD AND SILVER—CYANIDING

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9554—PULVERIZED FUEL—Methods for More Efficiently Utilizing Our Fuel Resources: Part XVII—The Extent of the Use of Pulverized Fuel in the Industries and Its Possibilities in the War. F. P. Coffin. (Gen. Elec. Rev., May, 1918; 8 pp., illus.) Also gives a list of the American users of pulverized fuel. 40c.

9555—PHILIPPINE ISLANDS—Coal Mining Possibilities in the Philippine Islands. V. E. Lednicky. (Bureau of Sci., Manila, P. I., 1917; 1½ pp.)

9556—STORING COAL—Effects of Moisture on the Spontaneous Heating of Stored Coal. S. H. Katz and H. C. Porter. (U. S. Bureau of Mines 1917; 25 pp., illus.)

MINING AND METALLURGICAL MACHINERY

9557—BLAST-FURNACE HOIST INSTALLATIONS. David L. Lindquist. (Iron Tr. Rev., June 20, 1918; 6⅓ pp., illus.) 20c.

9558—ELECTRIC FURNACE—High-Temperature Resistance Furnaces with Ductile Molybdenum or Tungsten Resistors. W. E. Ruder. (Bull. 134, A.I.M.E., Feb., 1918; 7 pp., illus.)

9560—ELECTRIC POWER—The Development of an Efficient Earthing System. J. P. Forster. (Iron and Coal Tr. Rev., Mar. 29, 1918; 2⅔ pp., illus.) 40c.

9561—LUBRICATION—Internal-Combustion Engine: Lubrication and Lubricants. P. H. Conradson. (Advance copy, Am. Soc. for Testing Materials, June, 1918; 6 pp.)

9562—MINE-TRACK WORK, Mechanical Tampers in. H. L. Hicks. (Eng. and Min. Journ., June 8, 1918; 1 p., illus.) 20c.

9563—POWER PLANTS—Fuel Economy in the Operation of Hand-Fired Power Plants. (Circular No. 7, Bull. 31, Univ. of Ill., Apr. 1, 1918; 94 pp., illus.)

9564—SAFETY—Mine Safety Devices Developed by the United States Bureau of Mines. Van H. Manning. (Report Smithsonian Inst., 1916, 1917; 12 pp., illus.)

9565—TESTING MACHINE—A Simple Type of Brinell Testing Machine for 500-kg. Load. A. V. de Forest. (Advance copy, Am. Soc. for Testing Materials, June, 1918; 11 pp., illus.)

9566—TESTING MACHINES—Some Continental Testing Machines. H. S. Primrose and J. S. Glen Primrose. (Iron and Coal Tr. Rev., Apr. 19, 1918; 3 pp., illus.)

INDUSTRIAL CHEMISTRY

9567—AMMONIA Program for 1918, The. Chas. W. Merrill. (Journ. Ind. and Eng. Chem., June, 1918; 2 pp.) 60c.

9568—KELP—The California Kelp Operations of the Hercules Power Co. An American Industry Developed as a Result of a Demand for Acetone for Use in Munitions. (Met. and Chem. Eng., June 1, 1918; 5 pp., illus.)

9569—NITER CAKE—A Summary of the Proposals for the Utilization of Niter Cake. John Johnston. (Journ. Ind. and Eng. Chem., June, 1918; 3½ pp.)

9570—POTASH from Wood Ashes; Production in Michigan and Wisconsin. C. T. Edgar. (Met. and Chem. Eng., May 15, 1918; 2 pp., illus.)

9571—SULPHURIC-ACID INDUSTRY, The. C. J. Goodwin. (Chem. Tr. Journ., Apr. 20, 1918; ¾ p.)

9572—SULPHURIC ACID—L'Appareil Gaillard, Pour la Concentration de l'Acid Sulfurique. A. Hutin. (Revue d. Chim. Ind., Mar., 1918; 2½ pp., illus.)

MATERIALS OF CONSTRUCTION

9573—CEMENT—Description of the Works of White's South African Cement Co., Ltd. H. Campbell. (Journ. So. Afr. Inst. of Engrs., Jan., 1918; 7 pp.)

9574—CEMENT—The Rizal Cement Plant, Philippine Islands. J. C. Witt. (Bureau of Sci., Manila, P. I., 1917; 11 pp., illus.)

9575—CONCRETE—Effects of Grading of Sands and Consistency of Mix Upon the Strength of Plain and Reinforced Concrete. L. N. Edwards. (Advance copy, Am. Soc. for Testing Materials, June, 1918; 14 pp., illus.)

9576—LIME—The Valuation of Lime for Various Purposes. Richard K. Meade. (Journ. Ind. and Eng. Chem., Mar., 1918; 4½ pp., illus.)

MISCELLANEOUS

9577—CLAY-WORKING INDUSTRIES and Building Operations in the Larger Cities in 1916. Jefferson Middleton. (Mineral Resources of the U. S., 1916—Part II, Apr. 13, 1918; 73 pp., illus.)

9578—EDUCATION—Report on Mining Education in England with Special Reference to India. G. F. Adams, E. H. Robertson and Glen George. (Trans. Min. and Geol. Inst. of India, Nov., 1917; 108 pp.)

9579—EDUCATION—Texas State School of Mines. Wm. D. Hornaday. (Eng. and Min. Journ., June 1, 1918; ⅝ p., illus.) 20c.

9580—HEALTH—Silicosis in Rats in a Witwatersrand Mine. J. Pratt Johnson. (Journ. Chem., Met. and Min. Soc. of So. Afr., Mar., 1918; 2 pp.) Reply to Discussion.

9581—LABOR—How Erie is Solving the Housing Problem. (Iron Age, May 30, 1918; 4⅓ pp., illus.)

9582—LABOR—The Cafeteria at the Kerr Lake Mine. H. A. Kee. (Eng. and Min. Journ., May 25, 1918; 2 pp., illus.) 20c.

9583—LABOR—The Crippled Soldier in Industry. Frank Gilbreth. (Bull. 136, A.I.M.E., Apr., 1918; 10 pp.)

9584—LABOR—A Dietary for Miners. J. B. Hastings. (Eng and Min. Journ., June 15, 1918; 1¼ pp.) 20c.

9585—LABOR—Getting the Foreign Workman's Viewpoint. Prince Lazarovich-Hrebelianovich. (Bull. 136, A.I.M.E., Aug., 1918; 7½ pp.)

9586—LABOR—Illness in Industry, Its Cost and Prevention. Thos. Darlington. (Bull. 134, A.I.M.E., Feb., 1918; 15¼ pp.)

9587—LABOR—Social and Religious Organizations as Factors in the Labor Problem. E. E. Bach. (Bull. A.I.M.E., Feb., 1918; 10 pp.)

Personals

Have You Contributed to the Association of the 27th Engineers?

P. C. Schraps, metallurgist for the South American Development Co., has arrived in San Francisco.

C. W. Walters, formerly with Guggenheim Bros., has resigned to enlist in the United States Navy.

Amor Frederick Kuehn, of 120 Broadway, New York, has had his name legally changed to Amor Frederick Keene.

Hennen Jennings received the honorary degree of Master of Arts from Harvard University at the last commencement.

E. H. Clark, of New York, president of the Homestake Mining Co., of Lead, S. D., spent several days in Lead, on his way to California.

Dr. Louis D. Ricketts was elected an additional vice president of the Greene Cananea Copper Co. at the organization meeting of the directors held on June 27.

Knox Taylor, president of the Taylor-Wharton Iron and Steel Co., Easton, Penn., has been elected chairman of the Manganese Track Society, succeeding A. H. Mulliken.

Dyke V. Keedy, mining and metallurgical engineer, of Boston, has been engaged by the Norton Co., of Worcester, Mass., and Niagara Falls, to conduct exploration and milling work for it.

Capt. Chauncey L. Berrien, until recently assistant superintendent of the mining department of the Anaconda Copper Mining Co., has been promoted to be a major in the aviation service.

Major Seeley W. Mudd has been promoted to a colonelcy. Colonel Mudd has recently suffered from a severe illness, but is now well on the road to recovery and is convalescing on the New Hampshire coast.

Carl O. Lindberg, of Los Angeles, has spent the last month in Washington and New York. Mr. Lindberg is taking part in the war minerals investigation now going on under the direction of the U. S. Bureau of Mines, having been appointed mining engineer in charge of sulphur investigation with headquarters at Los Angeles. Mr. Lindberg will maintain his practice as consulting engineer as in the past.

Guilliam H. Clamer, first vice president and secretary of the Ajax Metal Co., of Philadelphia, was elected president of the American Society for Testing Materials at its 21st annual meeting just held at Atlantic City. Mr. Clamer, who is 43 years old, is prominent as a metallurgist in the nonferrous casting industry. He became identified with the Ajax company immediately upon his graduation from the University of Pennsylvania as a special student in chemistry. In 1898 he took up the study of metallography, as a result of which was developed Ajax plastic bronze, an alloy used extensively for railroad bearings. Mr. Clamer was awarded the Eliott-Cresson gold medal by the Franklin Institute for developing a process of eliminating zinc, aluminum and iron and other metals electropositive to copper, tin and lead from alloys containing all of these metals. He was also associated with Dr. Carl Hering and others in developing several types of electric furnaces that have been successfully used in brass melting. Mr. Clamer is a past president of the American Institute of Metals, as well as chairman of the Institute's committee that is coöperating with the U. S. Bureau of Standards. He is also a member of the board of the Franklin Institute and of its committee on science and arts.

Obituary

John W. Bell, superintendent of mines for the Gulf States Steel Co., died at Birmingham, Ala., on June 20, aged 50 years.

R. B. Carnahan, vice president of the American Rolling Mill Co., Middletown, Ohio, accidently shot and killed himself on June 23 at his home. He was well known as a metallurgist.

Harry K. Myers, mining engineer, formerly consulting engineer with the D. J. Kennedy Co. and latterly in a similar position with the Kittanning Iron and Steel Co., Kittanning, Penn., died recently in Cowanshannoc, Penn., where he was operating the Kittanning Iron and Steel Co.'s Cowanshannoc mine. He was a graduate of Lehigh University.

Societies

Association of Iron and Steel Electrical Engineers will hold its twelfth annual convention in the Southern Hotel, Baltimore, Sept. 9 to 14 next.

Revelstoke International Mining Convention will be held at Revelstoke, B. C., July 8 to 10. Among speakers expected are William Sloan, Minister of Mines; John Hart, Minister of Finance, and J. H. Kig, Minister of Public Works.

British Engineering Standards Association was registered in Great Britain on May 23 with an unlimited number of members, to take over the work carried on since 1901 by the Engineering Standards Committee and to prove and mark certain engineering materials.

War Committee, Technical Societies of Chicago was organized on June 4, 1918, as the outcome of a movement started by the military committee of the Western Society of Engineers. The purpose is to coördinate the activities of the societies in the most effectual manner to help win the war. The following member societies are coöperating on the new committee: Western Society of Engineers; Structural Engineers' Association of Illinois; Society of Industrial Engineers; Illinois Society of Engineers; Illinois Society of Architects; American Railway Engineering Association; Swedish Engineers' Society of Chicago; Illinois chapter, American Institute of Architects; Chicago section, American Society of Mechanical Engineers; Chicago section, American Institute of Electrical Engineers; Chicago section, American Chemical Society; Chicago section, American Institute of Mining Engineers; Mid-West section, Society of Automotive Engineers; Illinois Association of American Society of Civil Engineers; Chicago section, American Society of Heating and Ventilating Engineers; Chicago section, American Society of Refrigerating Engineers; Chicago section, Steel Treating Research Society; Chicago section, Illuminating Engineering Society; Chicago chapter, American Association of Engineers. Officers of the War Committee have been elected as follows: Chairman, F. K. Copeland; vice chairman, W. L. Abbott; secretary, Edgar S. Nethercut; and treasurer, William A. Fox. The executive committee consists of F. K. Copeland, W. L. Abbott, William Hoskins, C. A. Keller, Charles E. Lord, C. F. Loweth, Isham Randolph and Richard E. Schmidt. The address of the secretary of the War Committee is 1735 Monadnock Block, Chicago.

Industrial News

Edison Storage Battery Co. has established a new sales office in Kansas City, Mo., appointing Benjamin F. Eyer as resident manager.

William D. Gordon, for the last seven years manager of the Mine and Smelter Supply Co. at El Paso, has been elected president of Camphius, Rives & Gordon, Inc., and has opened American headquarters for the company at 81 New St., New York.

Foote Mineral Co., Inc., 107 North 19th St., Philadelphia, in anticipation of the conservation of labor facing the publishing trade, announces that its publication "Foote Notes" will be published every other month, until the Allies are victorious, instead of monthly as hitherto. Subscribers will receive their full number of copies, but over a longer period.

C. H. vom Baur has been elected vice president of the T. W. Price Engineering Co., Woolworth Bldg., New York, and 114 East Jackson Boulevard, Chicago. This company has designed and installed electric steel furnaces for the Ludlum Steel Co., Watervliet, N. Y.; Hammond Steel Co., Syracuse, N. Y.; Century Steel Co., Poughkeepsie, N. Y.; Ulster Iron Works, Dover, N. J.; Hubbard Steel Foundary Co., East Chicago, Ind., and others. Mr. Price was formerly vice president and general manager of the Ludlum Electric Furnace Corporation.

Trade Catalogs

Meyer Dry Ore Concentrator. National Milling and Refining Co., Canton, Ohio. Pp. 14; 4½ x 7¾ in. Illustrated.

Mining and Industrial Cars. Lake Shore Engine Works, Marquette, Mich. Bulletin No. 17. Pp. 48; 6 x 9¼ in. Illustrated.

Marcy Mill. Mine and Smelter Supply Co., Denver, Colo. Catalog No. 42. Pp. 38; 6⅝ x 10 in. Illustrated. A complete description of the Marcy mill.

Rolls for Every Purpose. Rodney Hunt Machine Co., Orange, Mass. Card; 10¾ x 6¾ in. Guaranteed wooden rolls of yard-seasoned or air-seasoned stock.

Lower Pumping Costs with E. M. Synchronous Motors. Electric Machinery Co., Minneapolis, Minn. Bulletin 183. Pp. 23. 8½ x 11 in. Illustrated data on electric drives for large pumps.

"John F. Godfrey Junior" Conveyor. John F. Godfrey, Elkhart, Ind. Card; 8¼ x 10¾ in. Illustrated. Description of a mechanical conveyor (wire rope) for stocking coal; can be operated by one man and handles all sizes of coal up to 50 tons per hour.

Industrial Storage Battery Locomotives. Jeffrey Manufacturing Co., 974 North 4th St., Columbus, Ohio. Catalog No. 231. Pp. 24; 6 x 9 in. Illustrated. A description of the various types of storage-battery locomotives for industrial plants, lumber yards and contractors.

Centrifugal Pumps. Wheeler Condenser and Engineering Co., Carteret, N. J. Bulletin 108-B. Pp. 28; 8 x 10½ in. Illustrated. Shows the latest Wheeler turbine-driven geared centrifugal pumps; bi-rotor; tri-rotor; electric driven; small belt-driven; small high speed; side, end and bottom suction, etc. Characteristic test curves are given.

Electrical Welding Manual. Wilson Welder and Metals Co., Inc., New York. Manual No. 1. Pp. 46; 5¾ x 8¾ in. Illustrated. A book of instructions for installation and operation of equipment for electric welding by the Wilson system. Cast steel, cast iron, wrought iron, brass, copper, and in fact any weldable metal can be welded with this system.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Blast-Furnace Operation—Edwin E. Slick, Westmont Borough, Penn. (U. S. No. 1,267,004 and 1,267,005; May 21, 1918)

Electrode—Ferdinand A. Rudolf, New York, N. Y., assignor to Nichols Copper Co., New York, N. Y. (U. S. No. 1,267,120; May 21, 1918)

Electrode Totally Submerged—Harry H. Stout, New York, N. Y., assignor to Nichols Copper Co., New York, N. Y. (U. S. 1,267,141; May 21, 1918)

Hoist, Traveling—Howard V. Snively, Kansas City, Mo. (U. S. No. 1,266,636; May 21, 1918)

Nickel—Method of Separating Nickel from Nickel-Copper Alloys. Joseph Dhavernas, New Brunswick, N. J., assignor to United States Nickel Co., New Brunswick, N. J. (U. S. No. 1,266,775; May 21, 1918)

Phosphate—Process of Concentrating Phosphatic Material. Hyleman Alison Webster, Columbia, Tenn. (U. S. No. 1,266,730; May 21, 1918)

Smelting—Dust-Collector. Utley Wedge, Ardmore, Penn., assignor to the Process Engineering Co., Philadelphia, Penn. (U. S. No. 1,267,023; May 21, 1918)

Smelting—Process and Apparatus for Utilizing Sulphurous Gases with Treatment of Metalliferous Materials. George C. Westby, Ludwig, Nev., assignor to Western Process Co. (U. S. No. 1,266,731; May 21, 1918)

Smelting—Process and Apparatus for Sulphatizing Metalliferous Ores. George C. Westby, Ludwig, Nev., assignor to Western Process Co. (U. S. No. 1,266,732; May 21, 1918)

Smelting—Process of Electrical Reduction. Charles H. Fulton, St. Louis, Mo., assignor to Metallurgical Laboratories, Inc., Chicago, Ill. (U. S. No. 1,267,347; May 21, 1918)

Smelting—Slag-Heated Steam Generator. Utley Wedge, Ardmore, Penn., assignor, by mesne assignments, to Furnace Patent Co., Philadelphia, Penn. (U. S. No. 1,267,022; May 21, 1918)

Steel—Open-Hearth Process. Charles H. Elliott and Elmer T. McCleary, Youngstown, Ohio, assignors to the Youngstown Sheet and Tube Co., Youngstown, Ohio. (U. S No. 1,266,928; May 21, 1918)

Zinc—Method of Converting Zinc Powder into Liquid Zinc. Sven Huldt, Stockholm, Sweden, assignor to Norsk Elektrisk Metalindustri Aktieselskap, Sarpsborg, Norway. (U. S. No. 1,266,808; May 21; 1918)

Editorial Correspondence

SALT LAKE CITY—June 27

Demands for Increases in Wages occasionally arise, although Utah mine and smeltery employees have been in receipt of frequent increases during recent years. At a meeting numbering about 500 and representing about a third of the working force, employees of the Garfield plant of the A. S. & R. Co., voted to demand a flat increase of $1 a day for all classes of labor. The demand comes at a particularly unfortunate time, and would if granted make itself heavily felt. The wage scale at present ranges from $3.15 per day of eight hours for day labor to $6.65 for foremen. At the Cardiff mine, in Big Cottonwood, which is just beginning its shipping season after the comparative inactivity of the winter, the men are asking an increase of 50c. a day, instead of the 25c. a day granted by the company. Board and lodging can be had at this mine for $1 a day, and the men's quarters are new and equipped with electric lights and baths. The company, which now pays $4.75 to $5 a day to underground hoistmen and from $3.50 to $4.25 to laborers, contends that the low charge for board and lodging and the comfortable living conditions make its present wage scale unusually good.

Increases in Smelting Charges, announced by the Salt Lake Valley smelteries, are to be made as the result of the advance in freight rates announced by the Government, to be made effective June 25. The increases are not definitely specified and are to be fixed later upon receipt of information as to the exact amount of the advance in rates on each class of material. In a circular letter to operators, announcement is made by the smelting companies that the freight advance is particularly drastic as applied to coal, coke, limestone, and smeltery products. It is explained by Mr. McAdoo as being made necessary by existing war conditions. Operations are now being carried on under great difficulties, owing to the increased cost of all materials and the shortage of labor, and smelters are unable to bear the additional burden of the proposed advance in freight charges. It will be necessary, therefore, for them to make the increased costs a charge against the shipper and to remodel their contract terms in such a way as to make an adjustment of such increase. As soon as the necessary information as to exact amount of advance in freight rates has been obtained, they will state in detail the changes that are necessary. The letter asks for coöperation on the part of operators. Mine operators in this section are considerably worried as to the proposed advances, taken in connection with the fixed price of copper and with lead and zinc low.

PHOENIX, ARIZ.—June 25

Property of the Arizona Ray Copper Co., at Ray, has been sold to W. B. Smock and R. T. Dorsey. This corporation, organized in Los Angeles, was once the centre of an advertising campaign understood to have enriched its promoters, though practically no work was done on the property. It is understood that little or no ore was ever found, the basis of extravagant claims being the fact that the Arizona Ray claims adjoin the property of the developed Ray Consolidated and Ray Hercules companies.

A Shortage of Mica has been reported by the War Minerals committee at Washington. Arizona has at least one large deposit of the mineral, but it has been left unworked. It lies on the Pima Indian Reservation, near the summit of the Sierra Estrella range, and about 10 miles from the main line of the Southern Pacific R.R. about 20 miles west of Maricopa. In the Pleasant Valley section of northern Tonto Basin, east of Payson, on the Spring Creek mine, John Carolan and associates have developed a silver-gold proposition said to be of unusual merit. The property will be producing soon, as a stamp mill with cyaniding tanks is about complete.

Improvements at the Swansea Mine, in northern Yuma County, are being made, following a series of experiments by the mine management, and include a 200-ton flotation mill. Most of the mine product of sorted ores has been shipped to the United Verde smeltery, in the Verde Valley. The low-grade sulphides left will furnish milling material for months to come. A new 500-ft. working shaft has been completed and has been connected with the main orebody, securing economical stoping and transportation. The property is equipped with a large smeltery that cannot be operated economically under present conditions. In the last few years the mine has been getting out of debt, under an advantageous leasing system, and its bankruptcy soon is expected to be a thing of the past. A large part of the stock is held in the war devastated region of Belgium and Northern France, and the whereabouts of hundreds of stockholders, including the president of a year ago, are not now known. It is reported that the famous old Silver King mine, 60 miles east of Phoenix, has cut on the 400 level a new silver and copper orebody, 20 ft. thick. The work is in new ground, as the old workings are full of water or badly caved. A 30-ton mill is being built to handle the concentrating ores. Another pioneer silver producer, the Tip Top, in the southern Bradshaws, about half-way between Pheonix and Prescott, once a regular dividend payer, has been taken over by H. C. Wilmot & Co., of New York. The deep shaft, now full of water, will be cleaned out and a new reduction plant installed especially to secure the tungsten, which now is of more value than the silver.

TUCSON, ARIZ.—June 27

Arizona Corporation Commission has recently ruled that all stock pooled with the commission after July 1, 1918, will not be released until the company has paid a dividend of at least 7 per cent on all issued stock. The dividend must be bona fide and out of the earnings of the company. This is expected to act as a check on promotion schemes of questionable merit.

Arizona Bureau of Mines has undertaken the preparation of a new and amplified edition of a manganese bulletin which will be ready for distribution in a few weeks. The pamphlet will contain a complete description of the various commercially important ores, discussion of the genesis and structural peculiarities of manganese deposits, complete data on the chemical and physical peculiarities of manganese ores used in different industries, information concerning the prices which different grades of ore bring, and a list of all known purchasers of each grade of manganese ore. Requests for a copy of this bulletin may be sent to the Director, Arizona State Bureau of Mines, Tucson, now, and copies will be sent as soon as they are issued.

The Arizona State Bureau of Mines has been reorganized, with Dean G. M. Butler, of the University College of Mines and Engineering, succeeding C. F. Willis as director. The technical staff retained includes S. E. Dickinson, safety engineer; M. A. Allen, mineral technologist; G. R. Fansett, mining engineer, and Mark Ehle, rock and mineral analyst. Plans are being made for a complete reconnaissance geological map of the state and for the issuance of bulletins covering the mineral resources of each of the counties. The Bullion Bar property, in Pima County, owned in Detroit, is to have a small stamp mill, for the working of soft ores from a vein that runs from three to seven feet in width and carries gold. At Tombstone, the Phelps Dodge interests still are prospecting the old Bonanza properties and lately are said to have found new manganese and copper orebodies of value. The main trouble lies in the present inability to separate the two minerals profitably.

SPOKANE, WASH.—June 26

Mine Owners of the Kootenays, in British Columbia, in session at Nelson, recently adopted resolutions calling upon the Dominion government to appoint a permanent royal commission with unlimited power to inquire into all phases of the smelting industry. Such a commission would supersede the commission appointed some time ago by boards of trade, which was without government authority. R. F. Green, Member of Parliament from Kootenay, says such a commission will undoubtedly be appointed, with sufficient funds for all expenses. It was suggested that either F. E. Starkey, of Nelson, or Sidney Norman, of Spokane, be one member of the commission. The meeting also called on the authorities to investigate the assertions that the Canadian Pacific R. R. is unable to supply cars for ore consigned to points in the United States.

Immediate Construction of Motor Roads into the Ten Mile, Elk City and other gold districts of Idaho County, in central Idaho, was urged by resolutions adopted June 20 by the Northwest Mining Association and presented to the U. S. Bureau of Mines and other Government agencies. This action followed recent demands from Secretary McAdoo for a speeding up of gold production. The districts mentioned are largely in or surrounded by forest reserves, and the county and state are not in a position to supply adequate roads. It is estimated that placers of these districts have produced $50,000,000 in gold, largely in the early '60's. It is claimed that quartz mining will add heavy gold production now if transportation can be secured. The resolutions urge the commercial bodies of Idaho, the Idaho Mine Owners' Association and state authorities to join in an appeal to the Government to obtain construction of these roads and to secure data on cost of roads and possible gold production.

Bounties on Lead expire in British Columbia on June 30, according to a report issued by G. O. Buchanan, supervisor of lead bounties. He reports that during the year ended Mar. 31, there was received at the Trail smeltery, from Canadian mines, ore containing 36,762,916 lb. of lead and from mines of the United States ore containing 10,871,192 lb. of lead. During the same period there was received at the smeltery ores classed as zinc ores having lead contents of 23,101,424 lb., but the recovery of this lead remains a metallurgical problem as yet imperfectly solved. The Canadian mines that have made production of more than 100 tons each of lead ore during the year were as follows: Sullivan, Bluebell, Standard, Queen Bess, Emerald, Surprise, Galena Farm, Paradise, Highland, St. Eugene, Florence, Van Roi. Rambler, Cariboo, Coveroupee, Slocan Star, Cork-Province, Retalleck, Utica. The principal shippers from the United States have been the Electric Point (8,478,177 lb. lead), the Hercules and the Snowstorm. A total of 108 properties have shipped ores with more or less of lead contents to the smeltery during the year.

HELENA, MONT.—June 29

The Restraint on Funds of the Butte & Superior Mining Co. in connection with the Minerals Separation Co., Ltd., suits has been removed by Judge Bourquin of the U. S. District Court. Reports state that the order entered in October, 1917, restraining the company from disposing of its assets, had been set aside. Judge Bourquin was said to have set aside also the order requiring the filing of monthly statements and the deposit of earnings with the court.

JOPLIN, MO.—July 1

A Shallow Pyrite Deposit is to be opened up by the Red Granite Copper and Water Power Co., which is sinking a shaft on a lease near Spavinaw, Okla., not far from Strand. Discovery of the deposit was made last fall while prospecting for zinc ore. The pyrites are found at a depth of only 20 ft., and contain no less than 52% sulphur. One of the large sulphuric-acid makers of the country, represented by a local buyer, has evinced an interest in the deposit and may buy part or all of the lease.

Ball Mills for Pulverizing are gaining in popularity in the district. The White mine, at Picher, recently shut down to install three ball mills, all of which are now in place and giving good results. One takes the overflow from the two rougher jigs, one handles the tails from the sand jig, and one takes the middlings from the rougher tables. After pulverization the dirt is once more sent over the tables, and the recovery is further improved by the second largest flotation plant in the district. Assays made since the ball mills were installed show that the loss in the tails has been reduced from 2.5 to 1.5%. The White mine handles comparatively thin dirt, and the management decided its only chance to continue in successful operation was to increase its recovery, and it has accomplished this in a satisfactory manner.

Delegates from Oklahoma Section of the Joplin district will be sent to the meeting in Oklahoma City on July 8, when a branch of the American Mining Congress is to be formed. Representatives of the coal and oil and gas interests also will attend the meeting, which is expected to be the largest of its kind ever held in the state. The movement has received the endorsement of the zinc and lead operators, and at their latest meeting at Picher they voted to send delegates.

Completion of the Interurban Line of the Southwest Missouri R.R. from Joplin to Picher has been accomplished, and announcement has been made of an arrangement whereby what amounts to through service from Joplin to Miami will be supplied by a connection of the interurban line with the motor car line of the O. K. & M. at Picher. Hourly service will be maintained from Miami to Picher, and twice an hour from Picher to Joplin. The Southwest Missouri, now operating cars to within about half a mile of the main portion of Picher, will complete its track laying and establish connection with O. K. & M. about August 1.

Development of Zinc and Lead bearing sections outside of the older district continues, despite unfavorable price conditions. At Mansfield, Mo., the Pioneer Mining Co. has just completed the building of a modern mill and will work a lease that has been proved up. The ore in this field is found in shallow deposits, and during the last week the Pioneer Co. reports a fine strike in drilling on an adjoining tract at only 35 ft. At Butterfield, Mo., the New Mexico Mining Co. has completed its first hole, which showed about 21 ft. of good-grade ore. Good strikes also have been reported in the last week down on White River, in Taney County, Mo. There has been some development there, particularly on a fissure vein, but little successful mining.

Drilling Operations in the Oklahoma and Kansas sections of this field are easing up decidedly, and many of the drill rigs have left for new oil fields being developed in Oklahoma. Within the last two years approximately 400 companies have been organized for operations in this Oklahoma-Kansas field, and though many of them have developed or are developing good properties, many have been organized and the principals have been persuaded to invest their money without much of a chance of even getting it back. Some of these fake promotions are being brought to light now, and the usual and to be expected reaction from the boom of six months ago is under way. When the readjustment has been completed, however, it will be found that the district as a whole is remarkably solid, and it is expected that the output from the Oklahoma-Kansas region will continue heavy for many years. At present the Commerce camp is entirely idle, but even there the mines have not been worked out, and plans are under way to get them back in operation at an early date

CALUMET, MICH.—June 26

One of the Pioneer Mines of the Lake Superior copper country comes into Federal litigation as the result of the war, according to the belief of local people who have been asked by the Federal custodian of alien property for a report on the old Clark mine, of Keweenaw County. The mine is situated a short distance south of Eagle Harbor, and was opened in 1858, but has not been operated for many years. It is the property of Leon Estivant, a captain of the French army, who acquired it through inheritance. Estivant was captured by the Germans, and is still a prisoner of war. Just why this should be made the basis of action by the Government in taking over the land under the alien property act is not understood here. The property, which consists of about 2000 acres, has not been considered valuable until recently. It carries considerable manganese ore, it is stated, which has come into great demand because of the war, and it may be the intention of the Government to reopen and work it for this product. The last work on the property was done some years ago by the United States Smelting Co., which conducted diamond-drilling exploration.

A Shortage of Miners, particularly skilled machine men, seems probable, because many of them who have been working on machines here for years are leaving, being attracted by the high pay offered in factories and munitions plants elsewhere. Heretofore it has only been the shortage of trammers and unskilled labor that has bothered the copper-mining companies. Miners, shop men, machinists and others are now going out in increasing numbers. This movement, too, comes in the face of repeated increases in wages, the offering of bonuses and of premiums, with the option of working on contract for work done over the minimum "company account" system. It is the class of smaller properties that is suffering through this condition. Calumet & Hecla, Quincy and Copper Range have few complaints to make. Ahmeek, Osceola and Isle Royale are also holding their men well. These are about the highest-paying properties, in the matter of wages, operating in this district, except the Mohawk and Wolverine mines, which have met the wage increases of the other mines. The properties listed have been increasing their forces of trammers steadily and have been installing improved tramming equipment, making it unnecessary to employ such large numbers of men as in years past. In two or three of the mines such as the Ahmeek, mules and horses are also used for tramming. Men who have been earning \$6 to \$7 a day on contract work with some of the mining companies here feel the call from outside companies offering as high as \$8 per day, and even more, irresistible.

VICTORIA, B. C.—June 27

California Fuel Oil Shortage, because of war exigencies, is occupying the attention of most of the large industrial corporations of British Columbia, which have been dependent on that form of fuel. The Powell River Pulp Co., one of the largest industries of its kind in the Northwest, has arranged to make a rapid change from oil to coal should developments make it necessary. The same is true of the Whalen Pulp and Paper Mills, and Mr. W. P. Hinton, vice president of the Grand Trunk Pacific Ry. Co., who was in the West a few days ago, states that his company has made representations at Washington, D. C., with a view to ascertaining the attitude of the U. S. Fuel Administration toward the reported shortage of California fuel oil. Mr. Hinton explains that his company is particularly interested because of the steamers which it is operating in the Pacific Northwest. It is intended to reconvert the G. T. P. locomotives using fuel oil on the 800 miles of line to Prince Rupert to coal burners, and in this connection the company is interested in the development of the Telkwa and other Northern British Columbia collieries which are tributary to the Grand Trunk Pacific Railway.

An Increase of Wages Has Been Demanded by employees of the Consolidated Mining and Smelting Co., of Canada, in several of its mines. In most instances the miners have accepted the company's offer of substituting the Rossland mine's scale in the lead mines, which means an increase of approximately 15c. a day. Some miners, however, have refused this proposal. At the Sullivan Mine, Kimberly, B. C., an increase of 50c. a day was asked which would give muckers \$4.15 a day and miners \$4.65. Permission has been secured from the Dominion government for the export from Canada to the United States of 5000 tons of manganese ore. Hon. William Sloan, Minister of Mines, has been advised of this action by Ottawa. The license applies particularly to the Curle property, near Kaslo, B. C., which has been opened recently and already has a considerable quantity of the mineral ready for shipment.

NEW YORK—July 1

To Investigate and Finance Mining, Oil and Industrial Enterprises, the Finance Exploration and Development Corporation of America has been incorporated under the laws of the State of New York. An initial capital of \$500,000 has been provided. This corporation will develop and maintain a staff of skilled engineers and investigators to examine the merits and possibilities of companies needing additional capital for development or expansion. The directors are William R. Jones, Jackson B. Sells, Burt Brown Barker, E. L. Kerstetter and Homer L. Carr. Mr. Carr is mining engineer for the corporation, with offices at 50 Broad St., New York City.

Brazilian Manganese Ore is again moving from the mines, and by Aug. 1 it will be arriving in Rio faster than it can be exported, says Robert J. Todd, general manager of the International Navigation Corporation, in the "New York Commercial." The changed situation is due to the lifting of the embargo on the Central Railroad of Brazil. The present shortage of Brazilian manganese is due not so much to the acts of the shipping authorities of this country as to conditions in Brazil. The first effect of the increased movement of the ore will be that the poorest qualities recently put on boats will be eliminated and the previous high standard of 48% to 50% metallic manganese resumed.

WINNIPEG, MAN.—June 28

A Discovery of Gold is reported at the north end of Herb Lake. Paul Gasse has located several claims along a dyke cutting a porphyritic gneiss, which shows free gold and a heavy mineralization of iron, zinc and lead sulphides. The dyke has been traced 4500 ft. with a width of at least 50 ft., occasionally increasing to 100 ft. The region has hitherto been avoided by prospectors, under the impression that the gneiss would be barren. About 30 claims had been staked at last accounts.

TORONTO—June 27

Cobalt Mining Companies are directing their attention to the southeastern section of Bucke Township, about three miles north of the town of Cobalt. It is stated that a contact zone extends from Lake Temiskaming at a point known as the Devil's Rock, about three miles southeast of Haileybury, running northwest through Bucke Township. Much faulting occurs along this zone, and some promising veins are to be seen.

The Mining News

ARIZONA

Cochise County

SILVER KING (Superior)—To resume production. Development work has been done and good-grade silver ore has been cut.

Gila County

MIAMI COPPER (Miami)—Soon to operate 100-ton unit of mill to develop method for treating oxidized ore. Work to be in conjunction with Bureau of Mines.

Greenlee County

ARIZONA COPPER (Clifton)—Copper produced in May was 1,130,000 pounds.

Mohave County

ARGO (Kingman)—Operating small cyaniding plant.

ARIZONA ORE REDUCTION (Kingman)—Has installed new mill and completed 1600-ft. tunnel and shaft has been sunk to 400 level.

BERKELEY (Kingman)—New hoisting plant has been installed.

CHLORIDE QUEEN (Kingman)—Has installed 60-hp. engine and will develop mine.

GOLD ROAD (Kingman)—To operate cyanide plant soon.

TINTIC (Kingman)—Development work to begin soon.

ALCYONE (Oatman)—Plant now working and shaft being sunk to 400 level.

ARIZONA MOSSBACK (Oatman)—New plant has been completed. Shaft to be sunk to the 500 level.

BLUE BIRD (Oatman)—Plant enlarged and operations to begin soon.

GOLD ORE (Oatman)—Producing about 70 tons daily. New stope opened.

MOSSBACK (Oatman)—Shaft being retimbered.

RECORD LODE (Oatman)—Shaft to be sunk deeper as soon as pumping is completed.

RED LION (Oatman)—To sink 500 ft. of shaft.

TOM REED (Oatman)—Aztec shaft has been sunk 60 ft. Cutting out of ore pockets is almost complete.

Pima County

BULLION BAR (Ajo)—Installing new machinery and plans 10-stamp mill.

Pinal County

GOLDEN BELLE (Kelvin)—Property located near Copper Buttes now being developed by W. E. St. Charles with a force of 20 men. New hoist and compressor recently installed.

RAY-KELVIN (Kelvin)—New shaft down 90 ft. and shows three feet of lead-silver ore.

TROY-ARIZONA (Kelvin)—Closed down until adequate pumping equipment can be provided for Climax shaft.

U. S. VANADIUM (Kelvin)—Mine and mill have been leased for 10 years to Allied Metals Co., of Denver. Additional mining equipment to be installed and the capacity of mill increased. Harry S. Bryan is acting general manager.

GRAND PACIFIC (Superior)—Cut vein carrying good copper ore in shaft.

SILVER KING (Superior)—Silver ore cut on fourth level. Mill to be started middle of July, and new unit to be installed.

SUPERIOR BONANZA (Superior) — To be reopened. Equipment has been ordered and work to start as soon as plant is installed.

Santa Cruz County

DIXIE (Patagonia)—Good-grade lead ore has been cut.

FLUX (Patagonia) A 300-ton mill has been installed.

MOWRY (Patagonia)—A new hoist and engine have been installed.

CONSOLIDATED ARIZONA (Patagonia)—To open El Paso group soon; 500-ft. shaft to be sunk.

WORLD'S FAIR (Patagonia)—Machinery has arrived and operation to begin as soon as installation is complete.

Yavapai County

GREEN MONSTER (Jerome)—Dorothy May shaft has been sunk to the 1000 level. Present formation is quartz-porphyry.

UNITED CHINO (Jerome)—Drilling suspended due to caving ground.

UNITED VERDE (Jerome)—Main shaft to be sunk to the 1700 level.

UNITED VERDE EXTENSION (Jerome)—To develop 1500, 1600 and 1700 levels soon.

VERDE SQUAW (Jerome)—New shaft to be sunk.

CALIFORNIA

Amador County

PLYMOUTH CONSOLIDATED (Plymouth)—Comprehensive work being done on 2600 level. Mill is running at capacity.

CENTRAL EUREKA (Sutter Creek)—Crosscutting on 3500 level to develop orebody recently cut in foot wall. Albion Howe is superintendent.

Butte County

CHROME DEPOSIT near Lumpkin being developed by John Mullings and W. D. Fowler. Product will be hauled to Oroville.

THREE CHROME DEPOSITS near Magalia, beside the Western Ore Co. land, being developed. A. Wakeman working the Lambert and the Eureka properties. J. E. Stevens operating Curtis property.

WESTERN ORE. (Oakland)—Carload of concentrates from new mill on chrome claims at Limestone, eight miles west of Magalia, shipped to Pittsburgh. Equipment includes 1400-ft. tramway from mine to loading station. A. E. Vandercook is superintendent.

Eldorado County

ARGONAUT (Georgetown)—Mine on Greenwood road leased to O. S. Ford and A. Moyer. Development by tunnel.

Glenn County

ADAMS CHROME (Chrome)—First ore delivered at Orland for shipment. R. G. Adams and associates developing this and three other chrome properties. L. J. Joiner is superintendent.

Humboldt County

HORSE MOUNTAIN (Eureka)—Chrome ore at this copper mine ready for shipment to San Francisco. George Harpst is superintendent.

Kern County

JOE FERRIS (Caliente)—Temporarily closed down owing to insufficient mill capacity. Expect to purchase new mill equipment.

ZENDA (Caliente)—Closed down. Has large body of low-grade gold-silver ore.

Mariposa County

OWL COPPER (Los Angeles)—Purchased the Diaz copper mine near Indian Gulch. Louis A. Parsons is president.

Nevada County

ALLISON RANCH (Grass Valley)—New 550-gal. pump being installed as auxiliary to present plant.

San Luis Obispo County

CHROME MINING in Morro district active. Equipment shipped to Atascadero Beach, where large deposits are reported. Locations recently made in Paradise Valley.

MANGANESE ORE mined in Los Osos Valley going to Noble Electric Steel Co., at Heroult, amounts to about 200 tons a week.

Santa Barbara County

CHROME MINING near Los Olevos bids fair to become profitable industry. Property is worked by O'Donnell & Burns, of San Francisco. Product shipped to Niagara Falls.

Sierra County

CHROME ORE mined in vicinity of Downieville hauled to Blairsden for shipment. Part of the ore is taken from the White Bear ground.

MONARCH (Sierra City)—Report of finding oreshoot in lower tunnel confirmed Crosscut disclosed vein eight feet wide.

Siskiyou County

CHROME SAMPLING WORKS at Yreka contemplated by Hugh McKinnie, of Oro Grande Mining Co., and associates.

RANCHERIA (Henley)—Closed because electric power line not equal to requirements.

Stanislaus County

CHROME CONCENTRATING (Patterson) — Equipment recently increased. Chrome and manganese mines situated in western part of county, about 20 miles from Patterson.

Tuolumne County

EAGLE-SHAWMUT (Shawmut)—Milling on large scale. Shaft deepened to 2243 ft. Chlorination plant closed. Sulphurets shipped to Selby.

CONFIDENCE (Sonora)—Ball mill, tube mill, 10-tank cyanide plant and other equipment being installed.

COLORADO

Pitkin County

PARK TUNNEL (Aspen)—Removing compressor at Vinie Mine.

Summit County

ELK MOUNTAIN (Kokomo)—Operating old Iron Mask property. Has rebuilt and remodelled mill. F. R. Tabor is in charge.

SILVER EDGE (Kokomo)—Has cut lead-zinc ore in new tunnel. Shipping to smeltery at Salida.

READY CASH (Kokomo)—Operating custom mill equipped with magnetic separation installation.

GEORGIA

Lumpkin County

CHESTATEE P. & C. CORP. (Chestatee)—The 600-ton sorting and concentration plant and 10-mile standard gage railroad are practically completed, and the production of pyrites will be started early in July. Underground development has shown up large deposits of iron pyrites, and considerable ore is blocked out and broken in stopes.

IDAHO

Boundary County

DEER CREEK (Buckhorn)—To be equipped with Chilean mill.

Shoshone County

COEUR D'ALENE ANTIMONY (Wagner)—To sink main shaft an additional 75 ft. and cut station. New mill and flotation plant nearly completed.

MICHIGAN

Copper District

FEDERAL SYNDICATE (Calumet)—Good showing of copper in felsite conglomerate underlying felsite amygdaloid. Purchased four-drill second-hand compressor and Jackhamer drills.

SENECA (Calumet)—Sunk vertical shaft 96 ft. first half of June. Delayed by broken ground requiring timbering after each blast.

CENTENNIAL (Centennial) — Has greater area than was expected and is developing property despite statement that reserves are small and rapidly being depleted.

QUINCY (Hancock)—Dwelling houses nearly completed.

HOUGHTON COPPER (Houghton)—Has cut hard trap rock after passing through second new lode.

MAYFLOWER-OLD COLONY (Houghton)—Shaft down 500 feet.

NEW ARCADIAN (Houghton)—Resuming drifting at 1700 and 1850 levels in ground better than average.

NEW BALTIC (Houghton)—Crosscut from shaft to New Arcadian lode cutting good ground. Another crosscut is being driven north of shaft to same lode.

AHMEEK (Kearsarge)—Rock below 22 level to be hoisted through No. 2 shaft. Sinking of No. 1 shaft has been discontinued.

MICHIGAN (Rockland)—Purchased 93 acres from Mason estate.

MINNESOTA

Cuyuna Range

CLARK (Ironton)—To sink shaft. Shipments will be made this year. O. C. Montgomery is superintendent.

SULTANA (Ironton)—New washing plant under construction.

MISSOURI

Joplin District

BANKERS (Joplin)—Preparing to build mill on lease near St. Regis Mine, near Chitwood. Several thousand tons rich dirt on dump. J. M. Bloyd, Joplin, is manager.

FIFTEENTH STREET (Joplin)—Following sinking of winze to sink mill shaft from 164 to 186 ft. for lower run. Also drilling south part of lease, near field shaft.

YELLOWSTONE (Joplin)—Stopped zinc production and making lead from shallow level. Recent cave at mine did no material damage.
MUST

MONTANA

Jefferson County

COMET (Boulder)—Opening up 400 and 500 levels and to increase output.

Silver Bow County

BARNES-KING (Butte)—Has taken lease and option on the Mount Pleasant and to develop property immediately.

DAVIS-DALY (Butte)—Completed raise from 2500 level to 1900 level.

NEVADA

Elko County

BELLEVIEW (Contact)—Gasoline hoist installed, and incline shaft now down 200 ft. Development work on 100 level has opened good-grade carbonate ore.

BOSTON (Contact)—Development work under way.

CAMP BIRD and ZETTA BLANCHARD (Contact)—Optioned to Duluth men. Development work under way.

QUEEN OF THE HILLS (Contact)—Operated by lessees. Carbonate ore from shaft and tunnel workings being stored.

MIDNIGHT (Good Hope)—Development work to begin at once. Property an old silver producer.

BULLSHEAD MINING (Wells)—Recently purchased old Harrold property, in Spruce Mountain district. Shipments of silver ore being made to Utah. Some high-grade manganese ore carrying silver also opened.

Lander County

BLUE DICK (Battle Mountain)—Installing machinery.

GOLD TOP (Battle Mountain)—To sink double compartment shaft.

Lyon County

WESTERN NEVADA (Mason)—Shipping crude ore. Operated by Nevada Douglas Consolidated.

BLUESTONE (Yerington)—New 400-ton flotation plant completed and in operation. Ore treated consists of chalcopyrite scattered through silicified lime. Large tonnage crude ore shipped to Thompson smelting plant.

EMPIRE NEVADA (Yerington)—Several lessees working. Shipments of crude ore made. Work at leaching plant unsuccessful.

MONTANA-YERINGTON (Yerington)—Making regular shipments of good-grade copper ore.

Nye County

MANHATTAN CONSOLIDATED (Manhattan)—Raising from 300 level to cut vein of free milling ore above 200 level. East orebody being prospected from 500 level.

UNION AMALGAMATED (Manhattan)—Drift on 600 level which was driven north into the foot wall has been stopped with face of the drift in low-grade quartz.

WHITE CAPS (Manhattan)—Ore for the mill coming from 302, 404 and 406 stopes and from 510 raise.

ATLANTA (Goldfield)—Crosscut on main vein at 1850 level has cut several ore seams.

GOLDFIELD CONSOLIDATED (Goldfield)—Mill continues to treat tailings by cyanide.

GRANDMA CONSOLIDATED (Goldfield)—Shaft has cut shale at 825 feet.

SILVER PICK (Goldfield)—Shaft cut mineralized quartz at 1200 feet.

TONOPAH DISTRICT ore production for the week ended June 15 totaled 10,389 tons, of an estimated gross milling return of $176,766. Producers were: Tonopah Belmont, 1983 tons; Tonopah Mining, 3750; Tonopah Extension, 2570; Jim Butler, 621; West End, 869; MacNamara, 315; Montana, 161; North Star, 16; Cash Boy, 47; Midway, 47 and miscellaneous 19 tons.

JIM BUTLER (Tonopah)—Crosscut from raise from 600 level in Desert Green section of mine has cut good ore.

MONARCH PITTSBURGH (Tonopah)—Retimbering of shaft in progress.

NORTH STAR (Tonopah)—Drift through Mizpah fault on 900 level still shows quartz containing good return.

TONOPAH BELMONT (Tonopah)—Net earnings for the quarter ended May 31 were $182,539.83.

TONOPAH DIVIDE (Tonopah)—To sink shaft to 360 level, cut station and crosscut south.

TONOPAH EXTENSION (Tonopah)—Receipts from mine and mill operation during May were $119,906.27; current expenses, $80,911.33; leaving an operating profit of $38,994.94.

TONOPAH MINING (Tonopah)—Dump ore hoisted through Silver Top shaft being shipped regularly to mill at Millers.

OKLAHOMA

Joplin District

LOST TRAIL (Commerce)—New shaft being sunk and mill to be restarted about Aug. 1. Mine one of the oldest in Oklahoma field.

MAURICE (Douthat)—Has rebuilt derrick destroyed by fire and plans for mill in near future.

BUNKER HILL (Hockerville)—Plans 400-ton mill as soon as shaft now under way is completed. Tract well drilled. Owned by Tulsa investors.

BLUE BONNET (Miami)—New 400-ton mill completed and running part time. Two other shafts being sunk, one at 211 ft. W. H. Logan of Miami manager.

COMMONWEALTH (Miami)—To build new 500-ton mill to replace one destroyed by fire June 18. To purchase drills, sludge and slime tables, ore cars and other machinery. L. W. [illegible], Joplin, Mo., is superintendent.

[illegible] MIAMI (Miami)—To erect mill as soon as shaft is completed. Now down to 156 ft. To use gas for mill power. George W. Knox, Oklahoma City, is president.

MARY ANN (Miami)—Has bought Jayhawk lease and is finishing sinking shaft started some time ago and connect with mill 500 yd. distant by [illegible] tramway. Both properties [illegible].

MIAMI (Miami)—To build 400-ton mill, construction to start July 1. To purchase sludge and slime tables, crushers, engines, boilers and other machinery for four mills. J. D. [illegible] is superintendent.

ST. LOUIS (Quapaw)—Draining operations of several companies combined enabled this company to continue shaft sinking into orebody, and will start new mill soon.

OREGON

Coos County

COPPER CLAIMS situated in Coos and Curry counties have been acquired by the Coal and Metals Trustees, a company recently organized at Marshfield by M. G. Gibson, of San Francisco, Calif.; E. W. McInturff and J. A. Gates, of Seattle, Wash., and Russell Winslow, of Marshfield. Granite, Rusty Butte, Monumental and Salmon claims are included in the deal. Russell Winslow is mining engineer in charge of operations.

Jackson County

JAMES DOWNEY (Gold Hill)—Uncovered gold-bearing vein.

Josephine County

OREGON CHROME (Galice)—Large tonnage of ore available for shipment upon completion of road. Harry Sordy is superintendent.

J. F. REDDY (Grants Pass)—Purchased and leased chrome deposits between Hamburg and Seid, on the north side of Klamath River, in northern California. Properties producing.

R. A. SPENCER (Grants Pass)—To develop chrome deposits in Briggs Creek district in the south end of Josephine County.

UTAH

Juab County

TINTIC DISTRICT SHIPMENTS during the week ended June 22 were 152 carloads. Shippers were. Dragon Consolidated, 41 cars; Chief Consolidated, 17; Iron Blossom, 16; Tintic Standard, 15; Colorado Consolidated, 11; Centennial-Eureka and Eagle & Blue Bell, 10 each; Grand Central, 8; Gold Chain, 7; Gemini, 5; Scranton and Showers leases, 2 each; and Godiva, Ridge & Valley, Victoria, Bullion Beck, Swansea Consolidated, Empire Mines, Chief Consolidated managanese lease and Minnie Moore lease, one each.

COPPER LEAF (Eureka)—Shaft down 580 ft. and shows iron.

CROWN POINT (Eureka)—Winze being sunk from 800 level 250 ft. from shaft. Winze to be sunk 125 feet.

Piute County

FLORENCE MINING AND MILLING (Marysvale)—Work on new alunite mill being pushed.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Opened orebody from which it will ship regularly during shipping season.

ALTA TUNNEL AND TRANSPORTATION (Alta)—Tunnel being driven for downward extension of Prince of Wales fissure in 3408 ft. and shows stringers of lead and silver in face.

LITTLE COTTONWOOD TRANSPORTATION (Alta)—Narrow gage road now open for traffic as far as Alta.

CARDIFF (Salt Lake)—Hauling 60 tons daily by trucks.

Summit County

PARK CITY SHIPMENTS for week ended June 15 amounted to 4,174,950 lb. Shippers were Ontario Silver, Judge Mining and Smelting, Silver King Coalition, Daly West and Glencoe lease.

SILVER KING CONSOLIDATED (Park City)—California-Comstock to be worked from 450 level to surface until lower levels are unwatered by Spiro tunnel, which is making progress of 450 ft. monthly.

WASHINGTON

Ferry County

KNOB HILL (Republic)—Producing 12 to 14 carloads a month.

WISCONSIN

Zinc-Lead District

CONSOLIDATED LEAD AND ZINC CO. (Benton)—Has drilled orebody and is sinking shaft on Charles Smith land, 1½ mile south of Benton. Charles Lawyer is manager.

LAWRENCE MINES CO. (Benton)—Drilling old Lake Superior tract just north of Indian Mound mine.

ZINC HILL (Cuba City)—Has drilled good orebody and will drift from Little [illegible] shaft, which is sunk deeper. A 50-ton mill to be provided at once.

CONNECTING LINK (Cuba City)—Operating new three-jig mill on Henry Dall and Will Coulthard land adjacent to the old Dall mine.

MONMOUTH ZINC CO. (Hazel Green)—Drilling has developed new orebody. To be worked from old shaft idle three years. O. E. Newell is manager.

CANADA

Alberta

HUDSON'S HOPE (Peace River District)—Sanders and Galbraith are preparing to dredge for gold and have secured a 75-mile dredging base on the Peace River.

British Columbia

SILVERSMITH (Slocan) Slocan Star, taken over by this company, has been working since May 15.

WHITEWATER (Slocan)—M. S. Davys, lessor of Kaslo concentrator, to remodel plant and treat 100,000 tons tailings of Whitewater at Retallack and 40,000 tailings of Arlington mine near Slocan City.

BELMONT SURF INLET (Surf Inlet)—Net earnings for the quarter ended May 31 were $90,694.43.

Manitoba

REX (Herb Lake)—Initial shipment of bullion has been made.

Ontario

ASSOCIATED GOLDFIELDS (Larder Lake)—Completing installation of electrically driven equipment.

DAVIDSON (Porcupine)—Work has been started on sinking of shaft to 700 level. Levels to be cut at 400, 500, 600 and 700 ft. and the body of high-grade ore known to occur on these levels will be blocked out.

DOME LAKE (Porcupine)—A third lens of ore has been cut on the 500 level. Winze will be sunk to 600 level.

NEWRAY (Porcupine)—Mill again in operation.

PORCUPINE CROWN (Porcupine)—Rich oreshoot opened up at 1100 feet.

VIPOND NORTH-THOMPSON (Porcupine)—Operations are being gradually suspended and mill put in condition for period of idleness.

WEST DOME CONSOLIDATED (Porcupine)—Test run of ore put through Dome Lake mill showed average mill-heads of $9.80 per ton. Ore was representative of the body opened up along the entire length of the drift on 310 level. Showing was considered satisfactory, but as the companies could not come to an agreement as to the customs charge for the permanent treatment of ore at the Dome Lake mill, the West Dome mine was closed down.

BEAVER (Cobalt)—Good ore is being shipped from 600 and 700 ft. levels and exploration carried on at higher levels.

GREEN MEEHAN (Cobalt)—Another vein carrying commercial silver has been cut.

LA ROSE CONSOLIDATED (Cobalt)—New vein of high-grade ore cut on 70 level in old workings.

ALADDIN COBALT (Kirkland Lake)—Purchased the original Tough Oaks stamp mill, for treatment of high-grade ore from Burnside property.

MINAKER — (Kirkland Lake) — Small plant installed and development started on No. 1 vein.

ONTARIO-KIRKLAND (Kirkland Lake)—Arrangements have been completed for installation of electrically-driven plant.

DAVIDSON (Matachewan)—Mining Corporation of Canada, which has a short term option on this claim, has large force sampling property.

OTISSE, (Matachewan)—Cores from diamond drilling have been shipped to New York for assaying.

COOK CLAIMS (Boston Creek)—Visible gold has been found in a large red porphyry dike interspered with small quartz veins.

PATRICIA (Boston Creek)—New 50-ton mill is being tested. Underground workings have reached depth of 200 ft. Stoping is under way and ore reported as high grade.

HATTIE (Coulson Township)—Vein containing visible gold and tellurides has been discovered. Shipping and trenching being done. Shaft to be sunk 300 feet.

MEXICO

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper production during May was 1,873,760 lb. Copper ore averaged 3.54% copper.

The Market Report

SILVER AND STERLING EXCHANGE

June	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence	July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence
27	4.7530	99½	48⅞	1	4.7530	99⅝	
28	4.7530	99½	48⅞	2	4.7530	99⅝	48$\frac{13}{16}$
29	4.7530	99½	48⅞	3	4.7530	99⅝	48$\frac{13}{16}$

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

June July	Copper: Electrolytic	Tin: Spot.	Lead: N. Y.	Lead: St. L.	Zinc: St L
27	*23½	†	7.90	7.75	8¼ @ 8½
28	*23½	†	7.90	7.75	8⅜ @ 8⅝
29	*23½	†	7.90	7.75	8⅜ @ 8⅝
1	*23½	†	7.90	7.75	8⅜ @ 8⅝
2	*26	†	7.90	7.75	8⅜ @ 8⅝
3	*26	†	7.90	7.75	8⅜ @ 8⅝

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c per 100 lb. above St. Louis.

LONDON

June July	Copper: Standard Spot	Copper: Standard 3 Mos.	Copper: Electrolytic	Tin: Spot	Tin: 3 Mos.	Lead: Spot	Zinc: Spot
27	110	110	125	332	332	29½	54
28	110	110	125	332	332	29½	54
29	...	...	...	...	...	...	
1	110	110	125	332	332	29½	54
2	110	110	125	332	332	29½	54
3	110	110	125	337	337	29½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515 : £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—July 3

The outstanding feature of the market this week was the advance in the price of copper. Lead was firm and scarce. Zinc was quotationally higher, but was rather dull.

Copper—Representatives of the copper producers met the Price-Fixing Committee of the War Industries Board in Washington on July 2, and, as the result of their conference, the price of copper was advanced to 26c. That there was going to be an advance was foreshadowed in our report of last week, it being known that important officials in Washington had changed their minds respecting the copper situation. A formal announcement of the advance, as communicated by our Washington correspondent, is as follows: "Subject to the approval of the President, the Price-Fixing Committee of War Industries Board, in conference with representatives of the industry, has fixed the price of copper at 26c. per lb., an advance from 23½c., the price formerly fixed. The new price goes into effect July 2 and will continue until Aug. 15."

As in previous cases, there is a certain vagueness in this announcement, which leaves many matters open for adjustment. The most important of these is the question of existing contracts. In so far as the relations between the Government and the producers are concerned, the position is that whereas there was an agreement previous to June 1, since that time there has been no agreement, the producers having specifically refused to assent to the price that was then named by the Price-Fixing Committee. In the matter of commercial business, however, it is understood that existing contracts are to be filled at the previous price unless different provisions were agreed upon at the time of sale.

Though the advance in price does scarcely more than compensate for increase in freight rates, and some other recent increases in cost, the new attitude of the War Industries Board has created an immensely better feeling in the copper industry. Although all producers have striven patriotically to produce every pound of copper possible during the last nine months, the advance in price will do more than anything else to promote additional production.

Copper Sheets are quoted at 34¾c. per lb. for hot rolled, and 1c. higher for cold rolled. The situation in regard to the price of copper wire is indefinite owing to the change in the price of the metal.

Tin—Practically no spot tin is obtainable in this market. As an index to conditions, Banka may be quoted at 93@95c and the 99% grades at 91@92c., but those quotations are nothing more than nominal. Singapore quoted £348½, c.i.f., London, on June 27; the same on June 28 and July 1; £343½ on July 2, and £344 on July 3.

Lead—New transactions were light. Producers reported inquiries as being rather few. This is probably attributable to the appreciation among consumers of the futility of making inquiries. Some important consumers need large tonnages, and would not only make inquiries but also would buy if there were any immediate chance of their getting the lead. The price of all producers remained unchanged at 7.90c. New York, and 7.75c., St. Louis. Some small adjustments are to be expected in order to compensate for the changes in freight rates. The schedules issued for June 25, when the new rates became effective, were so complicated that not even the traffic managers could solve them at once. It has turned out this week that the advance in rate from St. Louis to New York will be 35c. per 100 lb. instead of the 24½c. expected, while the smelting-in-transit differential will be 27c., instead of 17½c., which was expected. The quoted prices for lead up to and inclusive of July 3 do not allow for the new rates. Inasmuch as those rates have been in effect since June 25, sellers will be the losers. The monstrous increases in these rates will be protested in hearings to be held in the near future.

Zinc—There was a small further advance in this market, largely on speculative bidding and buying, but at the close it seemed to be not quite so strong. Transactions were of no great volume, and, on the whole, the market was rather dull.

Zinc Sheets—Unchanged at $15 per 100 lb. less usual trade discounts and extras as per list of Feb. 1.

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Price was established June 1 and will continue to Sept. 1. Little available except for Government orders.

Antimony—Several large orders were placed, and in consequence of this business the situation was much improved. We quote spot at 13¼@13½. We quote futures at 11¾@12¼c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50 minimum and $1.75 maximum per pound.

Nickel—Market quotation is 40@45c. per pound.

Quicksilver—We quote $125@$130, sales being reported at the latter figure. San Francisco reports by telegraph, $116, firm.

Silver and Platinum

Silver—Situation remains substantially unchanged, New York official has advanced ⅛c. to 99⅝c. per oz., while London has declined to 48$\frac{13}{16}$d. These slight changes bring the fixed prices to a parity with each other, and represent actual marked conditions. Shipments to London week ending June 29 were 500,000 ounces.

Mexican dollars at New York: June 27, 77; June 28, 77; June 29, 77; July 1, 77; July 2, 77; July 3, 77.

Platinum, Palladium and **Iridium**—Prices fixed at $105, $135 and $175, respectively

Ore Markets

Joplin, Mo., June 29—Blende, per ton, high, $76.60; basis 60% zinc, premium, $75. Class B, $60; prime Western, $52.50@50; calamine, per ton, basis 40% zinc, $35@25. Average selling prices: Blende, $50; calamine, $36; all zinc ores, $8.78 per ton.

Lead, high, $99.80; basis 80% lead, $97.50; average selling price, all grades of lead, $94 per ton.

Shipments the week: Blende, 9310; calamine, 142; lead, 1254 tons. Value, all ores the week, $578,870. Shipments, six months: Blende, 230,624; calamine, 10,488; lead, 38,955 tons. Value, all ores six months, $15,368,910.

The shortage of production is making buyers anxious, and sharp competition resulted in advances on all but premium ore. Lack of cars, diverted to the harvest fields, holds down the shipments, but there is little unsold ore. Sellers realize the situation and are holding for firm prices. The Weir Smelting Co. has been revived, with a lease on the Caney plant of the American Zinc, Lead and Smelting Co., and put a buyer in the field this week for 200 tons of ore, as an initiative step. It is expected to use 400 to 500 tons per week in full operation. W. H. Eardley succeeds George W. Moore as local manager of the ore-purchasing department of the American Metal Co. Mr. Moore goes to the Eagle-Picher Lead Co. Both companies will have head purchasing offices in Joplin.

Platteville, Wis., June 29—Blende, basis 60% zinc, highest price reported paid for premium grade was $72.20 per ton. Second grade and high grade leady blende advanced to $47.50 per ton. Base lead ore, basis 80% lead, $86 per ton.

Shipments reported for the week were 2797 tons blende, 422 tons galena, and 743 tons sulphur ore. First six months 1918: Zinc, 66,434; lead, 3594, sulphur ore 26,601. tons. First six months 1917: Zinc, 70,177; lead, 2949, sulphur ore, 13,934 tons.

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight. Tonnage is extremely difficult to obtain, and of the allotment that was scheduled to be delivered in April and May, only a small portion has come in. Domestic pyrite is selling at prices ranging from 25 to 30c. per unit, f.o.b. mine. Unchanged.

Tungsten Ore—The market remains steady with prices ranging from $19 to $24 per unit, according to grade. High-grade ores free from impurities are quoted at from $23 to $24 per unit for 65% and 70% WO_3 respectively; low-grade ores containing impurities are quoted at $19 to $20 on the basis of 60% or over.

Chrome Ore—Unchanged at $1.50 per unit, f.o.b., shipping point, basis 40 per cent.

Manganese Ore—Unchanged at $1.35, basis 48 per cent.

Molybdenum Ore—A small lot was reported sold at $1.25 per lb. of molybdenum sulphide in concentrates containing over 90 per cent.

Iron Trade Review

PITTSBURGH—July 2

The war activities are being well supplied with steel. It has been possible to accumulate some ship steel at fabricating plants, and there is some accumulating of fabricated parts at shipyards, although complaint is made that at one or two shipyards, notably Hog Isalnd, receipts of steel are still not altogether sufficient. Some of the forge shops have not been able to keep pace with the rate at which steel has been shipped them. There is no relaxation of pressure by the Director of Steel Supplies, who desires to accumulate stocks as a measure of safety against possible interruptions to manufacture or transportation next winter. After these liberal shipments are made for the direct war activities, there are left good supplies for commercial purposes standing highest in the preference list. The industries standing near the bottom of the list are receiving relatively little steel, while the industries not recognized at all with preference are getting practically nothing. Hardship is resulting in few if any cases, however, because the industries not accorded preference are much less active than usual, and have considerable stocks of steel. The shortage of steel that has existed for nearly three years got nearly all buyers, jobbers and manufacturing consumers alike, into the habit of carrying good-sized stocks, and though lines are broken or poorly assorted in many instances, the aggregate tonnage is large. The outlook is that the apparently drastic control of pig-iron and steel deliveries is not in itself likely to disturb trade greatly.

Production of both pig-iron and steel ingots was at a slightly better rate in June than in May, but lessened production is expected in July and August, on account of weather conditions.

Pig Iron—Some of the merchant furnaces are greatly concerned over their costs, which it is claimed are in some cases approaching the Gover..ment price limit. The best-attended meeting in the history of the American Pig Iron Association was held in Pittsburgh last Friday, chiefly to discuss the situation. The greatest complaint does not come, as might be expected, from consumers of Lake Superior ore, who have to pay an advance of 45c. a ton from July 1, through the recent price adjustment of the War Industries Board but from furnaces in Tennessee and Virginia, whose difficulties arise chiefly from inefficiency of labor. Another meeting is to be held late this week, in Cleveland. Despite reports to the contrary, there is no gen ral desire on the part of the merchant furnaces to seek higher Government prices. There are few open market sales but many allocations by the Government. Commercial consumers not accorded preference treatment by the authorities are receiving little iron, but no great inconvenience seems to result. The market remains quotable at the set limits: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnaces. Freight from the Valleys to Pittsburgh, formerly 95c, advanced May 25 to $1.10 and June 25 to $1.40. W. P. Snyder & Co. report average prices in June, based on actual sales, at $35.20 for bessemer and $32 for openhearth at Valley furnaces. Foundry iron was quoted throughout the month at $33 furnace.

Steel—There is no soft steel available in the market, and only an occasional small lot of discard steel. Discard steel and off heats are being rolled into essential products wherever possible or are being melted up as scrap.

Ferromanganese—The market is quiet, with prompt and forward still quoted at $250 delivered, for 70%, with $4 a unit for higher manganese content. Spiegeleisen is nominally quoted at $76 furnace, but only fourth-quarter deliveries are obtainable at this figure, prompt commanding a premium of about $4.

STOCK QUOTATIONS

N. Y. EXCH.†	July 2
Alaska Gold M.	2¼
Alaska Juneau	1⅝
Am Sm & Ref. com	79
Am Sm & Ref., pf	105
Am. Sm. Sec., pf., A	89
Am Zinc	21
Am. Zinc, pf.	52
Anaconda	67¼
Batopilas Min	1¼
Bethlehem Steel	82¾
Bethlehem Steel, pf	88
Butte & Superior	31
Butte Cop. & Zinc	12
Cerro de Pasco	34
Chile Cop	16¼
Chino	40½
Colo. Fuel & Iron	47
Crucible Steel	67½
Crucible Steel, pf.	90½
Dome Mines	7¼
Federal M. & S.	10½
Federal M. & S., pf.	32
Great Nor., ore ctf.	32¼
Greene Cananea	42½
Gulf States Steel	85¼
Homestake	70
Inspiration Con.	54¼
International Nickel	29¼
Kennecott	33
Lackawanna Steel	83
Mexican Petrol	98
Miami Copper	29
Nat'l Lead, com.	59
National Lead, pf.	101
Nev. Consol	19¾
Ontario Min	11¾
Ray Con.	24¼
Republic I.&S., com.	89¼
Republic I. & S., pf.	99½
Sloss-Sheffield	62¼
Tennessee C. & C.	19¼
U. S. Steel, com.	105¼
U. S. Steel, pf	111
Utah Copper	82½
Va. Iron C. & C.	71½

N. Y. CURB†	July 2
Big Ledge	1 3/16
Butte & N. Y.	‡ 75
Butte Detroit	‡½
Caledonia	.44
Calumet & Jerome	1 3/16
Can. Cop. Corpn.	1¾
Carlisle	‡2
Cashboy	05
Con. Ariz. Sm.	1¾
Con. Coppermines	5¾
Con. Nev.-Utah.	‡ 3/16
Emma Con.	.17
First Nat. Cop.	‡1⅞
Goldfield Con.	21
Goldfield Merger	.02
Greenmonster	‡¾
Hecla Min	4¼
Howe Sound	‡4¼
Jerome Verde	‡⅝
Kerr Lake	5.35
Louisiana	‡.50
Magma	33½
Majestic	.23
Marsh	.04½
McKinley-Dar-Sa.	.38
Milford	‡.75
Mohican	‡.06
Mother Lode	36
N. Y. & Hond	‡12½
Nipissing Mines	8¾
Nixon Nevada	‡.42
Ohio Cop	15/16
Rawley	‡2¼
Ray Hercules	4¼
Richmond	‡ 56
Rochester Mines	.38
St. Joseph Lead	14¼
Standard S. L.	7/16
Stewart	.16
Success	09½
Tonopah	2¾
Tonopah Ex	1½
Tribullion	‡ 3/16
Troy Arizona	.12
United Cop	‡ 9/16
United Verde Ext	39½
United Zinc	‡1½
Utica Mines	‡ 08

SAN FRAN.*	June 25
Alta	.03
Andes	.07
Best & Belcher	04
Caledonia	04
Challenge Con	03
Confidence	04
Con. Virginia	30
Gould & Curry	01
Hale & Norcross	01
Jacket-Cr. Pt.	06
Mexican	28
Occidental	51
Ophir	11
Overman	02
Savage	03
Sierra Nevada	10
Union Con	50
Utah Con	01
Belmont	2 65
Jim Butler	65
MacNamara	20
Midway	04
Mont.-Tonopah	10
North Star	07
Rescue Eula	08
West End Con	99
Atlanta	05
Booth	02
Comb. Frac	‡ 02
Florence	10
Jumbo Extension	08
Kewanas	02
Nevada Hills	03
Nevada Packard	27
Round Mountain	23
Silver Pick	03
White Caps	26
Big Jim	‡ 75
United Eastern	3 25

BOSTON EXCH.*	July 2
Adventure	50
Ahmeek	75
Algomah	30
Allouez	49
Ariz. Com., ctfs.	13½
Arnold	.20
Bingham Mines	9½
Bonanza	17
Butte-Balaklava	27
Calumet & Ariz.	67
Calumet & Hecla	445
Centennial	10½
Copper Range	46½
Daly West	2
Davis-Daly	5½
East Butte	9
Franklin	4
Granby	75
Hancock	5½
Hedley	‡12
Helvetia	.20
Indiana	‡.50
Isle Royale	26½
Keweenaw	1
Lake	5¼
La Salle	2¼
Mason Valley	4
Mass	5¼
Mayflower	2½
Michigan	2¼
Mohawk	58½
New Arcadian	2⅝
New Idria	14
North Butte	14½
North Lake	.60
Ojibway	.60
Old Dominion	41
Osceola	49
Quincy	68
St. Mary's M. L.	50
Santa Fe	.70
Seneca	10½
Shannon	4¼
Shattuck-Ariz.	16
So. Lake	1¼
So. Utah	.10
Superior	‡4¼
Superior & Bost.	2¼
Trinity	3⅜
Tuolumne	.96
U. S. Smelting	43¼
U. S. Smelt'g, pf.	44
Utah Apex	1¾
Utah Con.	9⅜
Utah Metal	2¼
Victoria	2⅝
Winona	1¼
Wolverine	27
Wyandot	50

BOSTON CURB*	July 2
Alaska Mines Corp	12
Boston Ely	80
Boston & Mont.	52
Butte & Lon'n Dev	.17
Calaveras	.50
Calumet-Corbin	‡.01
Chief Con.	2⅝
Cortez	05
Crown Reserve	.15
Crystal Cop	.23
Eagle & Blue Bell	2
Gila Copper	‡17
Houghton Copper	50
Intermountain	‡ 05
Iron Cap	18
Mexican Metals	.35
Mines of America	1⅛
Mojave Tungsten	.07
Nat. Zinc & Lead	.17
Nevada-Douglas	.45
New Baltic	.80
New Cornelia	17¼
Oneco	.20
Pacific Mines	‡ 35
Rex Cons	.08
Yukon Gold	1

SALT LAKE*	June 29
Bannack	‡.26
Cardiff	‡2.00
Colorado Mining	‡ 07
Daly	‡2.00
Empire Copper	‡ 92
Gold Chain	‡ 05
Grand Central	‡ 47
Iron Blossom	38½
Judge	‡5 50
Lower Mammoth	‡.03
May Day	.01½
Moscow	‡.05
Prince Con	.54
Rico Wellington	.11
Silver-King Coal'n	1 15
Silver King Con.	1.45
Sioux Con.	‡.02
So. Hecla	‡ 68
Tintic Standard	1 91
Uncle Sam	02
Walker Cop.	1 25
Wilbert	06½
Yankee	‡.02½

TORONTO*	July 2
Adanac	.07
Bailey	.03½
Beaver Con.	.25½
Chambers Ferland	11
Coniagas	2 62½
Hargraves	04
La Rose	31½
Peterson Lake	09
Temiskaming	29
Wettlaufer-Lor.	04
Davidson	33
Dome Exten	09
Dome Lake	12
Hollinger	4 50
McIntyre	1 12½
Newray	12½
Porcu. Crown	13
Teck Hughes	30
Vipond	12
West Dome	07

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 2
Cresson Con.	4.50
Doctor Jack Pot.	.05
Elkton Con.	.04
El Paso	.10
Gold Sovereign.	‡.02
Golden Cycle.	1.58
Granite	.17
Isabella	.03½
Mary McKinney	.04
Portland	.78
United Gold M.	14
Vindicator	.30½

LONDON	Apr. 15
Burma Corp.	£4 0s 0d
Cam & Motor	0 11 0
Camp Bird	0 7 9
El Oro	0 8 6
Esperanza	0 8 6
Mexican Mines	5 5 0
Min. Corp. Can.	0 16 3
Nechi, pfd	0 10 6
Oroville	0 17 9
St. John del Rey	0 16 0
Santa Gert'dis.	0 12 9
Tomboy	0 17 3

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1916	New York 1917	New York 1918	London 1916	London 1917	London 1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	.....	30.000	40.110	.....
Aug.	66.083	85.407	.....	31.498	43.418	.....
Sept.	68.515	100.740	.....	32.584	50.920	.....
Oct.	67.855	87.332	.....	32.361	44.324	.....
Nov.	71.604	85.891	.....	34.192	43.584	.....
Dec.	75.765	85.960	.....	36.410	43.052	.....
Year	65.661	81.417	.....	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1917	New York Electrolytic 1918	London Standard 1917	London Standard 1918	London Electrolytic 1917	London Electrolytic 1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	.....	128.409	.....	140.409	.....
Aug.	25.380	.....	122.391	.....	137.000	.....
Sept.	25.073	.....	117.500	.....	135.250	.....
Oct.	23.500	.....	110.000	.....	125.000	.....
Nov.	23.500	.....	110.000	.....	125.000	.....
Dec.	23.500	.....	110.000	.....	125.000	.....
Year	27.180	.....	124.892	.....	138.401	.....

Tin	New York 1917	New York 1918	London 1917	London 1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	.....	242.181	.....
August	62.681	.....	243.978	.....
September	61.542	.....	244.038	.....
October	61.851	.....	247.467	.....
November	74.740	.....	274.943	.....
December	87.120	.....	298.556	.....
Av. year	61.802	.....	237.563	.....

(*a*) No average computed.

Lead	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	.....	10.644	.....	30.500	.....
August	10.594	.....	10.518	.....	30.500	.....
September	8.680	.....	8.611	.....	30.500	.....
October	6.710	.....	6.650	.....	30.500	.....
November	6.249	.....	6.187	.....	30.500	.....
December	6.375	.....	6.312	.....	30.500	.....
Year	8.787	.....	8.721	.....	30.500	.....

Spelter	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643		8.473	.....	54.000	.....
August	8.360		8.190	.....	54.000	.....
September	8.136		7.966	.....	54.000	
October	7.983		7.813	.....	54.000	
November	7.847		7.672	.....	54.000	
December	7.685		7.510	.....	54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡ 1917	Bessemer‡ 1918	Basic‡ 1917	Basic‡ 1918	No. 2 Foundry 1917	No. 2 Foundry 1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45		53.80		53.95	
August	54.17		50.37		53.95	
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

Engineering and Mining Journal

Volume 106 — July 13, 1918 — Number 2

THE TOPOGRAPHIC FEATURES OF THE TUNGSTEN AND TIN DISTRICTS OF BEIRA ALTA, PORTUGAL, BEAR A MARKED RESEMBLANCE TO THE SOUTHWESTERN UNITED STATES

The Mineral Industry of Portugal

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A brief résumé of the mineral activities in Portugal, together with some production figures, details of local working conditions and observations based on a six months' examination in various parts of the country. Copper, tungsten, tin, pyrite, lead, arsenic and uranium are produced.

ONE of the smaller nations of Europe, of which comparatively little is heard, but which is doing its part manfully in the cause of democracy, is Portugal. This country lies in the southern part of Europe in the southwestern corner of the Iberian Peninsula. It is little visited, and American mining engineers, until recently, have overlooked its possibilities. The impression prevailing generally among American engineers is that there is nothing in Portugal of mining interest. This was our impression also, but our views have been greatly altered by a visit and an examination of the mines and geological structure of the country.

PORTUGAL DIVIDED INTO THREE PROVINCES

Portugal is roughly rectangular, being about 350 miles in length by 135 miles in width and lying between 6° and 10° west longitude and 37° and 42° north latitude. There are only two large cities, Oporto (Porto), at the mouth of the Douro River, and Lisbon (Lisboa), the capital, at the mouth of the Tejo River. These two rivers divide the country into three provinces as shown on the map namely: Tras Os Montes, or the most northern province; Beira Alta, or the high province, and Beira Baixa, or the low province.

Tras Os Montes is cut by several ranges of mountains running in a generally north and south direction and reaching altitudes of 4000 ft. The summers are cool and the winters severe—especially in the mountains, where heavy snowfalls are the rule. The Douro River separates this province from Beira Alta and provides a convenient means of transportation for the product to Oporto, which serves as an outlet for Tras Os Montes and the northern part of Beira Alta.

The chief topographical feature of Beira Alta is the Serra Estrella Mountains, which run in a northeast direction across the central portion of the province. These mountains attain heights of 6000 ft. and form an effective divide between the east and west part of the province. Other minor ranges reach 4000- or 5000-ft. elevation and make the province in general mountainous. The summers are dry in this province, but the winter is a long, rainy season in the lowlands and one of heavy snowfalls in the mountains. The chief activities of these two provinces are grape growing for wine, and grain raising. The lower province, Beira Baixa, on the south side of the Tejo River, is flat except for the Serra de Monchique, which runs east and west across the southern part of the province. The climate is hot and dry—not unlike that of parts of our southwest. The visitor from the north notices the absence of bull carts, mules being used almost exclusively. The chief industry is grain growing. As far as the eye can reach the country is under cultivation.

As can be seen on the map, the country is well served by railroads. These are operated by the government. The main lines are of broader gage than ours (two meters), while the roads operating in the mountains are narrow gage. The engines are run entirely on wood fuel, as coal exports from England to Portugal have been stopped by an embargo. The service is not rapid, but, barring revolutions, is continuous.

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MINERAL DEPOSITS VARIED AND IMPORTANT

Mines are more widely distributed than is generally supposed, and there are many valuable deposits unworked at present, due to lack of capital in the country and also lack of outside knowledge of the mineral possibilities of Portugal. Tin and tungsten are found in Tras Os Montes. Tin, tungsten, lead, coal and uranium are found in Beira Alta, while copper, pyrite and iron are found in Beira Baixa. The situation of the operating mines is shown on the map. The production in 1914—the last year for which production figures are available—is given in Table I.

TABLE I. MINERAL PRODUCTION OF PORTUGAL IN 1914 (1)

	Grade, Per Cent	Long Tons	Value
Copper	75	3,200	$753,132
Pyrites		259,102	701,975
Tungsten	65	615 6	356,169
Tin	60	370	145,141
Lead	71	2,163	103,859
Coal		29,680	97,805
Arsenic	95	960	49,569
Uranium	5	1,317	6,552
Iron	48	6,639	5,960
Radium		305 (a)	14,831
Gold and silver		88 (b)	2,560
			$2,237,553

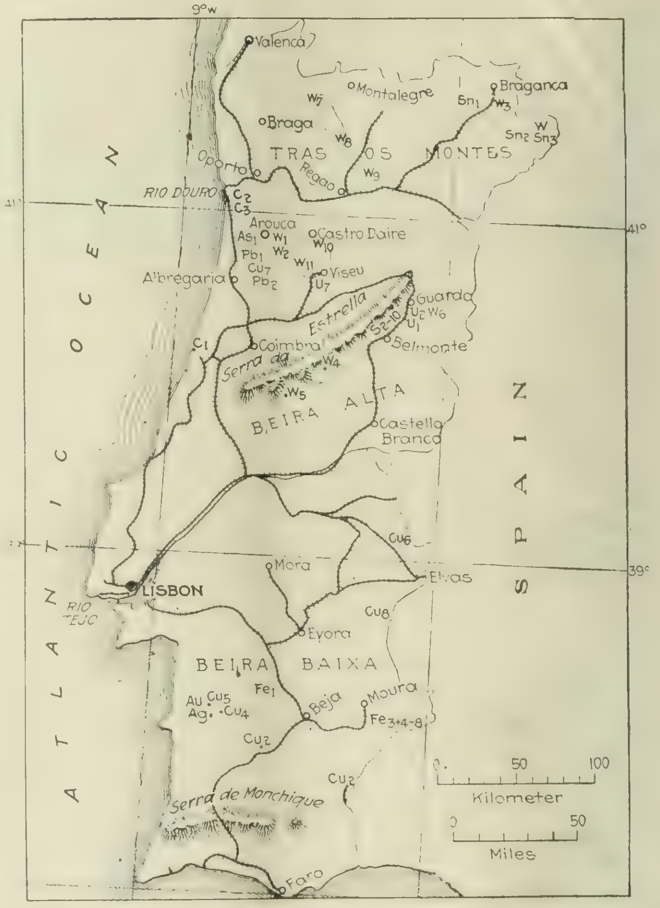
(a) Milligrams. (b) Kilograms.

COPPER, PYRITE AND IRON ORES IN BEIRA BAIXA

In 1914 the value of the output of copper and pyrite was $1,455,107, these being the leading mineral products. During the last two years, due to war conditions, the output of tungsten has increased. In 1917 its estimated value was $74,550.

The copper deposits of Portugal occur in Beira Baixa, their situation being shown on the map. The largest of these is the Minas de San Domingos, operated by Mason and Barry. This is an extension of the Spanish pyrites deposit of Rio Tinto and Tharsis. San Domingos is situated not far from the Spanish border. It has been worked since 1858. A railroad 12 km. long from Pomarao, on the Rio Guadiana, connects the mine with the outside. The river from Pomarao is navigable to the ocean. The ore contains 0.91% Cu and 48.28% S, and occurs in a mineral zone 200 ft. in width by 2000 ft. in length in Devonian schists containing lenses of cupriferous pyrite. The deposit is opened by several shafts and levels at 122, 150, 180 and 210 m. depth. The grade of the ore is decreasing with depth, but the sulphur content makes the pyrite of economic value. The copper is removed in a leaching plant and the remaining ore is shipped as pyrite. In 1914 there was mined 265,987 tons, of which 49,665 tons was treated in the leaching plant, producing 1029 tons of cement copper of 72.3% purity. Besides this, 218,252 tons of pyrite was shipped. Ore reserves amounted to 500,000 tons. Steam power to the extent of 1200 hp. is used, and the company operates its own locomotives on the railway to Pomarao. About 2300 laborers are employed.

The second mine of importance is the Minas de San Joao do Deserto (Aljustral) operated by Belgian interests. This is situated 30 km. southwest of Beja and contains 3500 hectares. The ore is found in six veins in schist. The veins contain copper pyrite, averaging about 1% Cu. The veins are developed by six shafts and numerous crosscuts at intervals to 120 m. depth. The property has not been in operation during the European war. The ruins of the old mill and smeltery are still to be seen. The mill is equipped with Krupp crushers, rolls, jigs and tables. When we visited the property, the mill was dismantled, so the exact flow sheet could not be determined. The copper concentrates were smelted in a small furnace, the flux being mined through a small shaft adjoining the mill. The concentrates and flux were mixed in the proper proportions, put into crucibles holding 100 kilos per charge and placed in the furnace. During 1914, 165,465 tons of ore was mined, from which was shipped 1229 tons of matte of 77% purity and 39,539 tons of pyrite containing 2 to 5% Cu. Steam power to the extent of 700 hp. was used. The property is inactive at present, due to the abnormal and unstable conditions and the high cost of supplies.



DISTRIBUTION OF MINING DISTRICTS, PORTUGAL

In addition to San Domingos and Aljustral, chalcopyrite is mined at Barranços and at Serra da Caviera by English interests. Small amounts of gold and silver are produced at the latter property as a byproduct. Tinoca and Azeiterios, in the northern part of Beira Baixa, and the Vale do Bicho, in the Arouca district, and Zambijeiro, near Evora, are the other copper producers in the country.

In 1914 the official estimate of production of tungsten concentrates from 11 producers, as shown in Table II, was 615 tons of 65% grade. In 1917 this production had increased to at least 1500 tons, and many old mines have been reopened. Tungsten is found in widely separated regions in Tras Os Montes and Beira Alta.

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(1) "Estatistica de Minas" Imprensa Nacional, Lisboa 1916.

All the districts lie in Archœan granite-schist areas. The granites vary from fine to coarse grained with large phenocrysts of quartz and feldspar, and frequently shade into aplite, and are usually an intrusion in the schist. The ore occurs in quartz veins of the fissure type cutting both granites and schists. It is impossible to determine the zone in which the tungsten belongs, as it is found in some districts in the zinc zone, at other properties in the lead zone and at still others in the sulphide zone. The lead and zinc zones are shallow, so that the main supply of ore is to be derived from the sulphide zone. One cannot predict what will occur with deep development, as the tungsten mines in Portugal are only a few hundred feet below the surface.

The deepest tungsten mines at present in the world are at Boulder, Colo., where, in the Conger mine, a depth of 1500 ft. has been reached. All that can be said is that at some depth the tungsten should be replaced by iron sulphide. As a rule, the richest ore has been found in the lead and zinc zones, but good pockets have been found in the sulphide zone. Faulting is common. Ore is also derived from alluvial or erosional deposits. In some of the districts such deposits are of sufficient extent and richness to be commercially valuable. The tungsten occurs mostly as wolframite and hübnerite, but scheelite has also been found. Tin and titanium are generally associated with the alluvial deposits. These minerals also occur in the country granite without any evidence of vein formation.

TUNGSTEN MILL IN BEIRA ALTA, PORTUGAL. WOOD FUEL IS CARRIED TO THE PLANT BY WOMEN

A French company, La Société des Mines de Borralha, operating the Borralha group, as shown at W7 on the accompanying map, in Tras Os Montes, is the largest producer. The Wolfram Mining and Smelting Co., an English concern, operating the Panasqueira group at W4, in Beira Alta, and American interests in the Viseu district at W10 and W11, in Beira Alta, produce almost as much as the French company. By an agreement with the Portuguese government, the products of the mines are shipped to France, England and the United States respectively. The remainder of the production, coming from the Arouca district, the Braganza district and the Guarda district, is purchased by agents of the three companies named.

The Borralha group, composed of the Borralha, Borrageira, Outeiro das Devesas, Picoto, Toncal, and Vale do Forno mines, is situated in the Serra das Alturas at an altitude of about 3000 ft. The ore is found in numerous quartz veins striking northeast and dipping at a slight angle to the northwest. The mines and mill are operated by hydroelectric power from an 850-hp. plant. About 500 men and women are employed and 500 tons of 65% concentrates is produced per year. The concentrates are shipped out via Vila Real and Regoa and thence down the Douro to Oporto.

The Panasqueira group is situated in the Serra Estrellas at an altitude of 4000 ft., 20 km. northeast of Pampilhosa. Power for mining and milling is furnished by two gas engines of 150 hp., 375 men are employed, and 400 tons of 65 to 70% concentrates is the available capacity per year. The product is shipped out via Pampilhosa and thence to Lisbon by rail and thence to England, there being no refinery in Portugal. In addition to the tungsten, considerable quantities of tin are produced and shipped. The company also owns and operates the Pintor arsenic mine and smeltery, described subsequently.

American interests have recently acquired and are operating the mines of the Dias Mining Corporation, the Ramelho Vieira Mines, Inc., and the Pendao Mines, Inc. These consist of five scattered mines and mills in the Viseu district, as well as a number of promising prospects. The ore is derived from alluvium deposits and fissure veins in granite. Steam and gasoline power is used at the mills—the work in the mines being done by hand. About 500 men and women are employed. The mines vary in altitude from 1500 to 500 ft. The present capacity is about 250 tons of concentrate per year.

The mines of the Count Castelo de Paiva in the Arouca district, operated by Gustav Thomas, are an important source of tungsten. Hand methods of concentration are practiced, which is satisfactory on the coarse product, but wasteful of the fines and gives a low percentage of extraction.

The mine of Montado de Adoria at W8 is a noteworthy example of hand work. The vein has been drifted upon and ore removed by overhand stoping methods. The ore is hand sorted and the picked material is sacked for shipment. The rest of the ore is pounded up on iron plates by girls with small hammers. They work at 120 strokes per minute and seem almost mechanical in their operation. This pounded ore is passed over a screen with $\frac{1}{8}$-in. openings and the oversize jigged by hand. The undersize is washed in water flowing through a long narrow box. The ore is agitated in the current by aid of a small tin scoop. This operation causes the coarser tungsten to settle toward the bottom, but the fines are all washed away with the sand. There are 15 or 16 large fissure veins in this group, and considerable ore has been taken out of a large open pit, where the ore occurs as a stockwork.

There has been no mining below water level. There are several thousand tons of low-grade filling left in the stopes and a large dump of pyritic ore which it was not profitable to handle by hand methods. There are excellent sites here for a mill, plenty of water and good possibilities for developing hydroelectric power. In 1914, 71.5 tons of concentrates assaying 65% were obtained by this washing method, which also produced 30 tons of second-grade material and two tons of 60% tin concentrates. In addition to the above mentioned, there are numerous small independent producers in the Borralha, Braganza and Guarda districts. A list of the chief producers of tungsten, their 1914 production and estimated 1917 production is given in Table II. There are in all over 30 tungsten mines in operation in Portugal today.

TABLE II TUNGSTEN PRODUCERS IN PORTUGAL

Property	Owner	1914 Tons	1917 (Estimated) Tons
Capela do Senhor dos Afitos	Count de Paiva	10	40
Cheira, Tiveda	Antonio Barros	4	10
Cabeco de Paredes	Societe des Etains de P	50	125
Panasqueira	Wolfram M. & S.	201	400
Cabeco do Seixo	Empresa Pesquisa de Minas	7	25
Fonte do Seixo	Alfonse de Costa	27	50
Borralha	Soc. des Mines De Borralha	220	500
Mortado de Adoria	Gustav Thomas	71	200
Codiceira	Count de Suffern	25	70
Encosta da Evinha San Cosmade, Avale	Diaz	15	15
Moimenta..............	Ramelho Vieira	5	250
Pendao	Pendao		
Totals		635	1,685 to 2,000 maximum

The amounts given are in all cases 60% WO_3

The majority of the old French companies were unsuccessful, as they built and equipped beautiful surface plants before developing sufficient ore to warrant the installation, and consequently there was not sufficient capital to develop the mine. A typical example of this is the tungsten mill at Iffanes near Braganza, in Tras Os Montes. There is a deposit of tungsten in a contact, between Archaean schist and porphyry with a quartz filling. The deposit is narrow, the vein varying from a few inches to two feet in width. The mill building is of stone and large enough to hold three times the present equipment. It is equipped with jaw breaker, rolls, ball mill, jigs, five steel tables, a buddle, three-unit classifier—all of Krupp make. The power unit consists of an 80-hp. horizontal boiler and a single expansion steam engine.

The mine equipment consists of a double-drum steam hoist, two-stage air compressor of 400 cu.ft. capacity. There is an excellent fully equipped blacksmith and machine shop containing forges, lathes, drill press, etc. The surface plant, however, was built before the mine was developed, and, after sinking 125 ft. and doing a few hundred feet of drifting, the funds were exhausted. Hand-washing treatment has been confined to the oxidized ores, where the wolframite and hübnerite are free from pyrite. As soon as water level has been reached the pyrite appears, operations are abandoned and a new locality is sought. Consequently there are many promising prospects in old mines waiting for sufficient capital for proper development and equipment.

In view of the fact that the price of tungsten has been fixed by the British government at 55s., or $11.80, per long ton unit, plus allowance for freight and insurance, the cost of tungsten production in Portugal as shown in Table III is interesting.

TABLE III COST OF TUNGSTEN PRODUCTION PER LONG TON

Concentration Method	No. of Plant	Cost of Production	Government Tax	Freight	Total
Mechanical	3	$7.59	$1.07	$0.50	$9.16
Hand	5	8.22	1.07	.50	9.79

At Panasqueira Borralha and the American group, where mechanical concentration is used, the average cost of production is $7.59, with a profit of $2.64 per unit. At five properties using hand methods the cost is $8.23, showing an indicated profit of $2.01 per unit. Ore bought at the mine varies from $8 to $10 a unit, as some of the small producers are able to skim the rich alluvium at a low cost. The tax of $1.07 is based on 180 escudos per long ton of concentrates and is fixed by the government on exported ore.

TIN GRAVEL DEPOSITS IN TRAS OS MONTES

As in other localities, the association of the tungsten and tin minerals in Portugal is marked. Many of the tungsten mines described produce tin concentrates as a byproduct. The Braganza and Guarda districts are the chief producers of tin in Portugal. In the Braganza district the Borralheira and Pereiro mines are operated by a French company. La Société des Mines d'Etain d'Ervedosa is the largest producer. The mines are situated on the eastern slope of the Serra Segundera, 30 km. southwest of Braganza at an elevation of about 2000 ft. The ore from both of the mines is treated in a concentrating mill operated by a gas engine and producing a 60% tin concentrate. In 1914 the production was 150 tons of concentrates. The tungsten mines of Vale do Milho, San Martinho de Angueiro and Cabeco do Codeco, near Vimioso, southeast of Braganza, produced small quantities of tin also.

The largest tin deposit in Portugal is that of the Portugese-American Tin Co., whose dredging operations have been described[2]. This American company operates a dredge about 15 km. south of Guarda. The concession covers 400 hectares, or 1000 acres. The deposit consists of pebbles and micaceous sands containing cassiterite and extends the length of Riberia de Macainhas and is 30 ft. or more in depth. The country rock is a coarse-grained granite with white mica cut by many dikes of pegmatite containing oxidized ores of tungsten, tin and uranium.

The other tin deposit of note is that of the Anglo-Portuguese Tin Co., Ltd., an English concern operating the Pendos de Isabel Miguel mine, in the same district. Hand methods of concentration similar to those described for tungsten are used.

SMALL PRODUCTION OF LEAD, ARSENIC, COAL AND IRON

About 10 km. east of Albergaria are situated lead mines of Bracal, Malhada, Coval da Mo and Cabeco do Macieira, operated by Portuguese interests. The ore occurs as galena and has been developed to a depth of 60 m. by several shafts. Hydroelectric power is generated and used for mining purposes. One water jacket and one muffle furnace are used for smelting the ore. A total of 2163 tons of lead matte averaging 65.5% Pb was produced in 1914—the greater part for home consumption in Portugal.

Small amounts of anthracite are mined at San Pedro da Cova, at C2, near Oporto, and lignite is mined at Buracos at Cl, near Figueira da Foz, but the quantity of heat units in Portuguese coals is low, and the coals are not of great importance. In 1914 a total of 39,000 tons of coal was mined, but at present the mines are practically inactive

An interesting plant, from a metallurgical standpoint, is the arsenic smeltery in connection with the

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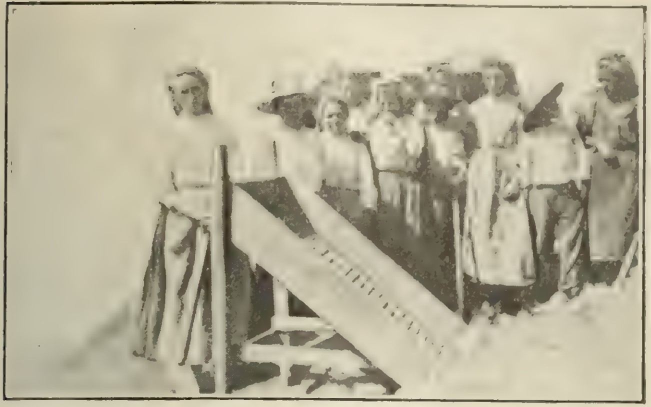
[2] "Tin Dredging in Portugal" Eng. and Min. Journ. Dec. 29, 1917, p. 1199.

Pinto mines at AsI. The mines and smeltery are situated about 30 km. south of Oporto and are operated by the Anglo Peninsular Mining and Chemical Co., Ltd., a subsidiary of the Wolfram Mining and Smelting Co. The ore occurs as arsenopyrite in veins in granite. The veins are mined to a depth of 100 m., hydraulic and steam power being used. One reverberatory and one Oxland-type furnace are used, but the greater part of the ore is smelted in Pengilly furnaces designed by the manager, Albert Edward Pengilly, of which type there are 50 in operation. In 1914 the production was 803 tons of arsenic of a 95% As_2O_3 purity.



HAND SCREENS AND GRIZZLY BARS ARE MADE ENTIRELY OF GREEN WOOD

There are several deposits of uranite in the Viseu and Guarda districts operated by French interests. The ore occurs in pegmatite dikes in granite impregnated with autunite, and contains 5 to 6% of the uranium oxide. These properties have been well equipped, but have not been successful, due to the failure of a leaching process attempted for the recovery of uranium. Carvalhos, 4 km. south of Viseu, is the chief operator at present. In 1904 305 mg. of radium bromide was produced from Rosmaneria.

Iron occurs in beds in the pre-Cambrian crystalline rocks in the district around Moura, in Beira Baixa. The ore is a hematite containing 60% iron and no phosphorus, sulphur or copper. Zinc ore is found in connection with some of these deposits. They have been worked to a small extent by Henry Burnay & Co. and have produced 9155 tons of ore containing 45% iron.

CHROMITE DEPOSIT AT BRAGANZA

About 2 km. from the town of Braganza there is a promising chromite deposit. The ore occurs as a contact deposit between Archaean schist and a basic porphyry. The deposit varies from a few feet to 20 ft. in thickness and is richly mineralized with chromite. Little work has been done, the contact having been exposed by surface trenching and a few open pits. Some ore has been mined and hand sorted. There are also known deposits of antimony, zinc and manganese in Portugal, but the extent or development of these is little known.

MINE LABOR CONDITIONS IN PORTUGAL

To one accustomed to labor in the United States, that in Portugal is a trial. The peasant or farmer class of Portuguese, upon which the country depends, is by nature slow, methodical, stupid and conscientious. The people are slow to learn anything new, and if it involves a change in the mode of operation from that to which they are accustomed, it is almost an impossible undertaking. No matter how explicit the directions given, instructions are never followed exactly. The Portuguese invariably do things just a little different from the way they should be done. The better educated the person, the harder it is to have instructions carried out explicitly. With education there seems to come an awakening which stimulates "ideas." These "ideas" are carried out regardless of the result, and a ready excuse is always forthcoming. The average Portuguese mind is not sufficiently developed to understand the process of logic, the laws of cause and effect and how to differentiate between the important and the unimportant factors. The natives also have a perverted inventive sense which prompts them to adjust engines and machinery, so that they cannot run. Practically all the work in the mills is done by women. For the most part the women are better workers than the men and more easily instructed.

There is no class of labor in Portugal corresponding to the miners and mill men in America. All the workmen own small farms and work in the mines only when not engaged in harvesting. Carpenters, blacksmiths, tinsmiths, etc., turn out creditable work considering the tools they use, but they are not at all amenable to the introduction of modern tools or improved methods. Portuguese laborers' wages are low in comparison with those paid in the United States, as shown in Table IV, but the fact that mechanical appliances operate better and at lower cost than any Portuguese hand labor must always be borne in mind.

Under proper supervision, and with the same mechanical equipment used in the United States, operating costs should be much less, on account of the low wages, but the substitution of hand methods, no matter how low the wages, for any mechanical appliance in Portugal, invariably results in higher costs and inferior grade of product.

TABLE IV. TYPICAL PORTUGUESE MINE WAGE SCALE, JULY, 1914

Topographical engineer, per month	$49 00		
Local superintendent, per month	35 00	to	$105 00
Portuguese engineer, per month	56 00	to	70 00
Bookkeeper, per month	28 00	to	42 00
Mill captain, per day	70		
Mine captain, per day	63		
Guard, per day	63		
Miners, per day	28	to	47
Trammers, per day	25		
Helper, per day	11	to	14
Blacksmith, per day	35		
Carpenter, per day	49		
Women, per day	14	to	21
Pack mule and driver, per day	70		
Bull cart and driver, per day	1 40		

CONSTRUCTION AND MATERIALS IN PORTUGAL

Local conditions in regard to the material obtainable for construction purposes must be taken into account in the contemplation and design of new plants. One of the most striking features is the cutting of foundation blocks from solid granite. This is necessary, as the cement manufactured in Portugal is of inferior grade and will not stand up under constant vibration. With the low wages, granite blocks can be cut and placed at a less cost than a concrete foundation and give greater satisfaction. Another consideration is that of timber. This is only obtainable in small sizes and relatively short lengths, as it must all be cut by hand from green stock in the vicinity of the mine. Long heavy timbers, such as are usually required for mill framing, are impossible to obtain, and the mill must be designed to obtain the required rigidity and strength from the splicing of a number of small members.

At many of the properties, all the timber is carried to the millsite, several kilometers, on the heads of women. Steep hillsides are generally available for mill sites. An engineer coming to Portugal for the first time must realize that only green timber can be obtained, as seasoned timber is almost unknown. Before the outbreak of the war, equipment could be purchased in England, but at present it is difficult to get it exported. Rails, steel, pipe, etc., may be obtained in Portugal at present in small quantities at fair prices, but only after a long and diligent search. Table V gives the cost of mine and powder supplies in July, 1917.

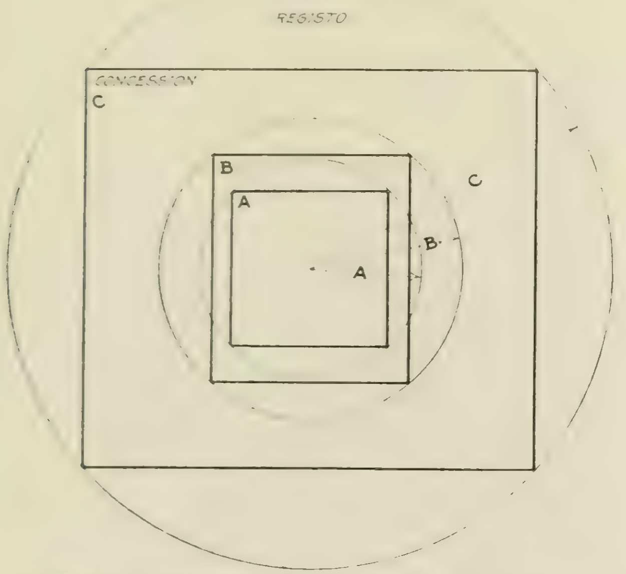


DIAGRAM OF PORTUGUESE MINERAL CONCESSIONS

TABLE V. COST OF MINE AND POWER SUPPLIES IN JULY, 1917

Caps, per 100	$2.65
Carbide, per kilo	2.10
Dynamite, per box of 75 kilos	28.00
Fuse, per five meters	.19
Gasoline, per 36 liters	6.40
Grease, per kilo	.24
Mobiloil "C," per liter	.28

An interesting comparison of construction costs is afforded by a stone reservoir of 40,000 gal. capacity recently built. It cost the equivalent of $3.29 per cu.yd. of stonework, or $4.76 per 1000 gal. capacity. A reservoir of similar design but of 100,000 gal. capacity built of concrete in Virginia cost $28 per 1000 gal. capacity, or over five times as much.

Before the outbreak of the war, the fuel question was not a serious one, as Cardiff coal was plentiful and easily obtained. At present there is no coal in Portugal, as England has stopped exportations and the coal produced in Portugal is practically worthless. For steam power, green wood must be depended upon and provision made for a sufficient supply to last through the rainy season, when the wood trails are impassable. Steam power, generated in horizontal movable type boilers of 15 to 25 hp., is used where timber is available. Gasoline motors, both the Hornsby-Stockport horizontal type and the Lister vertical engine, are often used as auxiliary power. Above timber line, which is often as low as 1000 m. above sea level, gasoline power is used exclusively. Gasoline is shipped in boxes holding two 5-gal. tins, which are carried as far as possible by rail and the remainder of the journey by pack train. It might be interesting to note that the wood from these boxes and the tin from the containers are the chief constituents of the shacks of the operators at these "sky parlor" plants.

It is possible to develop sufficient water power for small hydroelectric installations at many of the properties in Portugal, and the rainfall is sufficient to assure adequate water for at least eight months of the year, while by impounding in reservoirs an annual water power supply can be counted upon.

MINING LAWS OF PORTUGAL

The mining laws of Portugal are complicated and involved. They contain 122 clauses, relative to all phases of the industry. Little attempt is made, however, to enforce any of the laws except those relative to taxes, transfer of concessions and transportation of mineral. The diagram given shows the method of locating claims, which is the reverse of the method in the United States. The circle, known as the "registo," is inscribed on the government map and the "registo" plotted, then located in the field with reference to government bench marks. A fee of 10 escudos[3] is charged for "registos." Mineral land is divided into three classes, A, B and C as shown in Table VI, for which the radii of the circle are respectively 560, 707.1 and 1600.8 m. Class A covers metalliferous veins, beds and alluvium. Class B covers graphite, anthracite, asbestos, salt and gypsum. Class C covers phosphates, nitrates, hydrocarbonates and bituminous substances. The discovery point in all cases is taken as the center of the circle.

Prospecting may be conducted within the boundary of the circle for a period of two years under class A and four years under classes B and C. The concession is then granted to the holder of the "registo" who has paid his taxes during the time of prospecting. An additional payment of 120 escudos is required for classes A and B and 1000 escudos for class C. Where possible the concession must be a rectangle inscribed in the circle of area 50, 100 and 500 hectares respectively, but where the topography necessitates it a polygon of approximately the same area may be substituted. In any case the orientation of the figure within the circle is not specified—this being left to the concessioner, so that he may make it conform to the outline of the development.

TABLE VI. SIZE, COST AND CONDITIONS OF PORTUGUESE MINING CONCESSIONS

Class of Claim	Character Deposit	Meters Radius Registo	Years for Prospecting	Hectares of Concession	Payment 1917 Exchange
A	Metalliferous beds, veins	560.0	2	50	$84
B	Anthracite, etc	707.1	4	100	84
C	Phosphates, etc	1,600.8	4	500	700

This method of location on paper and then in the field is likely to cause trouble, as the government bench marks are not accurate and errors are magnified 1000 times, as the maps are on the scale of 1000: 1. The concession, while covering the desired area on the map, may not in the field.

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[3] The escudo in November, 1917, was worth 70c., par being $1.

Machinery manufacturers shipping to Portugal should keep in mind the Portuguese patent conditions. International patents do not hold in Portugal. Any piece of machinery may be patented in Portugal, irrespective of its being patented by the manufacturers in other countries. The effect of this is that a company may import one piece of machinery, have it patented in Portugal, and, using it as a model, have any number of duplicates made and make it illegal for the original manufacturer to ship any more to the country. Of course, the machine-shop facilities are not great, but simple patented machinery such as jigs, trommel screens, etc., can be copied. It is well for manufacturers to secure a Portuguese patent before shipping to the country.

Portugal contains many valuable deposits of different metals that have scarcely been touched by the native operations. Many deposits of proved worth have been abandoned because of improper metallurgical methods, and many deposits now lie idle due to improper exploration and development. It is a country well worth investigating for one interested in possibilities within easy reach of the world's markets.

Speeding Up Chromite Production

Domestic industry needs about 150,000 tons of chrome ore of various grades for 1918. A large part of the supply must come from the United States, and the more the better, to save shipping. According to the latest report by J. S. Diller, of the U. S. Geological Survey, the output of chromite in the United States in 1917 was 43,725 long tons, of which by far the greater part came from California. Oregon produced 7506 long tons, and smaller quantities came from Alaska, Washington, Maryland and North Carolina. This year the output must be greatly increased, and the promise of a considerable increase is excellent.

The large consumers are giving good prices, $1.25 a unit for 38% ore—that is, $47.50 a ton—f.o.b. cars on the Pacific Coast, on contracts extending through the year, so that it pays to mine chrome ore. Higher-grade ore is worth more and lower-grade less than the grade noted. For 30% ore 65c. a unit is offered—that is, $19.50 a ton. Low grades should be concentrated if possible, thus greatly increasing their value by widening the field and increasing the economy of application. About a dozen concentrators are already either in operation, in course of construction, or in contemplation in California and Oregon. A most hopeful sign of the times is that some of the large deep-gold-mining companies are using parts of their stamp mills, especially in Nevada County, for crushing and concentrating low-grade chrome ore. The ore sold on the Pacific Coast in 1917 ranged in grade from 30 to 55% chromic oxide, and the average was about 42% for the total output, 43,725 long tons, sold during the year at an average price of $26 a ton. The minimum price for most of the same ore to-day would be $47.50 a ton.

Notwithstanding the bad winter weather, the domestic production of chromite during January, February and March, 1918, was 11,448 long tons, of which 3679 long tons was produced and shipped and 5859 long tons produced but not shipped. The total production in April is not completely reported, but appears to be about 6245 long tons, making a total output for the first four months of 1918 of 17,693 long tons, equivalent to 14,862 long tons of 50% ore. That is less than one-third of the total domestic production expected in 1918. The most active season for mining chrome ore is now opening, and the outlook is encouraging.

The Valuation of Arizona Producing Mines for Taxation

In Arizona the full cash value of property is used as a basis for taxation purposes, and in order to arrive at a figure to represent such valuation of producing mines, the method or system adopted by the State Tax Commission is based primarily on ability to pay taxes. For assessment purposes the producing mines of the state are arranged into eight different classes as follows:

Class 1—Copper mines whose orebodies are found in veins, fissures and lenses and do not show evidences of exhaustion.

Class 2—Copper mines whose orebodies consist of porphyry deposits and large acreages of contiguous ground, largely unexplored and undeveloped.

Class 3—Copper mines whose orebodies consist of developed low-grade porphyry deposits.

Class 4—Copper mines whose orebodies show evidences of exhaustion.

Class 5—Gold and silver mines whose orebodies show evidences of exhaustion.

Class 6—Gold and silver mines whose orebodies have not shown evidences of exhaustion.

Class 7—Zinc and lead mines.

Class 8—All producing mines of irregular output.

Mines in classes 1, 2 and 3 are valued on a basis of the amount shown by a capitalization of the average true annual net output over a period of five full years' operation on an earning basis of 15%. Mines in Class 4 are treated in the same manner as above, except that a higher rate of earning is allowed as a capitalization figure, 20% being used. Classes 5, 6 and 7 are allowed a still higher rate of earning, 25% being used as a capitalization figure. Mines of sporadic or irregular output, depending chiefly on a high price of metal as to whether or not they are able to produce at a profit, are assigned to Class 8, and are allowed a capitalization figure of 33⅓ per cent.

For example, the assessed valuation of a mine in classes 1, 2 or 3, considering 15% as a capitalization figure and showing a true net production, is determined as follows:

True net for 1913	$ 3,000,000
True net for 1914	2,000,000
True net for 1915	1,900,000
True net for 1916	4,500,000
True net for 1917	7,500,000
Total true net for 5 years	$18,900,000
Average net for one year	3,780,000
Capitalized at 15%	25,200,000

The latter figure being the assessed valuation for taxation.

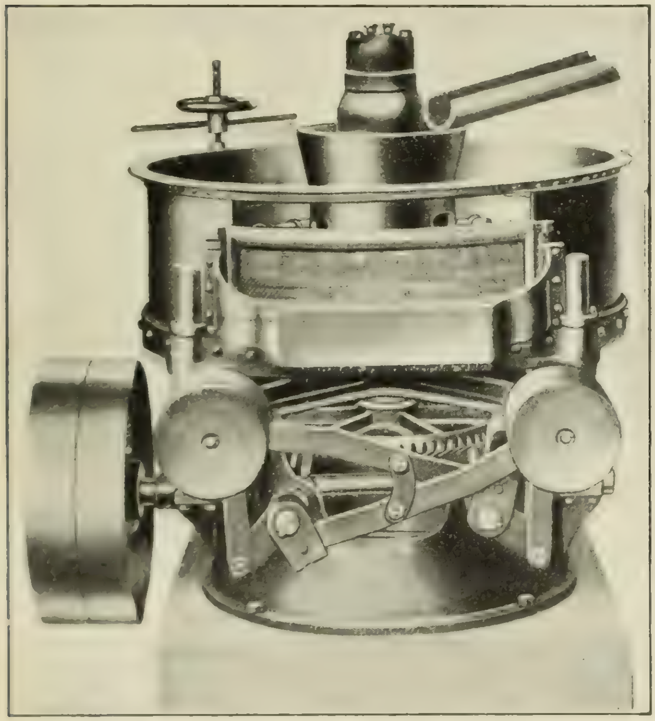
Non-producing mines are assessed nominally. The reduction in the valuation of the producing mines of the state for the last year, as compared to the year before, is due to the fact of higher cost of material and labor, lower average price of copper, and strikes during the summer of 1917. The tax commission has fixed the state tax levy at 53½c. on each $100 valuation, based upon a total net valuation of all property in the state of $697,000,000.

Data on Crushing and Cyaniding in a West African Mill

By PAUL T. BRUHL*

Details of equipment and practice at a Gold Coast Colony mill are given, relating largely to crushing and cyaniding. Abundant data are furnished as to results obtained and as to the labor cost and industrial practices developed by exceptional conditions and under abnormal disadvantages.

A FEW years ago the West Coast of Africa was known as the "White Man's Grave." Now, thanks to modern sanitary methods and to the improvement in the type of man going out to the colonies, it enjoys a pleasanter reputation, and though in no respect a health resort, it cannot, on the other hand, be regarded as a short-cut to eternity.



COBBE MIDDLETON PAN

Starting from England, the first port of call is Las Palmas, an important coaling station in the Canary Islands. It is a Spanish town of unimposing houses and untidy cobbled streets; of springless conveyances and picturesque country folk. There, too, one finds the ubiquitous British Indian trader, with his shawls and zodiac jewelry, his ebony elephants and silver filigree work from Orissa. An ancient cathedral stands in the heart of the town overlooking the sea.

At Freetown, the capital of the British colony of Sierra Leone, the traveler receives his introduction to the Dark Continent. Freetown is reputed by some to possess one of the most beautiful harbors in the world, but the reputation is not altogether deserved. A day's steaming along a monotonous coast line of mangrove swamps brings one to Monrovia, capital of Liberia.

At Sekondi an open roadstead, the passenger is literally dumped overboard in a "mammy-chair," and then, swaying to the rhythm of a chant, the canoe is driven shoreward. In the afternoon he takes the train up to the goldfields of Tarkwa and Prestea and further north to those of Ashanti. What truth there is in the statement I do not know, but I was told that the ballast on the railroad assays 50c. a ton in gold. The scenery is pretty, but there is a sameness to it that makes welcome a stoppage at any wayside station, where the hurried confusion and excited barking of a multitude of dogs create an animated if somewhat noisy diversion.

I purpose discussing the flow sheet of one of the mills as I saw it. In a recent paper published in the *Journal* a description was given of amalgamation and roaster practice at the Prestea Block A mill. These notes will be devoted largely, therefore, to the crushing and cyanide departments.

DETAILS OF MILL EQUIPMENT

The equipment of the battery consisted of 110 stamps of 1250 lb. each. Power was supplied from a central station and distributed among six 3-phase induction motors of 70 hp. each. The bin, with a storage capacity of 1500 tons, had a sloping bottom lined with $\frac{3}{16}$-in. plates. The ore was brought in by two aërial tramways in skips carrying a quarter ton. Feeders were of the Challenge type and were actuated by the outer tappet; the feed arm was on the cam floor and was connected with the friction plate by a 1-in. manila rope. False bottoms were placed in the mortar boxes to within 4 in. of the lip, thus making the die about 4 in. above the lip. A chuck block was used, replaced from time to time by a smaller one to compensate for the wear of the dies. The box was lined with ⅜-in or ¼-in. plate. The tappets and heads were of cast steel; the shoes and dies of Firth's special steel. The life of a shoe when dropping through 2½ in. 110 times a minute with a stamp duty of about 9, averaged 78 days; the die lasted from 10 to 20 days longer.

Two overhead crawls were provided, which made it possible to move a cam shaft and pulley, fitted for use, to any part of the mill. They were used also for changing or reversing stems. The belt tighteners first used were adjusted by rack and pinion, but later "jockey pulleys" were installed. This was an improvement, for they are not so hard on the belt. The battery launders measured 13 x 13 in., with a 10% fall; the main launder was 14 x 14 in., with a 6½% fall. Launders were lined on the floors with specially prepared concrete slabs and on the sides with old belting. No mortar blocks were used, the boxes standing on the concrete foundation with sheet lead, ⅜-in. rubber and tarred hessian in between. Eight 1⅜-in. bolts held the box in position; 1000 gal. of water was used per ton of ore crushed.

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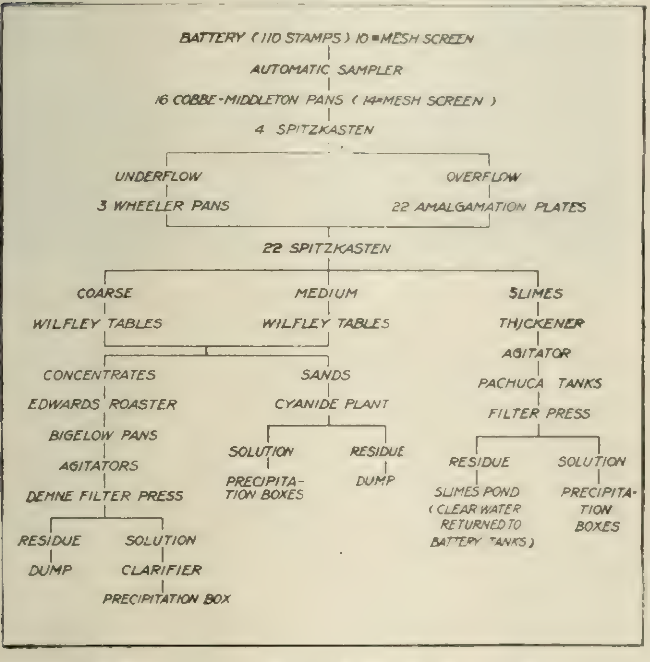
*Aurora, Nevada

The area of the screens was 46 x 18 in. and their average life 150 hours. The cam shaft was 8 ft. x 6 in. in diameter and weighed 750 lb., lasting 4 to 12 months. The order of drop was 1, 3, 5, 2, 4. The stems were 16 ft. long, 3¾ in. in diameter. Their weight was 555 lb. and their life six months to the first break. The weight of the shoes was 227 lb. and the life 75 days; the weight of the dies 167 lb. and the life 80 days, occasionally 110 days. From queen post to queen post was 13 ft. 6 in. by outside measurement; the space for the boxes was 5 ft. 1 in. Dimensions of the king post were 17 ft. 6 in. x 24 in. x 17½ in.; of the queen post, 17 ft. 6 in. x 24 in. x 11½ in. Ten-inch 6-ply Balata belting was used. There were three battery tanks, with a combined capacity of 120,000 gallons.

AMALGAMATING PANS CLEANED UP WEEKLY



FLOW SHEET AT A WEST AFRICAN MILL

The pulp from the battery was distributed between 15 Cobbe-Middleton pans, each of which was cleaned up about once a week, when the rich material which had become concentrated between the dies was fed, together with a few pounds of mercury, into the clean-up pan, which was itself cleaned up twice a month. The pans were arranged in two sets of eight, each set being driven by a 70 hp. motor. They did good work and required little attention so long as the feed was free from chips of wood. It is important that the feed be evenly distributed, as, obviously, the slightest overfeed to any pan will eventually lead to trouble and loss of time. Care should be taken also that the space between the shoulders of the dies and the pan side is not clogged with heavy sand. The weights keeping the dies up against the shoes were kept unaltered at the maximum. It is claimed for the pans that they do as efficient work whatever the condition of the shoes and dies; but I found that a new set invariably gave the pan a greater grinding capacity. Each pan was provided with a ¾-in. fresh-water service. If the pulp is kept thick, the pan is likely to choke; if too thin, there is an excessive swirl. The feed should not be allowed to splash over the yoke, as sand collecting on the muller plate may lead to trouble. The anti-friction rings should be kept well lubricated.

An average sizing test gave the following results: Pan feed: +30, 25.82%; +60, 22.27%; +90, 12.15%; +120, 4.95%; —120, 34.80%. Pan discharge: +30, 2.64%; +60, 34.37%; +90, 16.51%; +120, 6.19%; —120, 40.28%. It can be seen from the —120 figure that the pan did not slime much.

DETAILS OF PRACTICE IN CYANIDE DEPARTMENT

Eight 300-ton collectors received the sands from the Wilfley tables through Butters & Mein distributors, and, when full, were discharged by hand onto a belt conveyer feeding 18 cyanide tanks of 250-ton capacity. Three stock solutions were employed, namely: strong, running 0.25% KCN; medium, 0.15% KCN; and weak, 0.08% KCN. The requisite additions of cyanide were made to the strong sump. During the charging of a tank 250 lb. of lime was added and 100 lb. more used as a cover.

The treatment cycle, which required 5½ to 6½ days, was as follows:

1. Pump up first strong solution; leach until effluent has a cyanide content of 0.05%; shut cock for six hours; pump up enough to keep surface covered (about 90 tons of solution).
2. Open cock, drain dry; dig over surface as soon as dry enough to stand on; pump second strong solution; when leaching freely shut cock for six hours (about 70 tons of solution).
3. Open cock, drain as in (2); pump medium solution; shut cock for six hours (about 70 tons of solution).
4. Pump weak solution (about 175 tons of solution).
5. Pump as much water as possible.

GRAPHITE CAUSED PREMATURE PRECIPITATION

Trouble was experienced from graphite present in the sands. As dissolution of the gold and its premature precipitation take place simultaneously, it would seem preferable to omit any step which involves the closing of the leaching cock. A higher recovery would possibly have been made if a greater volume of solution had been drawn through the charge within the same time limits.

In making a clean-up, the following order was pursued: Shut off the solution, add 10 lb. of KCN to the head of the box and run a moderate stream of water through for two hours. The fine gold slimes were transferred to two Johnson presses by means of a suction pump. The long zinc was scrubbed in the clean-up tank; the short zinc and slimes below the screen in each compartment were carried to the acid tanks in buckets.

The short zinc was treated with sulphuric acid in the acid tank and steam-heated for two hours, the zinc being dissolved by the acid. This was followed by six or eight water washes. The contents of the tank were then transferred to the clean-up tank, whence they were passed through a Johnson press, the resultant cake being calcined and smelted.

The fine slimes were passed at once through the press, then calcined to reduce the bulk of material for smelting. They were then treated with acid and filter-pressed and the cake was calcined and smelted.

Following is a record of a clean-up taken at random:

First day—Box 1: eight 15-cu.ft. compartments, 62 lb. of zinc in each; box 2: eight 15-cu.ft. compartments, 57 lb. of zinc in each; box 3: eight 10-cu.ft. compartments, 40 lb. of zinc in each. One pound of lead acetate was used for every 80 lb. of fresh zinc. Sixteen carboys of acid were required.

Second day—Box 4: 14 cu.ft. per compartment, 60 lb. zinc per compartment; box 5: 11 cu.ft. per compartment, 42 lb. zinc in each; box 6: 11 cu.ft. per compartment, 42 lb. zinc in each. Seventeen carboys of acid were used, and for every 60 lb. of fresh zinc one pound of lead acetate was also used.

In smelting the precipitate, on the first day, 45 lb. of borax, 10 lb. of sand, 5 lb. of sodium bicarbonate, and 5 lb. of potassium permanganate were used to flux 82 lb. of gold slimes, from which 360 oz. of bullion, valued at $5250, was obtained. On the second day, 25 lb. of borax and 5 lb. each of sand, sodium bicarbonate and potassium permanganate were used for 44 lb. of gold slimes, yielding 117 oz. of bullion valued at $1600.

The results obtained from cyaniding raw and roasted concentrates are given in the following table:

TABLE I DATA ON CYANIDING CONCENTRATES

No. of Run	Strength of Solution, % KCN	Hours Agitated	Strength of Solution After Agitation, % KCN	Per Cent Solids	Heads	Tails	Per Cent. of Recovery
1	0 5	12	0 41	44	$40 80	$5 70	86 03
2	0 5	18	0 41	44	40 80	6 00	85 35
3	0 5	24	0.41	44	40.80	5.30	87 00
4	0 5	36	0 41	44	40 80	5 22	87 21
5	0 5	48	0.41	44	40 80	4.95	87 90
6	0 5	36	0 40	40	43 70	8 24	81 20
7	0 5	48	0 41	40	43 70	8 50	80 60
8	0 5	36	0.47	40	45 00	2.84	93 70
9	0 5	36	0 47	40	45 00	3 22	92 90
10	0 5	48	0 46	40	45 00	3.56	92 09

Runs No. 1 to 7, inclusive, were raw concentrates and No. 8 to 10 were roasted concentrates.

Experiments were also conducted on the slimes which flowed untreated to the dam. The thickened slimes were passed over a Deister table and the tailings cyanided. The table feed contained 30% dry slime. The heads were $2.04. The concentrates ran $46.74 and the tails $1.64. The ratio of concentration was 118 and the recovery 20.3 per cent.

The tails which were cyanided contained 16% dry slime and averaged $1.64. The strength of solution was 0.5% KCN. CaO used was 3 lb. per ton and the lead acetate was 0.5 lb. per ton. Agitation was continued eight hours. A 50% recovery was obtained, the tails running 82c. per ton.

Results of screen tests made in various departments of the mill are given in the following table:

TABLE II RESULTS OF SCREEN TESTS

Screen	Battery Screen Discharge	Pan Tails	Coarse Sand, Wilfley Table Feed	Fine Sand, Wilfley Table Feed	Sands as Cyanided	Slimes Sent to Dam	Screen
+30	25 82	2 64	8 10	0 07	7 95	0 25	+30
+60	22 27	14 57	49 83	2 17	45 07	1 05	+60
+90	2 15	[illegible]	16 69	14 00	21 55	1 00	+90
+120	4 95	6 19	5 33	11 23	6 31	0 65	+120
-120	[illegible]	46 28	17 05	72 47	19 06	96 90	-120

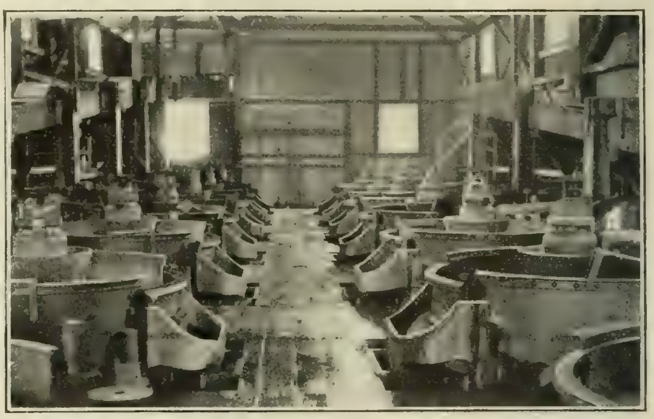
The samples of feed and mill products were taken in the following manner:

At the battery, a screen sample was taken hourly right across the screen with a slot scoop ½ in. wide, a separate sample being taken for each shift. In addition, a motor-driven automatic sampler cut the sample for the day from the main launder.

In the regrinding department, a heads sample for each shift was taken hourly with a slot scoop from the feed pipes to the pans. A shift sample of the tails was taken hourly with a slot scoop right across screens. Raw concentrates were sampled every morning, the samples being taken from boxes with a cheese sampler. The sample weighed about 15 lb. and represented 15 to 18 tons of concentrates.

A scoop sample was taken hourly of the roasted concentrates from the feed pipe to the grinding pan and represented the head value of the agitator charge plus what gold had been extracted by amalgamation in the pan. The sample extended over the time necessary to fill an agitator.

In sampling the roaster residues, a small piece about the size of a walnut was broken from each cake during the cleaning of the press. Each agitator contained enough for three to five press charges, depending on the consistency of the pulp. Each press residue was assayed separately and the results were averaged for each agitator.



COBBE-MIDDLETON PAN HOUSE, PRESTEA BLOCK A MILL, GOLD COAST COLONY, AFRICA

The roaster solutions were sampled from the press cocks during filling. A sample of the final drainings was also taken at the end of the water wash. Drip samples were taken from the head and discharge ends of the extractor box.

At the sands plant, a grab sample of the charge was taken from the conveyor belt during filling and weighed 120 lb., representing 220 to 240 tons. A sample was taken of the residue with a cheese sampler from each truck as it was run to the dump. The weight of the sample was 120 pounds.

A drip sample of the solutions was taken on each shift from the head and discharge ends of each extractor box. A sample was also taken of the last drainings from the final water wash of each charge. A sample of the slimes was taken hourly from the tails.

GOLD COAST NATIVE AND WHITE LABOR COSTS

Department	Number of Shifts	Monthly Cost
Crusher, bins and aerial tramway	894	$395
Battery	854	430
Regrinding	410	200
Amalgamation	271	135
Concentration	464	200
Roaster	832	340
Water supply	86	32
Clean-up	114	52
Discharging tanks	2,350	1,090
Transferring	1,162	485
Spare	226	135
Extractor house	414	180
Construction	1,251	435
Totals	9,328	$4,109

The cost of labor was not high. The figures in the preceding table represent the costs for a month chosen at random.

The white labor costs were on a scale approximately reflecting the situation of the mine and local conditions.

Position	Monthly Cost
Mill superintendent	$500
Mill foreman	350
Shift bosses (3)	600
Operators (18)	2,835
Assayer	200
Battery foreman	225
Amalgamation foreman	200
Machinist for regrinding department	175
Total	$5,085

A few years ago such white labor as could be obtained was not of a high order, but, more recently, a better class of man has been attracted, and the standard of efficiency has consequently been raised. Every operator was entitled to three months' vacation a year, transportation paid by the company, and a bonus of $150 paid six months after return to work. Salaried men were given half pay during vacations on the same conditions. Native labor was not uniformly good, but the exercise of a little tact and patience developed the more intelligent into useful millmen, especially in the battery.

Cœur d'Alene Mines in 1917

Production and net profits of Cœur d'Alene mines during 1917 are given in an accompanying table and have been compiled from sworn statements on file with the county assessor. Bunker Hill & Sullivan leads the production with an output for 1917 of 493,030 tons; the Morning mine, of the Federal Mining and Smelting Co., is second, with 469,079 tons; the Hecla is third, with 374,213 tons, and the Interstate-Callahan produced 161,455 tons during the year. In 1916, these four mines maintained the same relative position in the rank of producers in the Cœur d'Alene district, Bunker Hill & Sullivan producing 475,784 tons.

PRODUCTION AND NET PROFITS OF COEUR D'ALENE MINES FOR 1917

Mines	Tons Extracted	Gross Value	Extraction Cost	Freight and Treatment	Betterments and Repairs	Net Profits
Caledonia	38,557	$1,849,254 94	$137,110 84	$484,988 63		$1,227,155 47
Federal (Wardner)	147,347	626,685 92	401,344 23	170,457 30		54,884 39
Federal (Morning)	469,079	4,620,344 96	1,668,771 63	1,463,366 68	$168,247 76	1,319,962 89
Federal (Mace)	55,806	708,563 85	325,372 39	154,363 55		228,827 91
Federal (Frisco)	1,260	62,480.03	36,106.69	19,649 89		6,723 45
Black Hawk	15,600	117,125.62	66,947.79	46,304.67	....	3,873 16
Federal (Burke)	5,271	35,023 71	18,535 85	9,739 43		6,748 43
Wyoming	127	854.06	601.50	237.44	......	15 12
Gold Hunter	116,562	994,407.83	525,493.89	293,202 40	44,892 98	130,812 56
Hercules	108,052	9,880,978 63	2,140,052 96	3,765,024 76	285,500 39	3,690,400 52
Ontario	1,201	32,811 06	16,974 09	8,200 00		7,636 96
Sierra Nevada		2,120 45			6,101 85	
Tamarack	16,916	1,338,321 99	518,799 46	441,019 60	27,645 12	350,857 81
Anaconda (Douglas)	7,799	346,717 70	179,286 16	143,594 60		23,476 94
Hecla	374,213	4,462,030 69	1,506,639 09	798,165 33	262,160 82	1,895,065 45
Success	57,297	350,105 04	335,552 70	116,643 20		(a) 102,090 86
Interstate-Callahan	161,455	3,250,835 42	1,080,697 43	747,375 23	188,699 21	1,234,063 55
Green Hill-Cleveland	18,012	1,341,331.45	654,856.37	290,311 58	258,840 72(b)	137,322.78
Bunker Hill & Sullivan	493,030	9,584,963.40	1,473,479 52	4,641,181 03	1,056,618 87	(c) 2,447,285 86
National	13,374	72,741.54	41,835 30	15,719.85	50,000 00	
Totals	2,100,958	$39,677,698 29	$11,128,457 89	$13,409,545 17	$2,348,707 72	$12,765,113 25

(a) Net loss. (b) Paid Federal Company. (c) Includes $33,601 88 royalties.

Radium in Chihuahua

Unofficial notices appearing in the newspapers of Mexico City, according to a recent consular report from there, announce that there has just been organized in the Mexican capital a company for the exploitation of mines in the State of Chihuahua in which traces of radium have recently been discovered. The company, according to these accounts, will operate with a capital approximating 1,000,000 pesos and will start its work of exploration immediately.

Gold Producers of the British Empire To Meet

London cables to the *New York Times* announce a meeting to be held soon of the chief representatives of gold producers of the British Empire, the purpose of which is to formulate and submit their case with regard to the value received for their product from the government. Sir Lionel Phillips, of the Wernher Beit interests, who has been identified with the gold industry in the Transvaal for many years, has called attention to the reduction of gold production, which he ascribes to the fact that freedom is not allowed the mines in fixing the price for their product.

Seek To Make Britain Independent of German Raw Materials

Resolutions were recently adopted at the Imperial War Conference in London, states the *New York Times*. They aim to free the empire from dependence upon German-controlled organizations, to promote measures necessary to obtain for the empire and its allies the command of certain essential raw material to enable them to repair the effects of the war as soon as possible and to safeguard their industrial requirements, and the appointment of a committee to consider possible methods by which these essential raw materials might be obtained.

The conference expressed the opinion that the governments of the British Empire should make such arrangements among themselves as would insure that essential raw materials produced within the empire should be available for utilization within the empire and within allied countries.

Germany's inability to procure raw materials has led to the closing down of a great number of her industries. Returns published in the German press show that only 70 out of 1700 spinning and weaving mills are now able to keep open; that only 2500 out of 45,000 silk looms are in operation; that only 15 out of 720 plants in the oil industry can do business, and that one-half of the boot and shoe factories of the empire are closed.

Before the war Germany imported £250,000,000 worth of raw materials to keep her trade going.

Flint Pebbles exported from Denmark to the United States decreased in value from $168,336 for 1916 to $115,435 for 1917, according to certified American invoices.

The Survey Office on the Rand

BY E. M. WESTON

Control of stoping operations is a vital factor in the efficient operation of a mine. The present article deals with the work of the mine surveyor in gathering, systematizing and interpreting the data required for the determination of the stoping limits of orebodies in the larger South African gold mines and presents the formula used.

THE important work of the Rand survey office, in conjunction with the sampling department, usually under the direct charge of the chief surveyor, is in controlling stoping operations and the grade of ore sent to the mill, and in deciding on the payability of doubtful blocks of reef which have been developed or are being stoped. The efficiency of tramming and shoveling work is indicated by the figures that the surveyors gather. The return of development footage, shaft sinking and excavations for sumps and stations is shown in the accompanying Form A, and the items are grouped under the various shafts, reefs, and levels, and into raises, cuts, winzes and drifts, together with the values of the reef encountered in development. Data are thus obtained for the calculation of the ore developed during the month. Toward the end of the month all stopes are measured up, and where a sufficient number of surveyors are unavailable the sampling staff assists.

DETAIL OF OPERATIONS SYSTEMATICALLY RECORDED

The orebodies being, as a rule, tabular and of a fairly regular width, the methods used show no departure from those usually employed. The stope widths given by the samplers are checked by the surveyors, and any discrepancies investigated. As soon as the fathomages broken in the various stopes have been calculated, these returns are forwarded to the shaft clerk, who has details of all costs incurred in each stope, except timber, and he prepares a cost sheet such as Form B, which gives all of the necessary details of the cost of each stope, and, in

South African G. M. Co. (Form A)

Shaft No.................. **Development Return for Month of**...191....

WORKING PLACE	H.L. R.D.	From	To	Total	Feet on Reef	Reef Width	Reef Value	Inch Dwt.	Backs	Stope Width	ACTUAL TONS DEVELOPED						
											4 dwt. & over		Under 4 dwt.		Total		Reef Channel.
											Tons.	Val.	Tons.	Val.	Tons.	Val.	
TOTALS AND AVERAGES																	

Total Development Footage..........................
Capital Account Footage..........................
Prospecting Account Footage..........................

Total Tons Developed..................................
Total Tons Mined..................................
Main Shaft Depth..................................
Aux. Shaft Depth..................................

.................................*Mine Surveyor.* ....*Manager.*

Cost (Form B)

Gang's Name	Stope No.	Width	Fathoms Broken	Tons Broken	Native Shifts per Fathom	European Wages per Fathom	Native Wages per Fathom	Compound Charge per Fathom	Explosives per Fathom	Caps, Fuse, Candles, etc., per Fathom	Drill Sharpening	Total Cost per Fathom and per Ton

NOTE Prepared by shaft clerk from records he keeps of stores issued to various gangs and from records of native shifts worked obtained from the time office at (Compound) and from record of European shifts and pay rates obtained from the "white" time office. Fathomages and tonnages are furnished by surveyor. For machine stopes the additional items of cost of (air hoses and machine repairs) (machine steel) and compressed air per fathom and per ton are added.

Shaft No................. **Efficiency Return for Month of** .... 191....(Form C)

	STOPING	PROSPECTING	DEVELOPMENT	CAPTL. ACCT.	TOTAL
Total inches drilled by Hammer Boys. (As per Compound Returns.)					
Total Hammer Boy Shifts. (As per Compound Returns.)		—	—	—	
Average inches per Hammer Boy per shift.		—	—	—	
Total Tons broken by Hammer Boys. (As per Surveyor's Measurements).					
Tons broken per Hammer Boy per shift. (As per Shaft Clerk's Returns. Deduct total shifts on reclamation.)		—	—	—	
Average Number of Hammer Boys per shift.					
Total Number of Machine shifts.					
Average Number of Machines per shift.					
Total Tons broken by Machines. (Surveyor's Measurements.)					
Tons broken per Machine per shift. (As per Shaft Clerk's Returns.)		—	—	—	
Total lb. of Explosives used Hand Labor.					
Lb. of Explosives used per ton broken by Hand Labor. (Manager's Tonnage, equals tons milled less tons from development.)		—	—	—	
Lb. per linear foot Hand Labor. (Estimated at 4 lb. per ft.)	—				
Total lb. of Explosives used by Rock Drills.					
Lb. of Explosives used per ton broken by Rock Drills. (Surveyor's Measurement Tonnage.)		—	—	—	
Lb. per linear foot Rock Drills.	—				
Total Tons trammed.	—	—	—	—	
Total tramming shifts.	—	—	—	—	
Average Number of Boys tramming. (From Compound Returns of Shifts Worked	—	—	—	—	
Tons trammed per boy per shift.	—	—	—	—	
Total					

Mine Surveyor. ....*Manager.*

OPERATING CHARTS USED IN RAND MINES

addition, the cost per fathom. From the timekeeper's office of the native compound, returns are obtained showing the total number of natives employed and the total shifts worked under various heads; also the total inches drilled and any other cost items of native and European labor.

The white-labor timekeeping is, however, kept separate and in a different department from the native. Truck tallies are kept by the shaft clerk for each stope and level, and these are available as a check and for comparison with the surveyor's figures, and, where reclamation work is going on, they are the only means of estimating the tonnage drawn from places which cannot be measured up. Form C records the monthly summary of labor and materials used in mining.

SQUARE FATHOM MEASUREMENT UNIT

The square fathom is the unit of measurement, and, for purposes of checking the accuracy of the returns made out, the surveyor uses the following interesting formulas, which I do not remember having seen in print before: Twelve cu.ft. of unbroken reef in place are taken as the weight of one ton of 2000 lb.; one fathom = 36 sq.ft.; stoping widths are measured in inches and are designated *SW*; *F* is the fathomage broken. The cubic footage in one fathom equals, $\frac{36 \times SW}{12}$ the tonnage in one fathom equals, $36 \times \frac{SW}{12} \times \frac{1}{12}$ or, $\frac{SW}{4}$; $SW \times \frac{F}{4}$ equals tonnage; or *SW* equals tonnage divided by one-fourth of the fathomage. Averages are computed as follows: $SW \times$ Assay Value in dwt. = inch dwt. Inch dwt. $= \frac{\text{tons} \times \text{assay value}}{\frac{F}{4}} =$ gold contents of fathomage broken.

SOURCES OF MILL ORE SUPPLY

The ore supply of the mill may be taken from the following sources: (1) From payable ore extracted by stoping from blocks of ore developed and classified in the ore reserves as payable ore; (2) from blocks classed in the ore reserves as unpayable; (3) from isolated blocks of payable ore which are not developed sufficiently to be added to the ore reserves, but which are developed and removed at the same time by stoping—the more faulted the orebody or the more erratic the ore occurrences, the greater is the amount of such ore that is sent to the mill; (4) from what is known as reclamation work, that is, ore gained by the robbing of old stopes and levels. Pillars and patches of blocks of ore overlooked or formerly neglected as unpayable in the foot or hanging wall over stope fillings furnish the bulk of this ore. Ore broken in development faces and of sufficient value to send to the mill instead of to the waste dump is classified in the fifth group.

Much has been written on the subject of the limit of payability of ore. G. A. Denny recently presented a comprehensive discussion of the subject in a paper read before the S. A. Institute of Engineers. The surveyor on a Rand mine, in considering first the blocks that shall be included in developed-ore reserves, is governed largely by his knowledge of the gold occurrence in the particular mine or section of a mine which is under consideration. In a mine where nearly all the reef is consistently payable, a block of ground may be considered developed even though it is exposed only by a drive, the other boundaries being faults or dikes of known direction in respect to dip and strike. A block of this kind might also be developed by a single raise. In both cases only one face is available for sampling.

In the East Rand, where the payable ore occurs in large semi-oval patches or shoots, a block of ground cut only by two levels, 500 ft. apart on the dip, might be included in the developed-ore reserves and valued. In other mines no ore more than 50 ft. above a level could be safely included, and the block might require exposure on three sides for a proper valuation. Generally speaking, in including ore as developed, great importance is attached to the fact that a drive has been put in under it. The practice of including and valuing any ore exposed only by drives on top and by winzes is avoided. The sampling value and the stope-width of the block under consideration are next taken up. If there is a measured stope-width already determined this may be adopted. The reef channel-width, with an allowance of 12 in. of foot or hanging wall, may be adopted, or the presence of a well-defined foot wall or hanging wall, or both, may indicate a probable width.

In practice, the stoping-width to be taken may also depend on whether native labor is scarce or plentiful. Where labor is scarce, small reefs may be stoped with machine drills, which involves breaking out wider stopes and lowering the value of the ore, in spite of extra sorting. The value of a block depends on the value of the milling tonnage which it contains. The milling tonnage is the block tonnage within certain stope-widths, less the weight of the waste sorted out below and packed in the mine and the waste removed at the mill. A common figure is to take 30% of the waste broken as sorted out. Some groups of mines at one time gave the ore reserves in mill tons and values, and others in stope tons and values.

ASSAY FACTOR AND GOLD LOSSES

The assay factor to be applied in reducing the assay value of the block varies in different mines. It is found for any mine by comparing the total gold called for by the assay over a given period with the total mill returns of gold actually recovered. The assay factor varies from 75 to 90% or over. It greatly depends on the manner in which the reduction of high assays is handled. On a rich mine, high assays are usually drastically reduced. Gold is lost in fines in the cracks in the footwall or during blasting by being lodged in packs and inaccessible parts of the stopes as dust and broken ore; or in the sorting underground or on the surface. It is also sometimes lost in the sludge cleaned from the tracks and carelessly thrown down into old stopes. Loss takes place in the casings of rich leaders left in the foot or hanging wall, and also in the residues, dust and spillage during transfer.

On the Rand it is now not usual to use the term milling tons in calculating ore reserves, and blocks are not dealt with individually in regard to the sorting possibilities when including or excluding them from the developed pay-ore reserves. For example, assume the pay limit to be $5 per ton and that a block showed a value of $4 over 60 in. This block would be excluded, although it might be known that there were two 9-in. leaders with a clean foot and hanging wall, and 3 ft. of waste parting between that would allow a large sorting factor and give a payable grade of ore. This block would, however, be mined, and hence the necessity of Division 2, ore drawn from blocks classified as unpayable. In addition, a lowering of working costs or the discovery of richer leaders in the foot or hanging or a local enrichment might change the conditions sufficiently to warrant extraction. In taking out fathomages, stoped ore in pillars is deducted, as it appears under reclamation at a later stage.

The pay limit of ore in reserves is usually taken as the average working cost of the mine for the half yearly or yearly period under review. Strictly speaking, this limit is too low, as such ore would leave no profit on being worked if called upon to bear all working charges, but, on the other hand, money has already been spent in developing it, and to recover this money it must be worked. The capital cost incurred to develop it should also be charged against it. It has happened that companies have shown a low working cost and an increased profit for a time by charging capital expenditures not justified by the amount of payable ore ultimately worked.

Tonnage Return for the Month of ________________ 191 (form D)

Ore Mined by Stoping Excluding Reclamation	Fms.	STOPING VALUES									BLOCK VALUES								
		Reef		Channel		Stoping			Inch Dwt.	Tons Dwt.	Reef		Channel		Stoping			Inch	Tons
		W.	Tons	W.	Tons	W.	V.	Tons			W.	Tons	W.	Tons	W.	V.	Tons	Dwt.	Dwt.
1 Pay ore from pay ore reserves	904.0	16.3	3,694	17.8	4,022	48.1	9.0	10,889	433	97,873					45.1	9.7	10,191	438	99,177
2 Unpay ore from pay ore reserves	69.5	17.6	305	17.6	305	52.9	4.8	919	254	4,427					48.0	8.5	834	409	7,112
3 TOTAL ORE FROM PAY ORE RESERVES	973.5	16.4	3,999	17.8	4,527	48.5	8.7	11,799	422	102,300					45.3	9.6	11,025	435	106,289
4 Pay ore not from pay ore reserves	76.5	19.7	377	20.2	386	47.5	7.7	909	364	6,969					48	4.1	918	194	3,715
5 Unpay ore not from pay ore reserves	111.1	16.1	446	19.0	529	44.9	3.8	1,248	170	4,709					44.2	3.7	1,288	165	4,577
6 TOTAL FROM STOPES	1,161.1	16.6	4,822	18.1	5,242	48.1	8.16	13,956	392	113,978					55	8.7	13,171	394	114,581

Analysis of Ore Milled

Tonnage broken in stopes				13,956	tons at 8.2 dwt.
Tonnage added to or taken from broken ore reserve in mine					tons at dwt.
				13,956	
Tonnage from reclamation	3.5 dwt. and over	534	tons at 4.2 dwt.		
	under dwt.		tons at dwt.	534	tons at 4.2 dwt.
Tonnage from development	3.5 dwt. and over	2,052	tons at 4.4 dwt.		
	under dwt. (incl. waste)	2,958	tons at 0.0 dwt.	5,010	tons at 1.8 dwt.
TOTAL TONNAGE HANDLED IN MINE				19,500	tons at 6.4 dwt.
Less development rock hoisted and sent direct to dump			tons		(Surface Foreman's tallies)
Less waste rock hoisted and sent direct to dump			tons		
Less waste rock from stopes and development packed in mine		1,758	tons	1,758	tons at 0.0 dwt.
Ore sent from mine to crusher station				17,742	tons at 7.0 dwt.
Ore taken from surface dump					tons at dwt.
TOTAL ORE RECEIVED AT CRUSHER STATION				17,742	tons at 7.0 dwt.
Less waste sorted at crusher station (%)					tons at dwt.
ORE TO MILL BINS					tons at dwt.
Plus or minus tonnage not accounted for				+ 1,841	tons at 0.0 dwt.
ORE MILLED (Manager's monthly report)				19,583	tons at 5.306 dwt. (mill yield + pulp.)
					6.38 dwt. (mine valuation.)

Fms. - fathoms; W - width in inches; V - value in dwt. .... Manager .... Surveyor

FORMS FOR RECORDING MONTHLY TONNAGE RETURN AND ANALYSIS OF ORE MILLED

"Unpayable" ore may be worked from unpayable blocks and sent to the mill in order to test a block of ground further before condemning it, to make known payable ore more available for extraction, or, owing to unusually favorable working conditions, it may be judged to yield a profit after a consideration of the cost of breaking per fathom and the amount of sorting possible. Whether this is correct or not may be determined by studying the shaft clerk's list of the stopes worked and the detailed costs per fathom and per ton for the month. The grade of reclamation ore that can be worked profitably must be largely a matter of judgment. In some of the old outcrop mines of the Rand, all reclamation ore drawn from collapsed upper workings is sent to the mill if it has a value of $2 per ton.

The question as to what is the lowest value of development rock that it pays to send to the mill is a complex one. It depends largely on the crushing capacity in relation to the available ore supply. If there is an excess of stamping power, the cost of crushing an extra thousand or more tons of development rock per month is negligible, as it is practically only the cost of the wear and tear in the mill and a little cyanide and supplies. Unless there is a convenient dumping area for waste in the empty stopes, rock broken in development, whether milled or not, will be charged with certain expense items. The cost of breaking need not be considered, as it must be broken to develop other ore. The rock must be shoveled and trammed to the shaft and hoisted, and when it reaches the surface ready to be dumped into the ore or waste bin it has cost from 25 to 50c. per ton to get it there. If it is sent to the mill which would otherwise be idle it costs little to mill it, and so, if it returns gold to the value of more than the actual cost of treatment, it should show no loss. On the other hand, if it would displace in the mill ore that will yield a low profit per ton, it should be placed upon a separate surface dump, to be milled at a time when the production from the mine falls off. Usually, however, such ore goes either to the mill or the waste dump. The mining records prevent the milling of development rock of too low a value. At the higher grade older mines, nearly all of the so-called waste dumps have been found to be worth milling. Old dumps of 220,000 tons of a value of $3 per ton were recently milled at the Robinson mine.

To return to a consideration of the various forms that require the attention of the surveyor, it will be seen that he obtains the data necessary from his own measurements, from the sampling department, from the shaft clerk and from the timekeeper's office. Space does not permit of presenting all of the forms, and Form D, the monthly tonnage return, is the only general form given. In Form D there are shown figures for a section of a mine for a month, and it is obvious that the consulting engineer, by inspecting them, can judge whether the mine is being fairly worked in regard to its ore reserves or whether or not waste and low-grade rock that should not be hoisted are being milled. On other forms, not shown, more detailed figures for the diffierent blocks in a section are given. These enable the engineer to determine stope and pay limits.

In the system most in use, the ore broken in any stope for the month is given a value based only on the value of the stope sampling for that month. A much better method would be to take the mean of the last two samplings and thus assure a fairer valuation for any one month. At present, if a local enrichment is present in a stope face at the time of sampling, which may be toward the end of the month and when the enrichment has just been entered, a false value is given. The usually allowed margin of 10% either way is thus exceeded.

The surveyor is made responsible by the government for seeing that workings approaching winzes or old workings filled with water are extended with due regard to safety, and in cases where permission is given to undermine government railways or other public lands, he is required to submit plans at short intervals showing the progress of the work.

NATIVE ASSISTANTS AND COMPENSATION

Surveyors work with the aid of two or three intelligent natives, and they have to train them and see that no errors arise through their ignorance. As a rule, the native soon becomes expert in his duties and causes few errors. Owing to the war, surveyors are now scarce, since most of the younger members are in active service. A surveyor in charge of a shaft earns $200 to $225 per month, and an uncertificated assistant from $100 to $110 per month. They gain an intimate knowledge of all parts of the mine, and this knowledge often leads to their promotion. In all cases when contracts are let to miners, the surveyor is responsible by law for the correctness of measurements and is required to furnish the miners with plans on paper marked with fathom squares.

Increased Export Duties in Peru

The export duties on the most important Peruvian products have been modified by a law of Mar. 20, 1918, in such a manner as to increase greatly the duties payable under present conditions, according to *Commerce Reports*. Silver, copper, gold, vanadium, tungsten, and molybdenum are among the principal products affected. The distinguishing feature of the new law is the combination of specific and *ad valorem* rates of duty. With few exceptions, no export duty is imposed until the market quotations of the various articles reach the levels specified in the law itself. Beginning at that point, the specific rates provided for are applied, with an addition of 10% of the excess of the actual market quotations above the minimum prices fixed in the law. In consideration of the abnormal prices of most of these articles at this time, the *ad valorem* part of the duty is often greatly in excess of the specific. For example, although the specific duty on copper bars is only $1.25 per short ton, at the price of 23½c. per lb. for copper, the total export duty would amount to $22.25 per ton. The former duties were also partly on a sliding scale, varying according to the price of the articles, but the total resulting duties were generally much lower.

The form of the present duties will necessitate the periodical publication of prevailing prices, such as has been done heretofore, and the duties actually payable will be dependent upon the current official valuations. Estimated total rates quoted herein are based upon the quotations given in the *Boletin de las Aduanas del Peru* of Jan. 31, 1918.

The new export duty on metallic silver in any form is fixed at 1s. per kilo, plus 10% of the difference by which the current price for silver of standard fineness exceeds the fixed price of 24.5d. per troy oz. The resulting duty would, therefore, be 6s. 3d. per kilo, whereas the former duty was 5s. 2d. For silver in the form of sulphides or precipitates, the duty is one-fourth of that applicable to metallic silver under the same conditions.

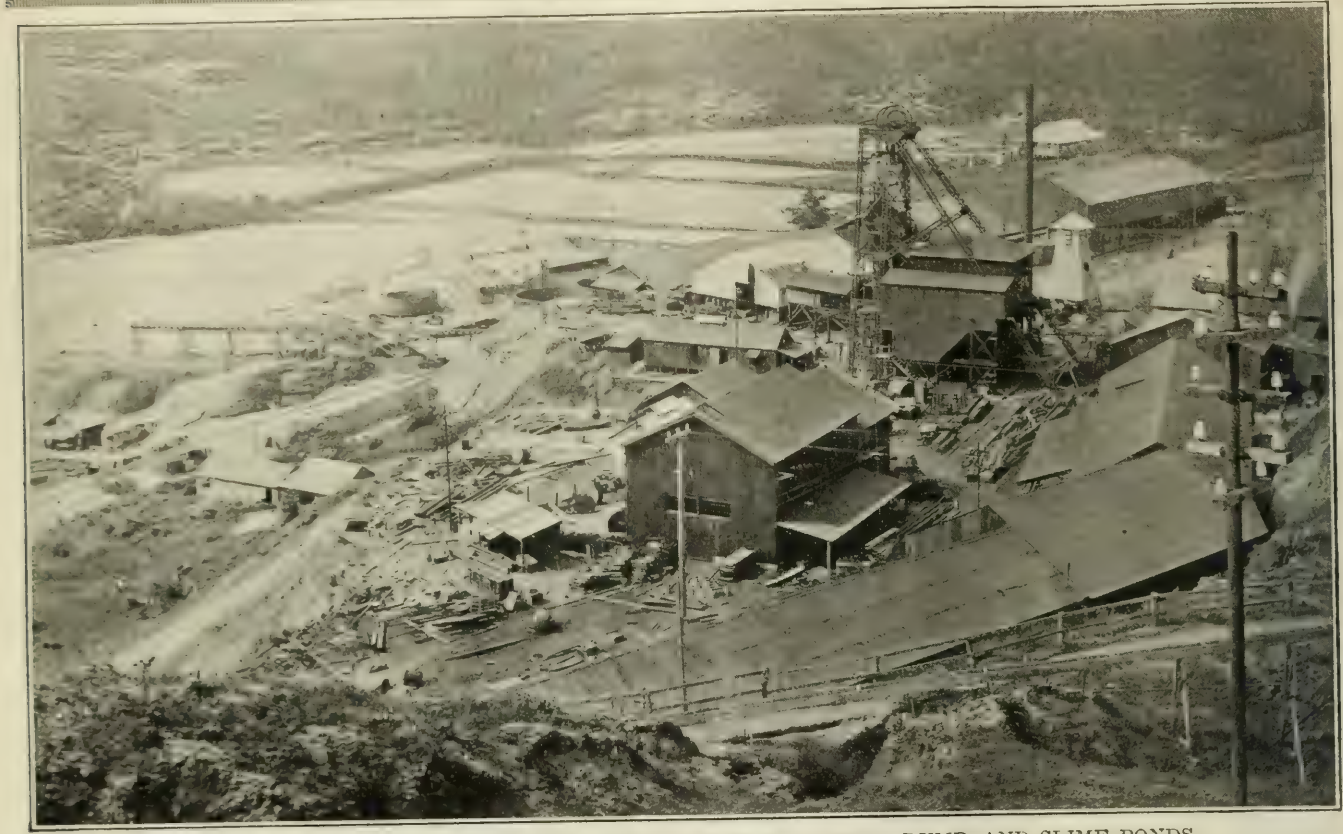
The basis for the collection of the export duty on copper bars is entirely changed, and the rate is now $1.25 per ton of 2000 lb., plus 10% of the excess of the current price, according to New York quotations, over the minimum valuation of $0.13 per lb. The duty was formerly computed in shillings per long ton, based on London quotations, and the substitution of the fixed price for copper prevailing in the United States for the variable price of the London market may result in a slight decrease from former rates. As heretofore, smelter products containing 80 to 90% of copper are dutiable as copper bars; those containing 60 to 80% of copper are subject to 50% of the duties on copper bars, and those with less than 60% at 40% of the respective rates.

The duty on the gold content of copper bars and smelter products in excess of 6 grams to the ton is increased from £2 to £10 per kilo, but a refund of the duties will be granted upon the importation of an equivalent amount of gold bullion or coin. The silver content of these products in excess of 2 kilos per ton is subject to the same duties as silver alone, as is also lead containing silver in excess of 2 kilos per ton.

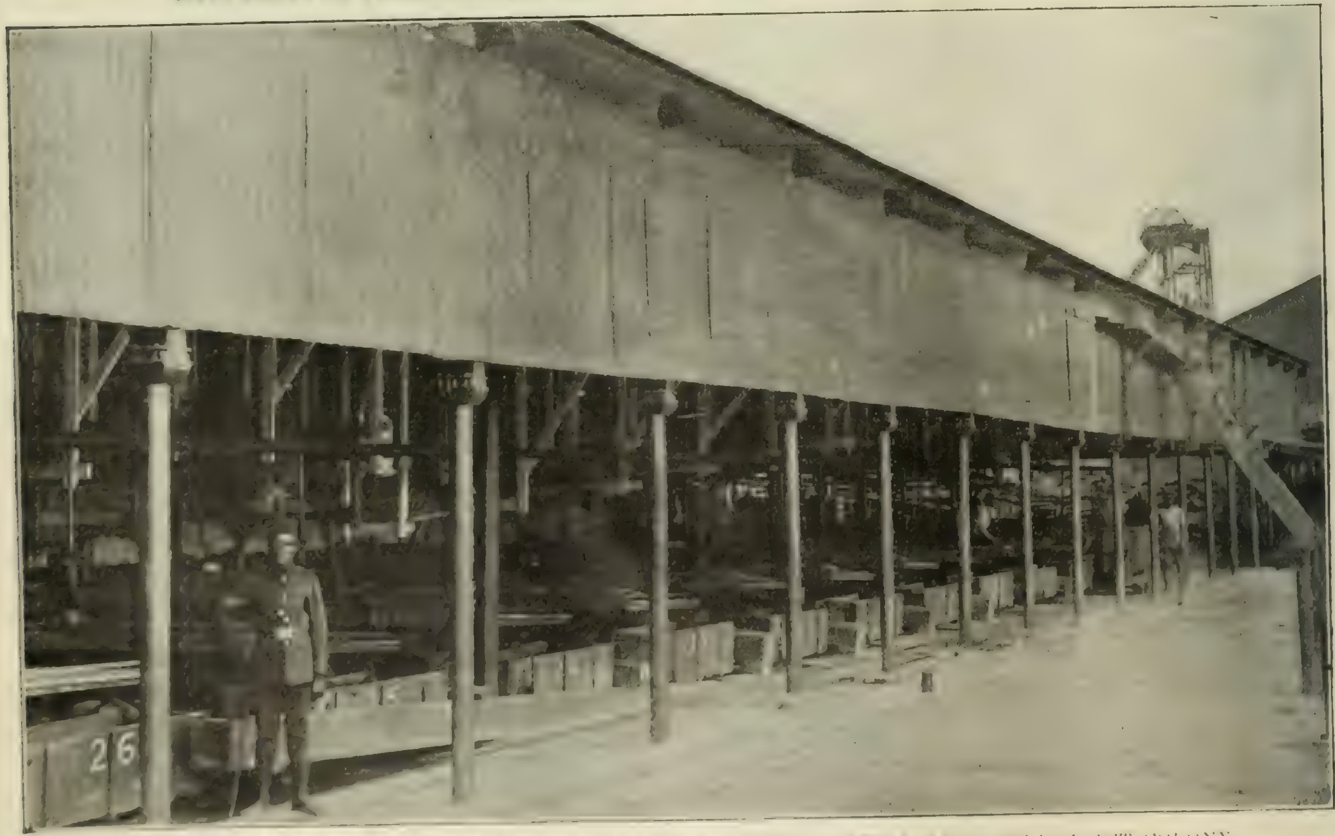
Vanadium ores and concentrates are dutiable at £1 per metric ton, when the vanadic-acid content is from 18 to 20%, with an increase of 10s. per ton for each additional 5 units of content above 20%. For tungsten, the rate is £1 per metric ton when the price in New York is not less than $20 per unit. The excess value of the exported product is subject to a tax of 10%, based upon an assumed content of 50% of tungsten. Molybdenum ores and concentrates are dutiable at £2 per ton without qualification or surcharge. Formerly the duty on all of these ores and concentrates was fixed at £1 per ton without regard to value.

Graphalloy, a new anti-friction alloy, is made by impregnating graphite with molten metal (babbitt or copper) under great pressure. It is self-lubricant, a good conductor of electricity, and useful for sliding contacts.

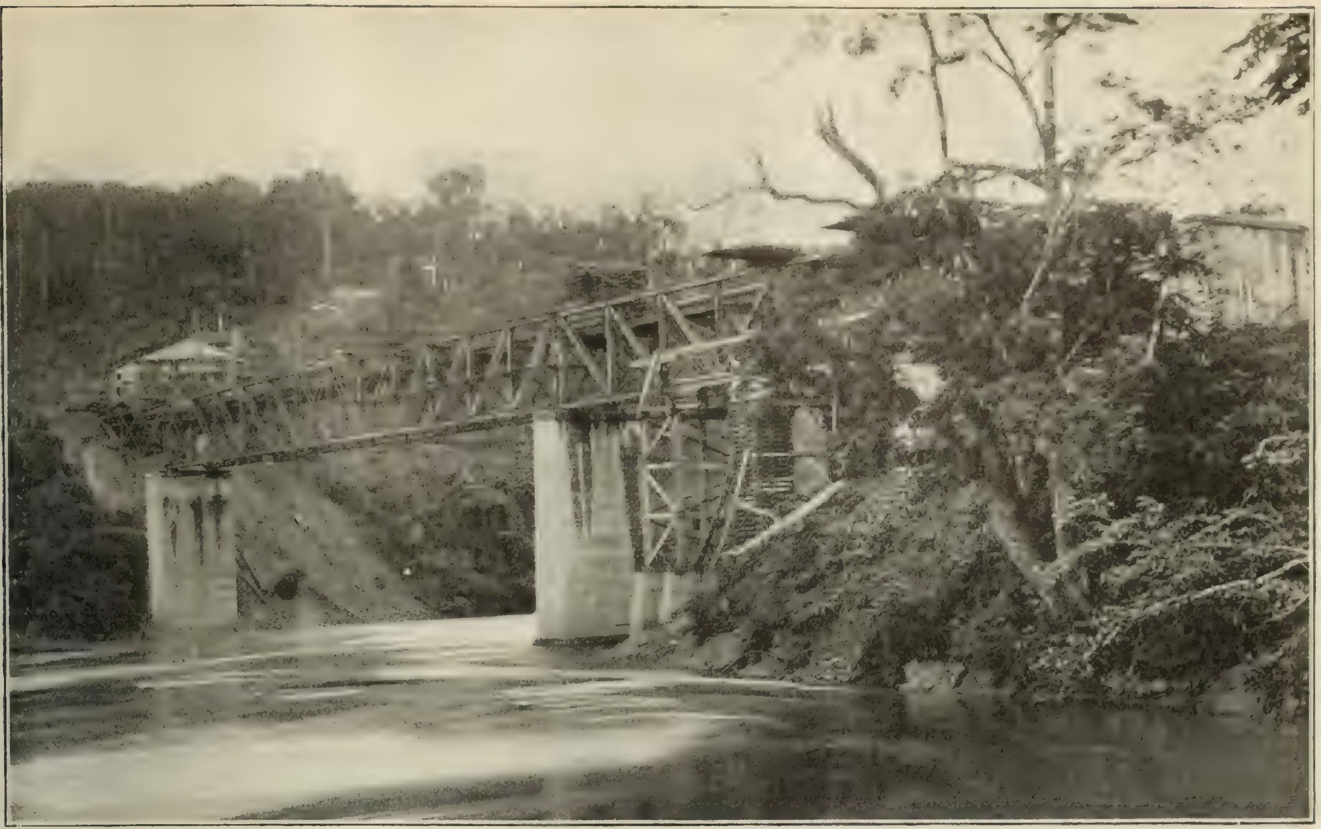
Views From Gold Coast Colony, Africa



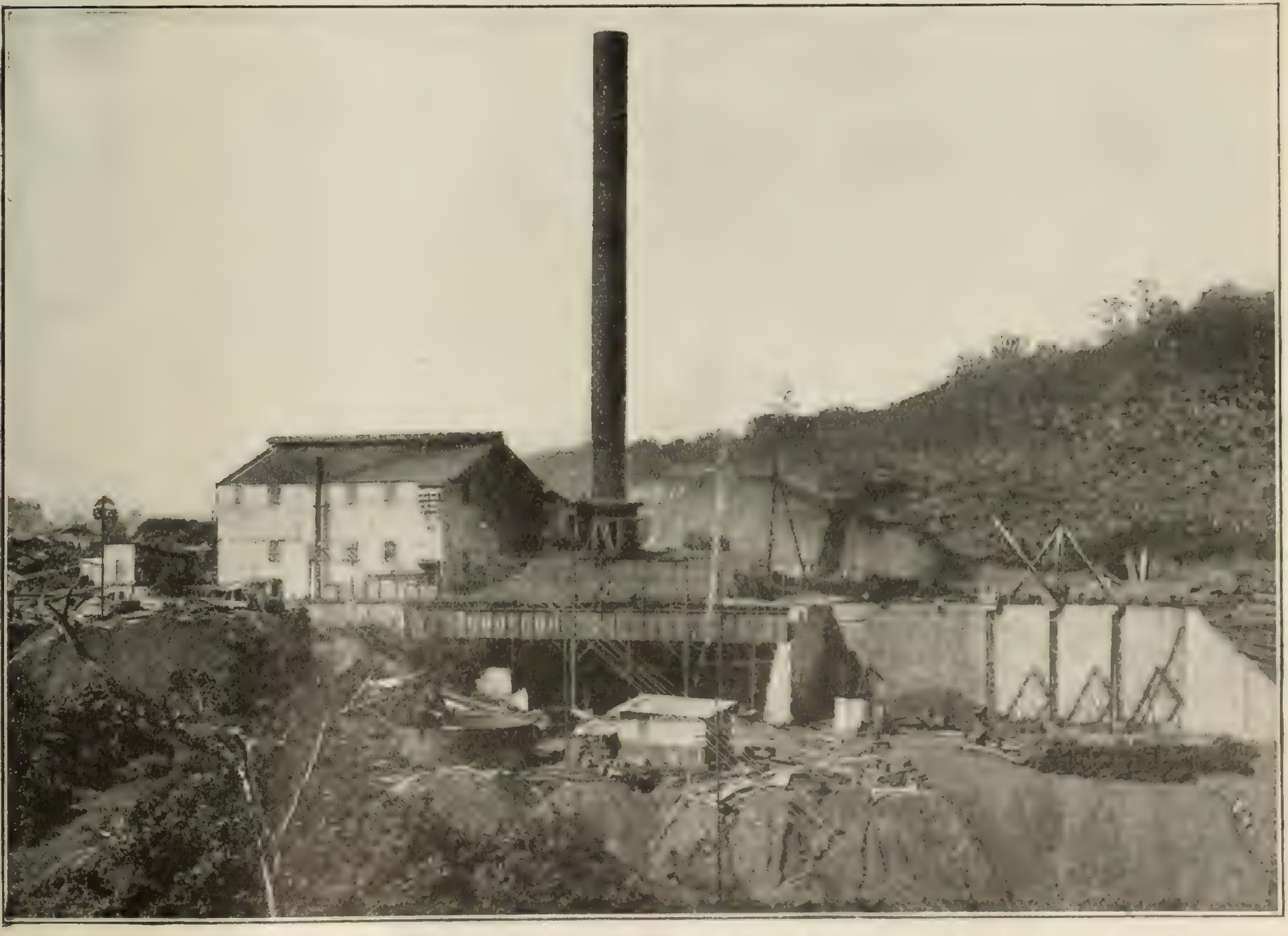
MAIN SHAFT OF PRESTEA BLOCK A, LTD., SHOWING ROASTER, DUMP, AND SLIME PONDS



WILFLEY TABLES AT CONCENTRATION PLANT OF PRESTEA BLOCK A, LTD., GOLD COAST COLONY



BRIDGE ACROSS AUKOBRA RIVER, NEAR PRESTEA BLOCK A, LTD., GOLD COAST COLONY



ELECTRIC GENERATING STATION OF PRESTEA BLOCK A, LTD., GOLD COAST COLONY

Jim Butler Tonopah Loses Appeal

THE U. S. Supreme Court has affirmed the judgment of the Nevada Supreme Court in favor of the West End Consolidated Co., of Tonopah, Nev., in the case of Jim Butler Tonopah Mining Co. *vs.* West End Consolidated Mining Co. The opinion of the Court was delivered on June 10 by Justice Van Devanter as follows:

This is a suit by the owner of two lode-mining claims—the Eureka and the Curtis—to enjoin the owner of an adjoining lode claim—the West End—from exercising an asserted extralateral right in respect of a vein extending beneath the surface from the latter claim into the others. All the claims are patented and their ownership is conceded. The Eureka adjoins the West End on the south and the Curtis lies immediately south of the Eureka. The state courts, both trial and appellate, upheld the defendant's asserted right to follow the vein extralaterally, 39 Nev. 375, and the plaintiff seeks a reversal of that decision on the theory that it is in contravention of the mining laws of Congress, in that (a) the end lines of the West End claim are not parallel and straight, and therefore an essential element of the right to follow the vein extralaterally is wanting; (b) this right can be exercised only in one direction, that is, beyond one side line, not both, and as the discovery vein* dips to the north the right can be exercised only in that direction; and (c) the facts specially found do not show that the top or apex of the vein is within the vertical limits of the West End claim.

For present purposes the West End claim may be described as having the form of a parallelogram 1500 ft. in length from east to west and 600 ft. in width from north to south, but with a small portion of the northeast corner cut off by a diagonal line and a somewhat larger portion of the southwest corner similarly cut off (see diagram, 39 Nev. 389). Thus what would be the end lines of the parallelogram, if it were complete, are substantially shortened, but the major part of each remains. These shortened lines are not only parallel but straight. Are they the end lines of the claim in the sense of the statute? Or do its end lines consist of the shortened lines and the diagonal lines? End lines in the sense of the statute are those which are laid across the vein to show how much of it, in point of length, is appropriated and claimed by the miner. All other lines are side lines. True, the end lines must be both parallel and straight, Rev. Stat., §§ 2320, 2322; Walrath vs. Champion Mining Co., 171 U. S. 293, 311, but it is not so with the side lines. They may have angles and elbows and be converging or diverging so long as their general course is along the vein and the statutory restriction on the width of claims is respected. Del Monte Mining Co. vs. Last Chance Mining Co., 171 U. S. 55, 84. Applying these tests to the bounding lines of the West End claim, we regard it as plain that the diagonal lines at the two corners are part of its side lines, and not of its end lines. In this respect the case is like Walrath vs. Champion Mining Co., supra, where in determining what was the northerly end line of the Providence claim (see diagram, 171 U. S. 298), the line g-h was held to be the true end line and the diagonal line f-g to be no part of it. Thus the objection that the end lines of the West End claim are not parallel and straight is untenable.

What in mining cases is termed the extralateral right is a creation of the mining laws of Congress, and to learn what it is we must look to them rather than to some system of law to which it is a stranger. Besides, as Congress has plenary power over the disposal of the mineral-bearing public lands, it rests with it to say to what extent, if at all, the right to pursue veins on their downward course into the earth shall pass to and be reserved for those to whom it grants possessory or other titles in such lands. What it has said is this, Rev. Stat., § 2322:

"The locators of all mining locations . . . on any mineral vein, lode, or ledge, situated on the public domain, their heirs and assigns, . . . shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes, and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes, or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of such surface locations. But their right of possession to such outside parts of such veins or ledges shall be confined to such portions thereof as lie between vertical planes drawn downward as above described through the end lines of their locations, so continued in their own direction that such planes will intersect such exterior parts of such veins or ledges."

It will be seen that the extralateral right so created is subject to three limitations. One conditions it on the presence of the top or apex inside the boundaries of the claim. Another restricts it to the dip or course downward, and so excludes the strike or onward course along the top or apex. And the last confines it to such outside parts as lie between the end lines continued outwardly in their own direction and extended vertically downward. But otherwise it is without limitation or exception and broadly includes "all veins, lodes and ledges throughout their entire depth"—one as much as another, and all whether they depart through one side line or the other. Given two veins which in their descent pass, one through one side line and the other through the other side line, how could it be held that the right applies to one vein and not to the other, when the statute says "all veins . . . throughout their entire depth"? By what rule would a court be guided in making a selection between the two when the statute makes none? And where a single vein in its descent separates into two limbs which depart through the opposite side lines, on what theory could the right be sustained as to one limb and rejected as to the other? The terms of the statute, as we think, do not lend themselves to any such distinctions, but, on the contrary, show that none such is intended. In Mining Co. vs. Tarbet, 98 U. S. 463, 467, this court in pointing out the intent of the statute said that "the end lines are to cross the lode and extend perpendicularly downwards, and to be continued in their own direction either way horizontally." And in Del Monte Mining Co. vs. Last Chance Mining Co., 171 U. S. 55, a case in which the statute was much considered, it was said, p. 88: "Every vein whose apex is within the vertical limits of his surface lines passes to him by virtue of his location. He is not limited to only those veins which extend from one end line to another, or from one side line to another, or from one line of any kind to another, but he is entitled to every vein whose top or apex lies within his surface lines. Not only is he entitled to all veins whose apexes are within such limits, but he is entitled to them throughout their entire depth, 'although such veins, lodes or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of such surface locations.' In other words, given a vein whose apex is within his surface limits, he can pursue that vein as far as he pleases in its downward course outside the vertical side lines." And again, p. 89: "The locator is given a right to pursue any vein, whose apex is within his surface limits, on its dip outside the vertical side lines, but may not in such pursuit go beyond the vertical end lines." In Calhoun Gold Mining Co. vs. Ajax Gold Mining Co., 182 U. S. 499, it was added, p. 508: "There are no exceptions to its language. The locators 'of any mineral veins, lode or ledge' are given not only 'an exclusive right of possession and enjoyment' of all the surface included within the lines of their locations, but '*of all veins, lodes and ledges throughout their entire depth*, the top or apex of which lies inside of such surface lines extended downward vertically.' A locator therefore is not confined to the vein upon which he based his location and upon which the discovery was made." And also, p. 509: "Blind veins are not excepted and we cannot except them. They are included in the description 'all veins' and belong to the surface location."

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*The discovery vein was on the northerly limb hereinafter described.

We conclude therefore that, when the other elements of the extralateral right are present, it may be exercised beyond either or both side lines, depending on the direction which the departing vein or veins take in their downward course.

So much of the special finding as bears on the character of the vein and the presence of its top or apex inside the vertical lines of the West End claim is as follows:

"The said vein does not on its upward course, or at its top or apex, outcrop or reach the present surface, but is covered or buried to a considerable depth by lava, locally known as and called 'Midway' andesite, which, after the formation of the vein, flowed over the then surface of the territory in which the vein exists; that at and for a distance of 360 ft. westerly from where said vein or lode crosses the easterly end line of said West End claim, which crossing is at a distance of 135 ft. northerly from the southeast corner of said West End claim, there is a juncture or union between two limbs or sides of said vein, and from the summit of said juncture or union the downward course of one limb or side thereof is in a northerly direction, and the downward course of the other limb or side thereof is in a southerly direction; that there is a continuation upward from the summit of said juncture or union of said northerly and southerly dipping limbs or sides of said vein of ore and silver-bearing quartz or rock in place for a distance from 20 or 30 to more than 100 ft., and to what was the surface before the same was buried beneath the said lava flow; that such ore and silver-bearing quartz were deposited where the same are now found at the same time and during the same period that the main vein below was created, and from mineral-bearing solutions having the same source; that the dip is fairly conformable, and the strike or course of such upward continuation of ore and silver-bearing quartz is conformable, to the dip and strike or course of said northerly-dipping limb or side of said vein from the summit of said juncture downward, and the court finds that said upward continuation is a part of said vein or lode; that thence westerly, and for a distance of 360 ft., the northerly and southerly dipping limbs, sides, or slopes of said vein do not unite or form a union or juncture in their upward course, but for that distance each of said limbs or sides has a separate and independent top or apex; that thence westerly, for a distance of 40 ft., the northerly and southerly dipping limbs, sides, or slopes of said vein are again found in conjunction, as in the said most easterly 360 ft.; that thence westerly, and until said northerly and southerly dipping limbs, sides, or slopes of said vein intersect with and cross said northerly side line of said mining claim, they do not unite or form a union or juncture in their upward course, but for that distance (approaching 400 ft.) each of said limbs or sides has a separate and independent top or apex; that between said distance of 40 ft., where said northerly and southerly dipping limbs, sides, or slopes of said vein, as aforesaid, unite or form a union or juncture in their course upward, and said points on said northerly side line of said mining claim where, as aforesaid, said contra-dipping limbs, sides or slopes of said vein respectively intersect said side line and cross the same and so depart from said mining claim, there are two points at which it appears that said contra-dipping limbs, sides or slopes of said vein on their upward course approach closely to a juncture or union, but as to said contra-dipping limbs, sides, or slopes of said vein at said two points actually forming a juncture or union on their upward course, the evidence is meager and unsatisfactory; that the point where the said northerly dipping limb or side of said vein departs from the said mining claim through the northerly side line thereof is 1120 ft. westerly from the northeast corner of said claim, measured along the northerly side line thereof; that the point where said southerly dipping limb or side of said vein departs from said mining claim through the northerly side line thereof is 1142½ ft. westerly from the northeast corner of said claim, measured along the northerly side line thereof; that throughout said distance of 40 ft., where the contra-dipping limbs or sides of said vein are found in conjunction, as hereinbefore stated, there is a continuation upward from the summit of the juncture or union of said two limbs or sides of said vein of ore or vein quartz to what was the surface before the same was covered by the lava flow; that the dip or downward course of both the northerly and southerly dipping sides or limbs of the vein where the two are found in conjunction, as aforesaid, and also in the places where each, as aforesaid, has its separate and independent top or apex, is regular and practically free from undulations; that the said southerly dipping limb or side of the vein in the easterly portion of the West End claim, that is to say, the easterly 360 ft. thereof, has been developed from the top or summit of said juncture of said contra-dipping limbs to and beyond the southerly side line of said claim, or for a distance, measured on the slope or downward course of said southerly dipping limb or side, of 800 ft. or thereabouts, the average dip there being 17° from the horizontal; that the westerly portion, that is to say, the westerly 300 ft. of said southerly dipping limb or side of said vein found in the West End claim, has been developed from its top to and beyond the southerly side line of said claim, or for a distance, measured on its slope or downward course, of 1000 ft. or thereabouts, the average dip there being 30° from the horizontal; that the average dip of said northerly dipping limb or side of said vein, so far as the same has been developed in its downward course, is 17° from the horizontal; that said vein is a fissure vein; that there is a difference in the strikes or courses of said northerly and southerly dipping limbs of said vein of about 40°; that at said places and throughout said distances, where said contra-dipping limbs of said vein are found to intersect and form a juncture, as aforesaid, there has been a mingling of the mineralizations of said two limbs of said vein within the angle beneath the juncture of the said two limbs; that at such places and throughout said distances the footwall of said two limbs of said vein, within the angle beneath their said juncture, by the process of replacement has been converted into mineralized quartz for considerable distances below said juncture, said replacement quartz extending from limb to limb."

Giving due effect to the finding, it is manifest that the vein in controversy is not a flat or horizontal vein or one which would be practically horizontal but for a succession of rolls or waves in its elevation. On the contrary, it is shown to be a fissure vein with two dipping limbs whose course downward is substantial, regular and practically free from undulations. For 750 ft. out of its total length of 1150 ft. within the West End claim, each limb is practically a separate vein with a distinct summit or terminal edge. For the remaining 400 ft. the two limbs are united, and from the point of union the mineralized quartz or rock continues upward for from 20 or 30 to more than 100 ft., and this seems to answer all the calls of a summit or terminal edge. In these circumstances we hardly would be warranted in saying as matter of law that the vein has no top or apex within the claim in the sense of the statute. See Stewart Mining Co. vs. Ontario Mining Co., 237 U. S. 350.

It is well to remember, as this court has indicated in other mining cases, that to take from the discoverer a portion of that which he has discovered and give it to one who may have been led to make an adjoining location by a knowledge of the discovery is unreasonable.

The contention is not that the top or apex of this vein has been found elsewhere, but only that what is found in the West End claim is not such in the sense of the statute. "The law," as has been truly said, "assumes that the lode has a top, or apex, and provides for the acquisition of title by location upon this apex." Probably this assumption could not be indulged where the fact appeared to be otherwise, but it serves to show that the absence of a top or apex ought not be adjudged in the presence of such a finding as we have here.

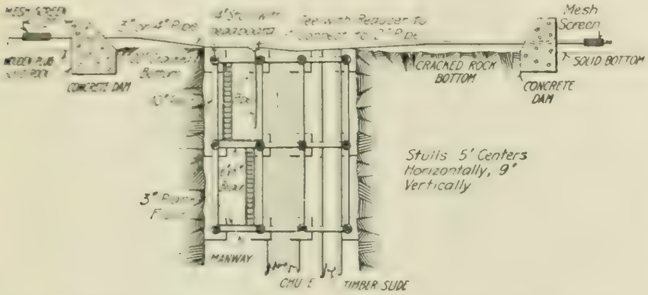
Judgment affirmed.

Details of Practical Mining

Keeping Water Out of Chutes

By Claude T. Rice

The wear and tear that mine pumps receive are due in part to water that can and should be kept out of the ore chutes and stopes. Water that runs down a chute or stope usually picks up a lot of fine material, much of which passes the settling boxes, gets into the pump and rapidly wears out the water end. Moreover, this water causes sloughing of the ground in the raises and stopes and makes the workings needlessly uncomfortable and difficult to work in. All water should be caught as soon as possible and dropped through pipes (diamond drill holes have been used in copper mines) immediately to the nearest pump level. If the floor of the level has been shattered and there is seepage, dams should be put across the floor, and the water coming along the ditch can be piped or boxed across so that it does not run aimlessly through the stopes and raises below. With the use of water drills underground, there is an incentive to encourage collecting the water and dropping it from level to level, rather than allowing it to drip through raises and stopes.



METHOD OF KEEPING WATER OUT OF RAISES AT BURKE, IDAHO

At the Hecla mine, Burke, Idaho, nearly all the water for the Leyner drills is obtained by collecting it on an upper level and piping it down through a nearby manway. Small settling basins are made at the top of the raises by putting in concrete dams across the drift. Three- or four-inch drain pipes are placed in the dam a few inches from the top and extend a foot beyond the inner surface of the dam, so as to drain the clearer water away, after most of the sediment has settled. The ends of these pipes are covered with a four-mesh cylindrical screen, made with an open end that is plugged with a wooden stopper. This is done so that the dam can quickly be drained by pulling the plug in case the screen gets choked with rubbish, but mainly because the screens are made more easily and cheaply in this way.

The pipes from the dams on each side of the top of the raise connect with a tee that in turn passes through a reducer to another pipe large enough to handle the flow of water. Through this pipe the water is taken to the level below. In case a stope that connects with the raise is being worked, a branch is taken off from this pipe at the proper height to supply the drills with water, for a state law in Idaho specifies that water must be used in drilling all holes, so that it is essential that water be taken into the stopes, not only to supply the large machines but also the stopers.

Thus by collecting the water and taking it in pipes to the pump level as soon as possible, a supply is cheaply obtained for the air drills and the stopes and raises are protected from the loosening effects of the water. In lead mines and other properties where the ore is friable and where this characteristic has a tendency to enrich the fines in the ore, a considerable saving of mineral will result in not having the fines washed out of the broken ore, either in the stopes themselves or in the chutes.

Characteristics and Care of Explosives

Dynamite is both combustible and subject to explosion from a heavy shock or concussion. According to recent instructions issued by E. I. du Pont de Nemours & Co., it should not be subject to a drop from a second story window on hard pavement; but a cartridge can be dropped on soft ground from a height of the waist with safety. Heat that will not injure the human body is perfectly safe for dynamite. Low-freezing dynamites are not affected by temperatures above the freezing point of water, but will chill at lower temperatures. Frozen dynamite is rendered less sensitive, and may not detonate until properly thawed.

Probably the best method of thawing is in a double container vessel of some sort filled between on sides and bottom with warm water. The dynamite is placed in the dry inner vessel, where it is thawed to the proper temperature without the danger of exposure to direct heat. Dynamite should not be placed in warm water, as instances have occurred where some of the explosive ingredient has been dissolved. Frozen dynamite is hard, but when properly thawed it becomes soft, and may be moulded or compressed with the hand.

The amount of shock or concussion required to explode dynamite is only a relative term and varies with the grade and strength. High per cent. strength dynamites are more sensitive than the lower grades, and consequently require a lesser shock of detonation. Dynamites as now made for commercial use are not sensible to the ordinary shock of careful handling. Cases of dynamite may be hauled in a motor truck or wagon, but should not be subjected to rough jolting over bad roads or fields.

In loading, the cartridges should be pressed down firmly in the bottom of the hole, and the first three or four inches of tamping material pressed in lightly, while the rest of the hole should be tamped vigorously. For the last part of the tamping as hard a blow as can be struck by the operator with an ordinary tamping stick in one hand is not too hard.

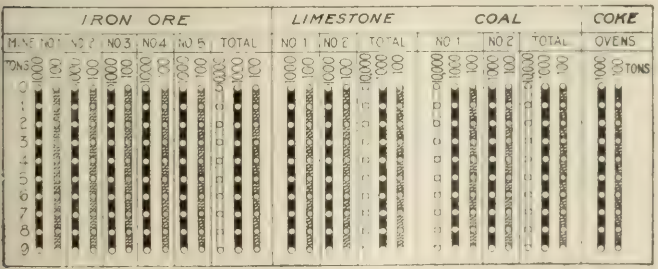
Ordinary and electric blasting caps contain an explosive which is much more sensitive to shock than dynamite and therefore requires more care in handling. Electric blasting caps are more waterproof than ordinary blasting caps, but are quite as sensitive to shock. The wires should never be pulled out of the copper shell and they should be kept away from too much heat. It is dangerous to strike caps against anything, and in tamping a charge the primer should be pressed more gently and handled with more care than the other cartridges. The same care applies to ordinary blasting cap primers, and in addition this kind should not be allowed to get wet. When crimping the caps on fuse, the work should be done gently and carefully. In hauling or storing, blasting caps and dynamite should be kept separately, for although the shock required to detonate a blasting cap would have no effect upon dynamite, the detonation of the former would surely explode the latter.

In handling fuse, care should be taken to avoid a sharp bend or break. The fuse is liable not to burn past a break in the powder train, or it may smolder for some time and eventually ignite the powder beyond the break. For this reason it is never safe to investigate a missed hole until after the lapse of several hours. Fuse should be stored in a cool, dry place; too much heat will cause the waterproofing material to soften and penetrate to the powder train, with destructive effect. Moisture is liable to ruin the fuse by wetting the powder. The exposed end of a coil or fuse is more susceptible to the absorption of moisture than any other part, and it is good practice, particularly in a damp climate, to cut an inch or two from the end before using. In cold weather fuse becomes stiff and somewhat brittle, and it is liable to crack or break; hence it should be warmed slightly before unrolling.

A Daily Production Board

By H. A. Sitterly*

The mining department of the Low Moor Iron Co., Low Moor, Va., has adopted a production board for recording the daily output, the device being reproduced herewith. By means of the board, the accumulative production can be shown daily for a month, so that the manager is kept in constant touch with the tonnage produced. Formerly, colored pegs were used as indicators, but these have been replaced by cotter pins, as the latter will not become loose and jar out of the board. At the end of the month, the pegs are set back and a new tabulation is begun. Production is shown in round numbers to the nearest 100 tons only. On the board, different colored spaces donate various quantities; i.e., orange, 100 tons; blue, 1000 tons, and green, 10,000 tons.



DAILY PRODUCTION BOARD USED BY THE LOW MOOR IRON CO., LOW MOOR, VIRGINIA

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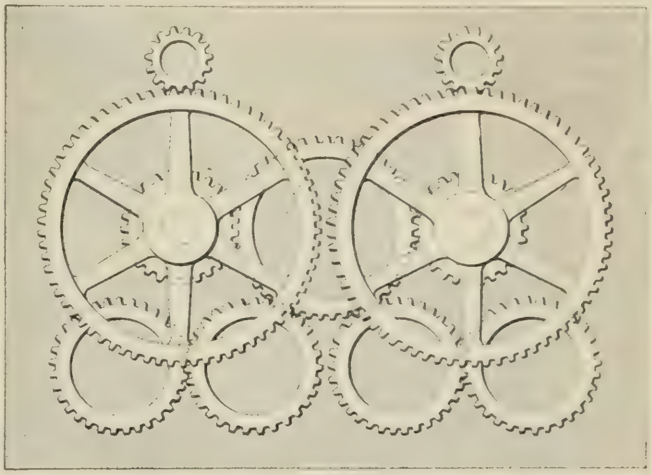
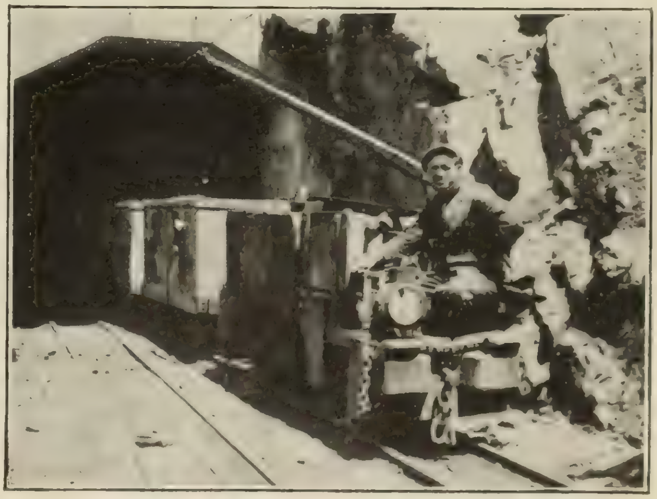
*Low Moor, Virginia.

A Built-Over Electric Locomotive

The illustration herewith reproduced shows a locomotive built over, and operated by the Argo Mining, Drainage, Transportation and Tunnel Co., at Idaho Springs, Colo. The original electric locomotive did not operate successfully, and the manufacturers, rather than have it shipped back to the factory, sold it to the mine at junk value. With the arrangement of gears as shown in the sketch, and using the frame and drive wheels of the old machine, L. S. Stewart, electrical engineer at the mine, built up the made-over locomotive. It operates on 500 volts, d.c., is said to pull a heavier load than another machine that weighs 1000 lb. more, and on account of the lack of reciprocating parts the operation is smoother and there is little slip on wet rails. Springs are provided to allow for inequalities in the track, so that contact and tractive power on all four wheels are obtained.



ARRANGEMENT OF GEARS IN MADE-OVER LOCOMOTIVE



A BUILT-OVER ELECTRIC LOCOMOTIVE

Correspondence and Discussion

American Zinc Institute

The mining, smelting and manufacturing of zinc appear to be outgrowing the loose, inefficient and antagonistic ways which characterized the industry in its youth, and begin to assume more the character of a national industry, possessing cohesion, strength and a capacity to grasp the world-role offered to the Future.

A brief historical review will bring this out. In America, zinc mining and smelting have been carried on separately, by small units, competitive and unorganized, although certain strong companies, admirably conducted, have developed out of this rather chaotic state, such as the New Jersey Zinc Co., the American Zinc Lead and Smelting Co., Butte & Superior, Anaconda and the several companies which have been regarded as subsidiaries of the Frankfort metal houses, such as the American Metal Co., and L. Vogelstein & Co. The great German metal syndicates, with mines and smelteries in Germany and Belgium and a highly organized world trade, controlled half of the world's zinc output in the month of July, 1914.

With the outbreak of the war and its vast munitions requirements, England and France turned to America for their zinc and brass supplies. To stimulate the unprofitable American zinc business of 1914 so that it might quickly grow to meet the war demands, high prices were necessary, and under the stimulus of 15c. to 20c. spelter the American zinc output doubled from 1914 to 1917. From a pre-war attitude of producing enough zinc to meet our domestic demands, we soon developed an export trade, amounting to 204,000 tons of zinc metal in 1917, worth $60,600,000. But by December, 1917, the submarine destruction of ships and our fast-growing need of ships for the transport of men, food and munitions had begun sharply to cut down this big, new export trade.

The zinc industry now found itself grown to a productive capacity sufficient to supply both our normal domestic trade and the new foreign demands, but confronted with the U-boat interference of exports and the stoppage of the galvanizing trade by the war demand for all-steel sheets. With these upsets in export and domestic demands came a sharp decline in the price of spelter to 6¾c., and this at a time, and in spite of the fact, that the costs of mining, smelting and transportation were nearly double the pre-war costs.

The changes from an excess demand to an excess production were brought about quicker than the industry could readjust itself, and stocks of ore and metal accumulated and prices fell below the normal, as this should be figured under the high-cost condition now prevailing. Today output has been radically curtailed and the market has resumed a more healthy and sound condition.

During this period of readjustment the Joplin-Miami district, producing 40% of the zinc of the United States, from more than 100 separate, independent companies, operating under short-term leases, found itself in worse condition than did some of the other mining districts. The very hardships of the situation induced the Joplin-Miami operators to get together in an association to work out their problem. Some immediate good was done by stabilizing the output and price of the "high-grade," lead-free concentrates going into the manufacture of sheet zinc for war purposes. This success also encouraged the mine operators to continue their efforts, and the preliminary organization of the American Zinc Institute was the result.

With the Government finding it increasingly necessary to control different metal and other industries, and with labor, fuel and material becoming more difficult to obtain, the Joplin-Miami operators felt it was high time to look around and take stock of conditions as they are today and may be tomorrow. War, labor and fuel shortage may compel a constriction in the whole zinc industry, or war needs may demand an expansion. In either event the Government war or trade agencies will probably take a hand in making these adjustments, and an organized industry could meet the war requirements more helpfully to the Government and with less stress and loss to the industry than it could unorganized.

All the committees sent from Joplin to Washington returned impressed with the belief that the various branches of the Government favored stabilization and coöperation in industry rather than the opposite course of destructive competition, profiteering or speculation. The great field for good of the American Zinc Institute lies in preparedness for the coming world trade conditions, and these will demand united, trained and consistent efforts along predetermined lines.

With the approaching victorious end of the war America will occupy a wonderfully advantageous position for export trade; possessing the capacity to produce and ship and having over-sea friends needing our goods and wanting to buy them from us. For this great and near-approaching day of victory and peace the zinc industry is far less prepared than the other great metal trades. This is because we have long shipped abroad our copper, steel and lead, but had sent no zinc until about three and one-half years ago. So zinc men must prepare. There are also many other lesser details of the business where we will profit by working together. Germany is another important reason why we should get together in friendly conference and strong coöperation.

When we shall have beaten Germany's armies and made peace with her, we will not feel pleased to learn that Germany is beating *us* in mining and smelting, in manufacturing and selling zinc, and that she is doing this even in America and among our friends and Allies, and not because Germany has better mines than ours, but solely because her mining and smelting business is organized like an army, intelligently controlled, while our zinc industry is run like the Bolsheviki, each man for himself.

Therefore our old ways must be junked, and by strong, oint effort we must prepared to build up our domestic nd foreign trade, showing the new uses to which zinc ay be put, and where it may displace its aristocratic ivals, copper and tin; and thus keep our mines and nelteries in permanent and profitable operation.

It is for the purpose of bringing together at dinner nd in friendly conference the men who are interested the mining, smelting and manufacture of zinc and or future welfare of the industry that the first meeting f the American Zinc Institute will be held at the Statler otel, in St. Louis, on July 29.

TEMPLE CHAPMAN.

Chatham, Mass, July 6, 1918.

American Metal Co.

The American Metal Co. has sent the following letter the Federal Trade Commission:

July 25th, 1918.

he Honorable, The Federal Trade Commission,
Vashington, D.C.
irs:

We have refrained from commenting upon the published ımmaries of the report of your commission of June 28 un- l we could secure and examine an official copy. We note rom a careful reading thereof that it contains no charge allegation such as was implied in some of the news- apers that the payment of tantiemes or profit-sharing lotments to the officers and managers of our company was ade for the purpose of evading taxation, although that as the natural inference to be drawn from the facts stated.

In order to correct certain misapprehensions existing your commission, as well as to rectify as far as possible ne injury which has been done to our company and its of- cers before the public, we beg to lay before you the fol- wing facts:

1. The tantieme or profit-sharing system was not re- ntly devised but has been in vogue in the American Metal o. since its incorporation more than 30 years ago. In 387, when our company was incorporated, its organizers, ho furnished the necessary capital, made an agreement ith the managers whereby the net earnings of the com- any in excess of 6% on its capital stock should be divided etween stockholders and managers in a given proportion, lieu of the customary salaries. This system was there- re started long before the days of income or excess-profits xes, and has been continued to this day, and adequate rovisions covering it are contained in the company's char- r. The profit-sharing practice is not at all unusual in rge companies, although this particular form may be to certain extent unique. Promoters and organizers of large terprises usually receive the fruits of years of labor rough stock acquisition and earnings thereon, by means f capitalizing surplus, good will, etc. By our method there a continuing inducement to extra and intelligent en- avor in the management of the company's affairs, for the ason that succession in office and a share in the profits pend not on shareholdings but solely on services rendered. he Government also fares better because the progressive atures of the income and excess-profits tax laws impose eavier rates of taxation upon the individuals than would ave been imposed upon the corporation had the total sal- ries and commissions paid to them been taxed to the cor- oration on the excess-profits tax basis. These facts are pparent from the tax returns of our corporation, its sub- diaries, and its individual officers, which were months ago led with the Treasury Department.

2. The tantiemes paid to our officers are not included in ne items going to make up our production costs. It seems xtraordinary to us that the personal affairs of our officers nd managers, which would normally be considered a mat- er entirely between them and the stockholders, should have een made public by your commission. It is apparent, how- ver, from the text of your report that this action was taken n the theory that these salaries and commissions, having een charged to expense account, entered into the cost of roduction of the metals produced by our company and re- uired by the Government in the prosecution of the war. Ve wish to state that this theory is entirely incorrect. At ne time your investigators examined our accounts, we gave hem our complete cost records and pointed out to them that our subsidiary companies were largely managed and operated by the officers and department heads of the parent company; that these men receive no compensation from the subsidiary companies, and that no charge is included in the cost accounts of our subsidiaries for salaries or overhead central-office management. We cannot emphasize too strongly, therefore, that the individual earnings of our officers and directors are not charged to production costs, but are figured on the profits of the company's entire commercial, financial, and industrial business, not only in this country, but also in the Allied and neutral world. In the year 1917, our total business amounted to upward of $150,000,000, of which our zinc industry, contrary to inference, constituted only about one-third. It is therefore apparent that the company's profits are very moderate, considering the volume of its transactions, and that the inference of profiteering drawn by certain newspapers is entirely unjustified.

We are transmitting copies of this letter to the press for the purpose of correcting, as far as possible, the public misunderstanding which has arisen with reference to our company and its officers through the published summaries of your report.

Respectfully,
THE AMERICAN METAL COMPANY, Limited,
By C. M. LOEB, President.

Manganese Prices Unfair to Producers in Northern California

The recent fixing of prices on manganese ore by agreement between the American Iron and Steel Institute and the War Industries Board is unfair to California producers and will result in lowering returns to those in northern California, and will undoubtedly curtail if not wholly eliminate production. The proposed additional freight rates are prohibitive. Prices are now based on deliveries at South Chicago, the freight paid being deducted from returns to the ore producer. Freights from Pacific Coast points to South Chicago are from 50 to 100% higher than from other producing points.

A bonus is given to producers east of Chicago, although their freights are much lower than ours. No reason is given for this. If any bonus is paid to any producer, surely those paying highest freight rates are entitled to it. Smelters on the Pacific Coast by buying on Chicago base will obtain their ores at a price lower than that previously prevailing.

When 80% ferromanganese was selling at $250 per ton, we were able to dispose of all our ores at from 16 to 25% higher than we will receive under the fixed prices. The ferro manufacturers have now had their returns increased by the lowering of specifications to 70% manganese content, with no lowering of the price per ton.

Our ores are nearly all high silica, low iron and low phosphorus. Although in the past we have sold them on the basis of total free silica and free silica to 20%, and the manufacturer has been glad to get them, we are now being penalized on the silica and no allowance is made for low iron and low phosphorus. We are paying the highest mining wages in the country in this industry, which is necessary, as the mines are new and do not possess the comforts found in larger camps.

So far as we know, no northern California producers were asked to submit figures showing what price-fixing would do to their ores. The present output is not large, but production, if encouraged, might become an important factor in the national supply.

San Francisco, June 15, 1918. RALPH E. HYATT.

Events and Economics of the War

The preëminent feature of the week just passed was the launching, on the Fourth, of 95 merchant ships, totaling almost 475,000 tons. On the same day in a speech at Mount Vernon, President Wilson declared that the war cannot end with a compromise. The question of intervention in Russian affairs was discussed by the President in conference with Cabinet members and military and naval advisers, the matter having come to a head through the landing of American naval forces at Vladivostok and Kola. The strike of telegraphers set for July 8 was called off at the request of the Secretary of Labor. The House and Senate concurred in fixing the price of wheat at $2.40 per bu. for the ensuing year. The $8,000,000,000 bond bill was passed by the Senate on July 5. The 16,000-ton transport "Covington" was sunk en route to the United States, with the loss of six of the crew.

The Allies on the western front continued their gains in local actions; American troops have arrived in Italy. Germany is reported to be sending men to the Italian front. Russians of the Murman coast along the White Sea have broken with the Bolshevist government and joined the Allies, though neighboring Finns are said to be hostile to the latter; Von Mirbach, German Ambassador at Moscow, was assassinated; Czecho-Slovak troops, who were formerly war prisoners in Russia but favor the Allied cause, have taken over the government at Vladivostok after crossing Siberia on their way to France. Unrest in South Africa, due probably to enemy agents, is reported by Premier Botha.

Financing the War

In discussing the question of Federal taxation, William B. Dickson, vice president of the Midvale Steel and Ordnance Co., was recently quoted by *Iron Age* as saying that, inasmuch as corporate accounting is the basis for such a large proportion of national financing, the Federal Government should require a uniform system of accounting by all corporations, and that a principle so fundamental as this should have been embodied in the original war-tax legislation. Mr. Dickson declared that Governmental expenditures should be divided into two classes, namely, irretrievable expenses and those which are investments, in whole or in part. The former include expenses incurred in creating and maintaining the fighting forces, and the latter cover secured foreign loans, advances on farm loans and to manufacturers, as well as money spent on permanent improvements. Such investment expenditures should be financed by bond issues.

If Mr. McAdoo's suggested division of one-third present taxation and two-thirds bond issues be adopted, states Mr. Dickson, these percentages should be applied to the amount remaining after the investment expenditures have been deducted from the total.

Mr. Dickson concludes, as a general proposition, that the Government "will be justified, as far as practicable, in issuing a series of short-time certificates of indebtedness and in paying a high rate of interest on such certificates in order to be in position at the end of the war to rearrange the entire financial structure.

"The total amount to be financed will then be definitely known, and it will be possible to decide intelligently what percentage of the total must be refunded by long-term bonds, and the term and interest rate of such bonds; and also the form of direct and indirect taxation which can most easily be borne by the business and social fabric under the conditions then existing."

Gas Warfare Work Unified

Following the recent transfer of work on war gases from the U. S. Bureau of Mines to the War Department, a further step toward unifying all work of this sort was taken by Secretary Baker in ordering that all classes of gas warfare hereafter should be under the control of the Chemical Warfare Service, commanded by Maj. Gen. William L. Sibert. Divisions in the Medical Department, the Ordnance Department, as well as in the Bureau of Mines, have been handling it in the past. All officers and men who have been connected with offensive or defensive gas warfare will now be responsible to the Chemical Warfare Service. The field-training section has been under the corps of engineers.

Defensive gas warfare has been under the control of the Medical Department. The work has consisted of the designing and manufacture of masks, both for men and animals, and the procurement of appliances for clearing trenches and dugouts of gas. Offensive gas warfare consists principally of manufacturing gases and filling gas shells. The work has been under the direction of the Ordnance Department. The new department will take over the work of chemical research for new gases and protection against known gases. All chemists now in the Army will be transferred to the new service.

Britain Rations Coal and Light

A new order for the rationing of coal and light went into operation in Great Britain on July 1, it is announced in the British press. It is intended to ration gas, electricity, and coal on a coal consumption basis at the rate of 3½ tons of coal for two rooms in a dwelling house. For other rooms a ton each is to be allowed. This will cover the gas or electricity, one ton of coal being considered equal to 15,000 cu.ft. of gas or to about 800 B.t.u. of electricity. In the case of a householder with four rooms, he will be entitled to 5½ tons of coal a year. If he uses 3 tons it will leave him 2½ tons to cover lighting, which will entitle him to 37,500 cu.ft. of gas. Beyond this he will not be allowed to go, so that if he is not economical he may find himself without either gas or coal before the end of the year. Small consumers may be provided with coupons, which will keep them within rations. They will be supervised by control committees elected in each district.

Canadian Iron Industries Fostered

A policy has been adopted by the Dominion government, says the *Canadian Mining Journal*, of encouraging new iron and steel industries in Canada by offering to purchase all pig iron produced in the country by all new blast furnaces erected during the next two years. It is understood that it will undertake to accept three years' output and that prices paid will be governed by the market conditions at the time. The province of British Columbia has taken similar action. The Iron Bounties Act binds the province to give a bounty of $3 per ton on all pig iron manufactured from British Columbia ore in British Columbia and $1.50 per ton on all pig iron manufactured in British Columbia from foreign ore.

U. S. Exportation of Silver

Sixty-four million silver dollars have been melted into bullion by the U. S. Treasury, most of which has been exported to India. Fifty-eight million dollars of silver certificates have been withdrawn from circulation and destroyed, as the silver on which they were secured was melted down. The Treasury still holds 426,000,000 silver dollars, against which $390,000,000 in silver certificates are outstanding. New Federal Reserve bank notes of the denominations of $1 and $2 are being issued to replace the silver certificates withdrawn.

Turn Old Gold and Silver Into Cash

Persons who have old gold or silver which they wish to convert into cash for war or other purposes have been offered the opportunity to do so by the Government. The Director of the Mint has announced that old gold and silver in quantities approximating $100 in value may be sent to the United States assay office in New York, or to any one of the Government assay offices in Philadelphia, Denver or San Francisco. The senders will receive in return a check on the U. S. Treasury for the value of the material less the charges for fitting such material for coinage purposes. These charges are nominal. No institution under the Government in Washington receives this material, as none has facilities for depositing or treating it.

To societies raising funds for war relief work, the suggestion is made that individual collections of old gold and silver be gathered together in some central depository and when the necessary amount has been obtained that it be sent to the assay office in the one of the four cities mentioned which is most conveniently situated for transportation.

May Import Magnesite as Return Cargo

The War Trade Board has amended the restriction upon the importation of magnesite so as to allow it to be brought in under the back-haul proviso, thus permitting its importation when shipped as return cargo from Europe and the Mediterranean coast of Africa and when shipped from convenient ports where loading can be done without delay. This ruling follows that of June 30 by which the board extended the back-haul privilege under the general policy of restricted imports, hitherto applying only to convenient ports in Europe, to apply under the same conditions to convenient Mediterranean ports in Africa. The Shipping Control Committee will determine what ports are to be considered as convenient.

Importations of manganese ore from Asia and Australasia have, by another ruling, been prohibited as to ocean shipments made on and after July 20. To make this ruling effective all outstanding licenses for the importation of manganese from those countries have been revoked as to ocean shipment on and after July 20. Adequate supplies can be obtained, it has been found, from sources near by, entailing far less strain upon the tonnage resources of the United States during the present difficult period than shipments from the distant ports.

Exempt Coal Miners, Garfield Asks

Exemption from draft for men producing and handling coal at the mines has been asked by Dr. Harry A. Garfield, the Fuel Administrator. Statistics from the principal coal-producing states have been compiled by the operators in connection with figures supplied by the office of Provost Marshal General Crowder. The figures on men called from these states and now in the Army are: Alabama, 63,900; Illinois, 212,982; Indiana, 89,913; Kentucky, 66,056; Maryland, 42,417; Ohio, 199,422; Oklahoma, 22,161; Pennsylvania, 294,831; Tennessee, 66,474; West Virginia, 44,544.

Under the tentative plan of labor distribution by allotment under consideration by officials of the various war administrations in connection with the War Industries Board, coal production will be rated as third in the priority scheme. Several thousand men have already been sent to the mines through the Federal Employment Service, officials of the Department of Labor say, but not in sufficient numbers to replace the men taken away under the draft calls of the Army.

German War-Science Foundation

The Kaiser has approved the foundation of a trust to further the development of scientific and technical aids to warfare, says *Iron Age*, by uniting the scientific and the military forces of the country for work together. The scientific work is to be carried on by the following technical committees (or commissions):

(1) Committee for the chemical raw materials for the production of munitions-manufacturing materials; (2) committee for chemical war materials (powder, explosives, gas and the like); (3) committee for physics, including ballistics, telephony, telegraphy, determination of targets and distances, measurements and the like; (4) committee for engineering and communication; (5) committee for aëronautics; and (6) committee for obtaining and preparation of metals.

All Navy Bids Open

There are now more than 14,000 names on the bidders' list of the Bureau of Supplies and Accounts of the Navy Department, according to Rear Admiral Samuel McGowan, its chief. The bureau, he says, is constantly rejecting applications to be placed on the bidding list from concerns which cannot show themselves to be manufacturers or dealers carrying in stock the articles they offer to supply. All bids for Navy contracts are open, and the record is available for the inspection of all interested.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Graphite Stocks Ample for 1918

Stocks of graphite and home production are sufficient to meet all requirements for this material during 1918 in the opinion of the War Trade Board. All importation of graphite has been prohibited for the remainder of the year. The announcement reads as follows:

> The restriction upon the import of plumbago or graphite has been extended by the War Trade Board, in a new ruling (W. T. B. R. 157), to be effective for the entire calendar year of 1918. Under the list of restricted imports No. 1, this restriction was made absolute until July 1 of this year, the possibility of importing not to exceed 5000 long tons for the remainder of the year being left open, should investigation prove that stocks in this country were inadequate to meet the home requirements for the entire year. As a result of the investigation, it has been found that present stocks, together with the home production, suffice to meet the home requirements until well into 1919. The restriction has therefore been continued in effect, and the Bureau of Imports has been instructed to issue no licenses for the importation of plumbago or graphite for the rest of the calendar year.

May Metal and Ore Imports and Exports

Imports of the more important minerals and metals during May, 1918, and the corresponding month of 1917, were as follows, the figures being the returns of the Department of Commerce:

IMPORTS, MAY, 1917, AND 1918

Metal and Ore	May, 1917	May, 1918
Antimony ore, contents, lb	2,385,975	72,845
Antimony matte regulus or metal, lb	5,123,971	1,975,456
Copper:		
Ore, contents, lb	9,404,438	6,724,894
Concentrates, contents, lb	2,473,799	2,827,000
Matte, regulus, etc., lb	4,941,783	1,334,399
Imported from (in part)		
Canada, lb	1,913,323	3,116,993
Mexico, lb	3,701,917	4,302,124
Cuba, lb	4,772,180	1,638,963
Chile, lb	5,614,125	1,314,214
Peru, lb	340,007	137,709
Unrefined black, blister, etc., lb	31,573,727	27,892,478
Imported from (in part)		
Canada, lb	4,304,968	4,965,525
Mexico, lb	4,665,979	6,961,105
Chile, lb	13,695,673	4,788,917
Peru, lb	7,182,567	5,971,322
Japan, lb	1,276,540	
Refined, in bars, plates, etc., lb	453,128	8,378,337
Lead:		
Ore contents, lb	1,169,543	3,312,494
Bullion contents, lb	9,728,609	17,290,195
Imported from (in part):		
Canada, lb	596,163	2,124,370
Mexico, lb	9,999,906	17,584,769
Chile, lb		782,076
Pigs and bars, lb	1,587,393	12,635
Zinc:		
Ore contents, lb	23,242,353	3,636,092
Imported from (in part):		
Spain, lb	9,003,280	
Canada, lb	606,000	1,288,422
Mexico, lb	8,918,837	2,224,470
Australia, lb	4,714,236	
Manganese ore, long tons	81,269	29,837
Pyrites, long tons	72,583	39,404
Imported from:		
Spain, long tons	55,775	23,406
Canada, long tons	16,808	15,998

Exports of copper, lead and zinc for May, as reported to the Department of Commerce, with those of the corresponding month of 1917, as finally revised, are as follows:

EXPORTS OF COPPER, LEAD AND ZINC, MAY, 1917, AND 1918

Metal and Ore	May, 1917	May, 1918
Copper:		
Ore contents, lb	511,462	232,273
Concentrates, contents, lb	72,200	134,200
Unrefined black, blister, etc., lb	514,142	448,000
Refined in ingots, etc., lb	105,337,317	65,298,223
Exported (in part):		
France, lb	33,805,152	25,291,592
Italy, lb	12,890,288	10,894,246
Russia in Europe, lb	7,336,938	......
United Kingdom, lb	42,191,576	25,628,116
Canada, lb	4,010,910	2,507,810
Lead:		
Pigs, bars, etc., produced from domestic ore, lb	8,393,119	13,953,634
Produced from foreign ore, lb	2,417,114	4,970,406
Exported to (in part):		
United Kingdom, lb	9,729,564	4,632,414
Argentina, lb	242,723	309,120
Brazil, lb	51,187	239.534
China, lb	....	84,200
Japan, lb	....	2,811,376
Zinc:		
Dross, lb	2,964,684	4,951,832
Spelter:		
Produced from domestic ore, lb	34,880,350	6,627,809
Produced from foreign ore, lb	19,891,529	5,957,576
Exported to (in part):		
France, lb	16,020,588	7,330,412
Italy, lb	7,339,773	3,132,557
Norway, lb	477,095	......
United Kingdom, lb	26,128,250	744,429
Canada, lb	2,203,441	1,227,406

German Mine Car Concern To Be Sold

Millions of dollars worth of alien-owned property will soon be put on the market by the Alien Property Custodian. Officials in the office of the latter are now arranging a series of public sales, soon to be held. The first property to be sold will be the plant of the Orenstein-Arthur Koppel Co., at Koppel, Penn. The date set for the sale is Aug. 15. It is said that this company, whose offices are at Pittsburgh, and a large lumber concern are the only German corporations in the United States that have never been incorporated in this country.

Mining Least Profitable in 1917

More than half of all corporations engaged in mining lost money during 1917, according to a compilation of income-tax returns prepared by the Treasury Department. The number so engaged was 11,968, of which 5393, or 45.6%, operated at a profit and 54.94% lost money during the year. The net profits of the successful companies amounted to $798,883,349. The losses of the unsuccessful companies were $70,773,408. Mining corporations paid 9.22% of the total income tax. Mining as an industry was at the foot of the list so far as profits are concerned. All other industries showed a higher percentage of profit.

The Senate has passed Senator Henderson's bill suspending assessment work on mining claims during the war and until midnight of Dec. 31 of the year following that in which the war shall have been concluded. The resolution does not apply to oil placer location.

Though some members of Congress regard the report of the Federal Trade Commission on profiteering as a "sensational statement from a sensational organization," it is apparent that the majority of the members of Congress accept it at its face value.

Company Reports

Greene Cananea Copper Co.

The report of the Greene Cananea Copper Co. for 1917 is the first to be made since the organization was simplified by merger of the subsidiaries with the parent company. Operations in the early part of the year were hampered by new laws and labor regulations and unwarrantable interpretations of them by the Mexican authorities, and the plants were closed June 22. Work was resumed Dec. 10, and by the end of the year all plants were again in operation. During the suspension it was not possible to maintain the physical condition of the plants, and the depreciation of the equipment was rapid.

Mining operations produced 420,596 wet tons of smelting ore and 153,986 wet tons of milling ore, or a total of 574,582 tons, at an average cost of $2.90 per ton. Ore milled totaled 171,202 dry tons, of which 122,349 tons was treated by flotation. The total production of metals, including that from the San Pedro mine and custom work, was 30,496,487 lb. of copper, 891,226.9 oz. of silver and 5753.72 oz. of gold. The cost of copper was 17.95c. per lb., made up of direct operating cost, 13.88c.; production tax, 2.56c.; shut-down expense, 0.90c., and reserve for repairs incident to the shut-down, 0.61c. The average price received for copper was 27.04c. per lb. At the smeltery, 481,632 tons was treated, at a cost of $2.61 per ton.

Sales of copper brought in $8,245,694, and miscellaneous credit items, including sales of gold and silver, increased the income to a total of $9,471,480. Mining and reduction expenses were $4,565,180; refining and selling, $571,440; administration and taxes, $1,486,517; and depreciation, $350,455. These deductions left a balance for the year's operations of $2,497,888, and previous surplus was drawn upon to pay total dividends of $3,954,215. The surplus remaining to the credit of profit and loss account is $8,048,652.

Canada Copper Corporation

The annual report for 1917 of the Canada Copper Corporation, owner of the properties and assets of the British Columbia Copper Co. and of a new and more important property at Copper Mountain, near Princeton, B. C., indicates that plans have been completed for a large plant at Copper Mountain and that some actual construction has already been done. At the close of the year the outstanding capital stock of the company amounted to 945,694 shares. The balance of debentures, amounting to $63,800, was called during the year, and the stockholders were offered the privilege of subscribing to their pro-rata share of an issue of $2,500,000 in 10-year 6% first mortgage bonds, convertible at any time before maturity into stock of the company at $3 per share. All other loans have been paid, so that the capital indebtedness is represented entirely by the stock issued and the convertible bonds.

The report of Allen H. Rogers, consulting engineer for the company, presents a concise but complete statement of operations at Greenwood and of development and future plans of the Copper Mountain property. At the mine smeltery operations were suspended entirely for nearly two months because of inability to obtain fuel, and at other times coke was rarely available for more than one furnace. Tonnage smelted was 203,478, as compared with 311,858 for the previous year. Copper produced was 4,247,316 lb., silver 46,356 oz., gold 9592.4 oz. The Mother Lode mine shipped 181,189 tons, averaging 0.917% copper, 0.17 oz. silver, and 0.038 oz. gold per ton. The Lone Star mine was reopened in August, and produced 4780 tons, containing 1.94% copper, 0.14 oz. silver, and 0.026 oz. gold per ton.

At the Copper Mountain property the development campaign begun in the previous year was continued until September, at which time permanent construction and haulage ways were begun. The development work was satisfactory in establishing the accuracy of previous estimates of ore reserves, which now stand, as formerly, at 10,000,000 tons assured and 2,000,000 tons probable ore, of an average grade of 1.74% copper and 20c. per ton recoverable in gold and silver. Some of the permanent mine buildings were completed; a pumping plant was installed and complete water and sewage systems were laid out. The Kettle Valley Ry. Co. is to construct a railroad from Princeton, and the Okanagon Power Co. is to furnish power. A 50-ton test mill was erected, 3000 tons of ore was treated and the flow sheet was worked out. Plans for a mill to be located between the mines and Princeton were decided upon. All possible speed is to be used in the construction of the plant, but owing to uncertain deliveries of equipment it seems hardly likely that the mill can be ready for operation until well into the year 1919.

Rio Tinto Company, Ltd.

The report of the Rio Tinto Co., of London, which operates the ancient mine of that name near Huelva, Spain, for the year 1917, shows a total balance of earnings after all expenses, including taxes and administration, and including the balance from the previous year, of $11,461,373, the British monetary units having been changed into U. S. currency at the standard rate of exchange, namely, $4.8665 to the pound sterling, from which is deducted for depreciation of plant $300,920 and for staff provident fund $24,332, leaving a net balance of $11,136,119, out of which there were made during the year dividend disbursements aggregating $8,607,622, leaving a balance of $2,528,497 to be carried forward to revenue account. The total dividends paid amount to 51% on the whole share capital of the company. No details of operation are given in the report, but general satisfaction is expressed with the conditions at the mines.

Amparo Mining Co.

The report for 1917 of the Amparo Mining Co., which operates a group of silver mines carrying subsidiary gold values, near Etzatlan, State of Jalisco, Mexico, furnishes a sad illustration of the hardships imposed on mining operations in general and upon cyanide plants in particular by war conditions. Production during the first seven months was greatly curtailed, mainly through shortage of cyanide; operating costs advanced materially, due to a higher wage scale and an abnormal increase—representing a net advance of from 50 to 300%—in the cost of supplies; embargoes and other regulations of the U. S. Government, car shortage and the congested conditions of freighting added to the difficulties. Partial relief from these general hardships was given by the increased price of silver, and further satisfaction is in order as a result of an expenditure of $72,000 in development work, as against $26,400 in the previous year, and in the fact that the existence of the orebody on the 1100-ft. level was proved beyond doubt.

Ore treated totaled 84,277 tons, a decrease of 14,763 tons from the previous year; working costs increased to $9.93 per ton from $5.98 per ton in the previous year; sales of bullion brought in $1,052,239, which was increased to $1,220,964 by miscellaneous profits. Profit and loss debits of $941,731 for operating expenses, $18,775 for loss in exchange, $64,893 for depletion of mines, and $17,500 for administrative charges and taxes in the United States reduce the net profit for the year's operation to $178,065. A comparative statement is given to show the general increase in the cost of supplies.

COST OF SUPPLIES AT AMPARO MINE, 1912–1917

Article	Price in 1912	Price in 1917
Dynamite	$9 90 case	$17 80
Cyanide	.18 lb.	.88
Miner's steel	.11 lb.	.28
Fuse	3 93 M ft.	7 95
Caps	46 (100)	1 74
Carbide	.06 lb.	.07
White iron	.005 lb.	.03
Coke	20.00 ton	70.50
Lumber	40 00 M ft.	120 00
Nails	.07 lb.	.18
Round and flat iron	04 lb.	14
Cruciform steel	.11 lb.	.30
Steel plates	.06 lb.	.19
Steel shafting	.08 lb.	.16
Crucibles, No. 300	21.00 each	64.88
Battery shoes	10 00 each	27 00
Battery dies	8 00 each	17 50

Waihi Gold Mining Co.

The Waihi Gold Mining Co., Ltd., which operates a large gold-silver mine at Waihi, New Zealand, shows gross earnings of $1,903,343 for the calendar year 1917, the British monetary units of the report having been converted into American at the standard ratio of $4.8665 to the pound sterling. The balance, after deducting mine expenses in New Zealand and administrative expenses in London, was $943,617, and four dividends aggregating $482,666 were paid. After reserves of $234,794 for taxes, $89,485 for depreciation of plant, and donations to war funds of $4866, the net balance remaining to the credit of revenue account for the year 1917 was $303,842.

The dry ore milled totaled 191,742 short tons, averaging 0.394 oz. gold and 3.39 oz. silver per ton. The recovery was 91.1% of the value of silver and gold. From its beginning in 1890 this mine has realized $57,798,177 from sales of bullion.

Semi-Annual Report of Mount Bischoff Tin Mining Co.

The Mount Bischoff Tin Mining Co., owning a tin mine at Waratah, Tasmania, and smelting works at Launceston, reports for the half-year ended Dec. 31, 1917, earnings of $60,695 and interest earned, $1290, which, added to previous profit and loss credit, gave a total available balance of $492,830, British monetary units being reduced to U. S. Currency at the standard ratio of $4.8665 to the pound sterling. Of this amount $29,199 was paid out in dividends, and deductions at the rate of 15% were made for depreciation on various plant items; the deductions aggregating $50,110 and, with a further deduction of $3353 for income taxes, the profit and loss surplus was reduced to $410,169. New construction cost $12,156.

The ore produced totaled 53,944 tons, of which amount 1624 tons came from underground mining and the remainder from eight different surface openings; 1289 tons of this was discarded as waste, and the remainder produced 219 tons of tin concentrates. Ore reserves amount to 1,250,000 tons, averaging 0.301% tin. The working costs per ton treated for the period are shown in the accompanying table.

WORKING COSTS, MOUNT BISCHOFF TIN MINING CO., 1917

Mining, including new works, stores, etc	$1.115
Aërial ropeways, including maintenance	.170
Milling and concentrating	421
Prospecting and development work	012
Electric running	.030
Assaying and sampling	028
Races and dams	.003
Administration	.068
	$1.847

Wallaroo & Moonta Mining and Smelting Co., Ltd.

The Wallaroo & Moonta Mining and Smelting Co., which operates a copper mine at Wallaroo and Moonta, South Australia, reports that the profit for the year was $616,761 (English monetary units have been changed to U. S. Currency) after charges of $10,726 for royalties and $156,015 for income taxes. From these profits $389,320 was paid in dividends, and, in addition, $97,330 in dividends from profits earned during 1916. The expenditure for the year for new construction was $248,625. The average price received for copper was 25.36c. per lb. net at the plant.

Ore produced from the Wallaroo mines was 57,725 tons, averaging 8.46% copper; from the Moonta mines, 8330 tons, averaging 15.89% copper. The cementation plant at Moonta produced 747 tons of precipitate, averaging 67.88% copper. The smelting works treated a total of 69,979 tons of ore, precipitate and blister during the year, and produced 10,201 tons of copper, 2970 oz. gold and 1675 oz. silver. Sulphuric acid produced amounted to 6190 tons. Increased costs for labor and supplies resulted in greatly increased working costs.

Fuel Oil Production in England by carbonization of cannel coal is being studied and large scale tests have been carried out, according to the London *Times (Chem. Tr. Jorn.)*. It is stated that these tests have been successful, and that they have shown that extraordinarily high yields of fuel oil, ammonia, and other byproducts can be obtained by utilizing existing gas works retorts under special conditions which do not involve much additional outlay.

Tungsten Producers' Tariff Board Hearing

Limited development, uncertainty of deposits, instability of price, large capital requirements of low-grade producers, and difficulty of marketing small lots of ore are the principal reasons for the decline in the domestic production of tungsten ores in Nevada and California. Producers in these states are united in the opinion that a stable price at a figure between $25 and $40 per unit would operate greatly to increase quantity production and thus make tungsten mining profitable.

ON JUNE 28, Western tungsten producers appeared before Commissioner William S. Culbertson, of the U. S. Tariff Commission, and G. C. Riddell, metallurgical expert of the commission, at San Francisco. The objective of the meeting was to obtain information covering the conditions under which tungsten ores are produced and marketed in California and Nevada.

J. H. Mackenzie, of the U. S. Bureau of Mines, was called, and he said that the domestic production of tungsten ores would probably be smaller in 1918 than in 1917, and the imports greater. For the first four months of 1918 the imports totaled 2300 tons of 60% WO_3. The imports came principally from South America, China and Japan, and were as a rule characterized by impurities. The imports in 1917 were: Hong Kong, 32 tons; other Chinese ports, 196; Siam, 28; Japan, 603; Mexico, 340; Portugal, 120; Argentine, 215; Chile, 1930; Peru, 1200; Panama, 159, Ecuador, 11; Bolivia, 45 tons; total 4880 tons. The production credited to Chile, Peru, Panama, and Ecuador was probably all of Bolivian origin. Portugal produced 3000 tons, and of this amount the destination of 1000 tons was unaccounted for and is believed to have been smuggled through Spain to Germany.

The domestic production was 990 tons in 1914; 2332 in 1915; 5849 in 1916; and 4800 tons in 1917. The estimated production in 1918 is from 4000 to 4500 tons. Mr. Mackenzie stated that the chief factor influencing domestic production was the price obtained per unit. The stocks of tungsten products and concentrates on hand are given in the following table:

TUNGSTEN PRODUCTS AND CONCENTRATES ON HAND

	May 1, 1917.	May 1, 1918.
Ferrotungsten (7% tungsten)	517,102	545,000
Ores and concentrates	1,134,379	2,370,219
Tool steel	3,555,257	5,269,958
All tungsten in the above figured as 60% concentrates	3,690,720	5,757,640

On May 1, 1918, it was estimated that there was 1000 tons of tungsten concentrates and ores in warehouses. The requirement for 1918 for the United States was estimated to be 11,975 tons, 60% tungstic acid, and the world requirement 21,000 tons. Mr. Mackenzie expressed the opinion that there would be no change in price.

In response to questions from Mr. Riddell as to whether tungsten mines were giving out or decreased production was the result of low price, Mr. Mackenzie said that increased production was a matter largely of price. A price of $35 or higher per unit would increase production 50%. At this price low-grade deposits containing from 0.5 to 0.75% tungstic acid could be worked in California and Nevada. In Colorado there are no large deposits of 1% ore. Concerning the Atolia mine, the grade of the ore ranged from 2 to 8% tungstic acid, although some ore produced by hand sorting contained from 60 to 70%. This mine is 550 ft. deep, but is not regarded as a large resource, as on the lower levels the ore is of lower grade. In three or four years the largest production will be made from the lower-grade deposits, such as those near Toulon and Mill City, Nev., and Bishop, California.

The cost of tungsten ore production in Colorado ranges from $15 to $33 per unit, and at the Atolia mine about $8 per unit. At this mine it was formerly much less, as at one time the ores were sold for $6.50 to $7 per unit. Bolivian tungsten costs are $18; Argentine, $18.98; Chile, Peru and Panama, $15.75 per unit (c.i.f. New York); Chinese, $11.60; Burma, $15.25 per unit, delivered at Liverpool; Japan, $17.41 per unit. Mr. Mackenzie discussed the difficulty of accurately determining costs, saying that tungsten deposits were most uncertain and ore reserves were extremely limited.

Commenting on the international situation, he said that Great Britain and France were anxious to enter into an agreeent with the United States to divide the tungsten production, Great Britain to retain the production from Burma and her colonies. the United States to have her own production, and the remainder to be divided among France, Great Britain and the United States. Under this arrangement, to last during the period of the war, the United States would obtain less than she was now receiving from Bolivia. The total producton of Germany and Austria is said to be 500 tons, and both of these countries are thought to be very short of this metal. Although it is believed that these countries are using molybdenum as a substitute, there is no certainty as to this. France, Great Britain and the United States are not using molybdenum, and there is no marked demand for this metal.

Speaking of metallurgical recoveries, Mr. Mackenzie said that the average recovery was 75%; although some claim 85%, few operations are attaining 80%. By stage crushing, more careful classification, dewatering and thickening, a better recovery is to be expected. Flotation is not a factor.

W. W. Bradley, of the California State Mining Bureau, stated that the tonnage production of California tungsten ores was greater in 1917 than in 1916, although the value was only 75% of the value in 1916. The production came from Inyo, Kern, Nevada and San Bernardino counties. He expressed the opinion that though many of the California deposits were small, there was sufficient ore to sustain production.

Samuel Kahn, of H. M. Byllesby & Co., said that his company was operating in the Lovelocks district in Nevada. He expressed the opinion that a higher price would stimulate production in Nevada.

F. W. Griffin, of the Tungsten Mines Co., discussed the difficulties of handling large low-grade orebodies, pointing out the large capital requirements for both property and mill. The Tungsten Mines Co. is operating a mill on ore 0.5% tungstic-acid content. The stabilizing of the price for tungsten ores over a long period would greatly facilitate the opening up of such low-grade deposits. He differed from Mr. Mackenzie in the question of price and said that $28 to $30 would be sufficient. The uncertainty of price was the principal disturbing factor, and the opinion was expressed that this condition should be removed by some form of price-fixing.

Robert A. Kinzie, engineer for the Tungsten Mines Co., stated that the deposits at Bishop, Calif., were typical of the low-grade deposits which occurred at a number of points in a zone extending from San Diego, Calif., to Lovelocks, Nev. He expressed the opinion that the ore supply of the future would come from such deposits, but that there would be considerable difficulties in bringing the deposits to production, on account of the large capital required for purchase, milling equipment and development. There are no tungsten deposits in the world where they were treating ores as low grade as at the properties of the Tungsten Mines company. Their greatest depth was 260 ft. The cost of production, including capital charges as well as operation, was $21.80 per unit. Mr. Kinzie said that depreciation was figured at 50%, and in response to questions as to whether this was not too great, he stated that the life of a tungsten property was short, that there was no established practice and that the figure was not excessively conservative. Operating costs were from $5 to $6 per ton. A price ranging from $25 to $30 per unit would asure development of low-grade deposits. For a plant of 300 tons' daily capacity, a tonnage of from 80,000 to 100,000 tons should be available at the beginning of operations.

M. J. Conroy, of the Black Hawk Tungsten Mining Corporation, Atolia, Calif., stated that his company had spent $200,000, but had not yet made shipments. He explained the marketing difficulties experienced by the small producers. As an example, he said that the Midvale Steel Co. would enter into a contract with a producer who could supply 10 tons of concentrates per month. This enabled the larger producers to obtain good prices and to readily move their product. The small producers were compelled to handle their product through dealers, and as a consequence obtained less for their ores and experienced great difficulty in disposing of them at all. He suggested the desirability of Government assayers for determining accurate weights and percentage and a price of $35 to $40 per unit for all ores.

L. J. Osdike, of the Randsburg District Miners' Association, mentioned the following as among the difficulties that the small producers were facing: Abnormally high operating costs; great fluctuation in the price of ores; small producers unable to ship in car lots; lack of stabilized price for local ores and the presence of the "middleman."

Edwin Higgins, of the California Metal Producers' Association, stated that the cost of mining supplies and machinery, owing to war conditions, had increased 80 to 90%. He was of the opinion that tungsten ore prices were much in need of stabilization.

There were about 30 in attendance at the meeting, and a fair number of those present contributed information in the course of the session.

Central Utah Manganese Deposits

Several deposits of manganese ore in southern Utah near Monroe, Sevier County, and near Marysvale, Piute County, have recently been examined by Victor C. Heikes, of the U. S. Geological Survey. These deposits lie along the eastern boundary of Sevier Valley, at the base of Sevier Plateau, which is underlain by igneous rocks, chiefly Tertiary tuffs and lavas.

The Loring deposit lies six miles south of Monroe, near the base of Monroe Peak. The nearest shipping point is Elsinore, on the Denver & Rio Grande R.R., eight miles distant. Nine carloads of ore were shipped from this place in 1916 to smelteries at Dunbar, Temple, and Washington, Penn. Assays of two carloads of the ore showed that it contained 35% of manganese, 6.6% of silica, and 8.57% of iron. The ore occurs in cracks and crevices of weathered igneous rock and has been obtained by stripping the overburden from an area 600 by 200 ft. to a maximum depth of 16 ft. Small lenticular masses of manganese and iron oxides in tufa have been found a short distance east of Monroe, but have not been mined. The deposits were probably formed by hot springs.

Near the mouth of Manning Canyon, 10 miles southeast of Marysvale, there is a deposit of manganese ore, owned by Krotki & Sandberg, of Marysvale. The ore is exposed in four opencuts, but no ore has yet been shipped. The outcrop of the ore strikes N 65° W, and can be traced for 400 ft. The inclosing rocks are lavas of several varieties, but most of the ore is disseminated through a flow of rhyolite that ranges in thickness from 8 to 30 feet.

Small shipments of manganese ore have been made from a deposit near Junction, Piute County, and from a deposit near Pahreah, Kane County, Utah. No detailed information concerning these deposits is yet at hand, but as the cost of hauling ore from Pahreah to the railroad is said to have been $30 a ton, the prospect of exploiting them with profit appears small.

Importation and Supply of Magnesite

The general embargo list of the War Shipping Control Board, issued last month, prohibited the importation of magnesite except by railroad, and as a result cut off the small shipments which were coming in from the Mediterranean deposits and preventing the resumption of shipments from the important deposits on the island of Margarita, Venezuela, which have been acquired by the American Magnesite Co., and the Magnesite Products Co., both of New York. Subsequently the embargo was modified as to shipments from Greece, provided the shipments were made from a port of return of the Allied ships engaged in the transport of troops and materials to Europe and under conditions that involve no delay of the ships.

Application has been made for a modification effecting the Venezuelan operations, based on the consideration that the importation from this source will relieve the railroads from the long haul from California and Washington deposits to the Eastern centers where the material is used as an essential refractory in the iron industry and in metallurgical operations. The present supply of the country comes entirely from these Western districts and from Canada. The Canadian material is mostly high in lime and not suitable for all purposes. Before the war the important source of supply, in addition to the Greece and Turkey high-grade deposits, was from an Austrian mine owned and operated by an American company. The high price and scarcity of magnesite have resulted in the substitution of other refractories and the use of various products made from dolomite.

Chronology of Mining for June, 1918

June 1—Official announcement of the schedule of prices for the manganese ores produced in the United States issued by the War Industries Board—Announcement of plans for the distribution of coal within the various states formulated by the U. S. Fuel Administration.—Strike of smelters at Bartlesville, Okla.; men returned to work on June 4.

June 3—Oil producers warned by the oil division of the U. S. Fuel Administration that the Government will not at this time permit any further advance in the price of crude oil.

June 6—American Zinc Institute was formed at Joplin, Missouri.

June 7—Announced that the entire production of pig iron and steel is to be distributed by the War Industries Board.—The Chemical Alliance pledged itself to coöperate with the chemical division of the War Industries Board in allocating and distributing sulphur-bearing materials during the war.

June 9—The rod and wire plant of the Anaconda company began operations.

June 12—Decision was rendered by the U. S. Supreme Court which sustained the Nevada courts in a case covering a new phase of the law of the apex, and upheld the right of the West End Consolidated to operate in both directions from the crest of a roll in its vein which formed the outcrop. The Jim Butler Tonopah Mining Co. had brought suit to recover the value of ore extracted from beneath the surface of its claims.

June 13—The Supreme Court of the United States denied the application for the writ of cetiorari by the Butte & Superior company in its litigation with the Clark-Montana Realty Co., commonly known as the Elm Orlu-Black Rock case.—The case of Louis Ross against Albert C. Burrage, vice president of the Chile Copper Co., which involved a commission on the flotation of the Chuquicamata property, was decided in favor of Ross by the master appointed by the U. S. Supreme Court.

June 16—Imports of copper ore, except from Cuba or that on rail from Canada or Mexico, were forbidden by the War Trade Board.

June 17—U. S. Tariff Commission opened a conference with tungsten producers at Denver, Colorado.

June 20—Restrictions on the importation of Mexican labor to be used in certain specified occupations were removed by an order of the Secretary of Labor.—Fire destroyed the Darling 500-ton mill of Commonwealth Lead and Zinc Co., near Picher, Oklahoma.

June 21—The War Industries Board added 45c. per ton to the base price of Lake Superior iron ore.—Meeting of the American Institute of Mining Engineers held at Washington, at which it was finally decided to drop all enemy aliens from membership. Announcement was also made of a proposition to be referred to the membership to change the name of the organization to the American Institute of Mining and Metallurgical Engineers.

June 25—James Douglas died.—Antimony producers appeared before the U. S. Tariff Commission in San Francisco.—Increased freight rates became effective.

June 26—Meeting of quicksilver producers before the U. S. Tariff Commission at San Francisco.—The President ordered the work on the use of gas in warfare to be transferred to the War Department from the chemical section of the Bureau of Mines—Explosion of dynamite blast prematurely by lightning caused caving of a bank at the Silver open-pit mine at Virginia, Minn., burying and killing 19 men.

June 27—The War Industries Board announced maximum prices for sulphuric acid.—U. S. Tariff Commission, sitting at San Francisco, heard arguments of chrome-ore producers.

June 28—Meeting of tungsten producers before the U. S. Tariff Commission in San Francisco.

June 29—The Federal Trade Commission issued a report on war profits which discussed policies and profits of mines producing copper, zinc, nickel and sulphur.

June Pig-Iron Production

Pig-iron production in June was 3,323,791 gross tons, as compared with 3,446,412 tons in May, according to *Iron Age*. The daily rate for June was 110,793 gross tons, as against 111,175 in May. A total of 44,844 gross tons of ferromanganese and spiegeleisen was produced during June.

Declining Gold Production of Australia

Gold mining is steadily decreasing in Australia. The returns for the first quarter of 1918 show that the decline, which began over 10 years ago, continues in every state of the commonwealth. The causes are lower grade of ores, higher operating costs and no new discoveries. The existing gold mines of any consequence, as depth is gained, are all finding their ores decreasing in grade and quantity and becoming more difficult of treatment. Since the West Australian discoveries no large fields have been opened. A few new mines or small fields have been opened there, but they are not sufficiently rich to make up for the decrease in the production from the larger mines. The five other states, the Northern Territory and the Papuan Islands have not produced any really big mines in the last decade. A small production may have been obtained from local mines which did not make returns, but the total from them does not affect the main issue, namely, that gold mining in Australia is not paying its way today. The gold won from copper ores is also not taken into account in the statistics.

The shares of about 50 gold mines and six dredging properties, of which number only 10 have paid dividends during the last 12 months, are quoted on the Interstate Stock Exchanges. So far as the quality and ease are too old; that is, their rich ores which were easily of treatment go, the trouble is that the bulk of the mines treated are worked out. Dredges are cleaning up the old alluvial fields, but these also are decreasing in number. The higher costs result from increased prices of labor and materials. Although Australia has not resorted to conscription, labor is depleted by war recruiting and that left is inefficient. Wages have had to be increased everywhere to meet higher living costs, and in most states the hours of work have been decreased to 44 per week. Costs of material have necessarily risen from 100 to 400%. Steel, iron, zinc shavings, coke, explosives and freights are all higher. The base-metal producers have had the advantage of higher metal prices, which the gold mines have not. Economy in working cannot do much for the industry, as a whole, though it may help individual mines. Thus the amalgamation of the Bendigo gold mines is a move in the right direction, taken about 20 years too late, however.

Since there seems no hope of a radical economy in costs nor general rise in grade of ore of existing mines, the next decade will record a marked decrease in the number of Australian gold mines, unless new fields are discovered. The probability of new fields is, however, good. The western half of the commonwealth, from a line drawn from the center of the Gulf of Carpentaria to Port Pirie, is virtually unexplored, except for the West Australian portion, which is really not much more than a patch when the vast total area is considered. The country to be opened by the new railway line running from Port Augusta to Kalgoorlie will perhaps be the region of the next "rush," for it affords a base for the exploration of the dry country to the northward.

Neill Jig Tests for Tin Dredging

BY L. H. EDDY*

Fifteen tests with two Neill jigs and one test with a sluice box were made recently at San Francisco for the purpose of obtaining data to determine the desirability of this type of jig as a part of the metallurgical equipment of dredges operating in tin-bearing gravel near Potosí, Bolivia, South America. The tests were conducted by Joseph S. Henry, a mining engineer of Sydney, Australia, now in Bolivia. The main data collected covered the following points: Recoveries made by jigs; capacity; water used, and modifications required.

The essential points and results of jig tests Nos. 1 to 12 inclusive are covered in the accompanying table, which is a summary of the three tables contained in the original report. Tests Nos. 13 to 16 were not tabulated.

SUMMARY OF RESULTS OF NEILL JIG TESTS FOR TIN DREDGING

Points Considered	Jigs	Test No. 1	Tests Nos. 2, 3, 4, 5	Tests Nos. 6, 7, 8, 9, 10, 11,	Test No. 12
Depth of jig bed, in.	No. 1	4	4	3½	3½
	No. 2	4	3½	3½	3½
Material treated, cu.yd.	No. 1	1	1	½	3
	No. 2	1	1	½	3
Ratio of reduction	No. 1 and No. 2	15.6 to 1	15.1 to 1a	9.23 to 1a	9.9 to 1
Concentrates produced, lb. per cu.yd. treated	No. 1	136	140a	237a	600
	No. 2	62	71½a	93a	200
Total concentrate, lb.		198	211½	330	800
Tin content of concentrates, lb.	No. 1	3.276	3.208a	3.020a	7.5
	No. 2	0.03	0.033a	0.156a	1.483
Total tin content, lb.		3.306	3.241	3.176	8.983
Recovery, per cent	No. 1	86.48	85.22a	86.31a	81.96
	No. 2	0.7	0.87a	3.156a	4.83
Total recovery, per cent		87.18	86.09	89.466	86.79

a Average.

Tests No. 1 to 12 inclusive were made upon material similar in character to that to be treated in Bolivia. Nos. 1 to 5 were made upon 1-cu.yd. samples; No. 6 to 11 upon ½-cu.yd. samples; No. 12 upon 3-cu.yd. samples. The material was river gravel and tin oxide. The gravel, having a sp.gr. of 2.66, was passed through a screen having ⅜-in. perforations. The screening tests showed the following percentages of gravel remaining on the screens of from 10 to 100 mesh: 54.6% on 10 mesh; 20% on 20 mesh; 12.2% on 40 mesh; 2.7% on 60 mesh; 0.34% on 80 mesh; 0.07% on 100 mesh, and 0.08% passed through 100 mesh.

The tin oxide used amounted to eight pounds per cu.yd. The sp.gr. was 5.563, and screening tests gave the following results: 1.314% on 20 mesh; 34.08% on 40 mesh; 33.7% on 60 mesh; 17.95% on 80 mesh; 7.76% on 100 mesh, and 5.196% passed through 100 mesh. The largest particles of tin oxide saved had a diameter of over .065 in., but less than .09 inch.

Two jigs arranged in series were used, the effective screen area of each being eight square feet. The screens were W. S. Tyler Ton-Cap No. 368, having .093-in. openings. Cast-iron shot of ¼-in. diameter and gravel were used for the jig bed, the sp.gr. of the shot being 5.245. Provision was made to maintain a regular feed to the jigs and an even distribution over the full width of the screen. The jigs were operated at speeds varying from 135 to 146 strokes per minute, with 140 strokes per minute for the final tests. Length of stroke was 3½ inches.

Material was fed to the jig at the rate of four, six and eight cu.yd. per hr. to determine the amount that could be treated with good recoveries. The best recoveries obtained were from gravel treated at the rate of 4 cu.yd. per hr., although test No. 12 did not confirm this result, which would indicate that for continuous running less than 4 cu.yd. per hr. could best be treated. The amount of hutch water used during the tests varied from 50 to 60 gal. per min. per jig.

The concentrates produced per cu.yd. of gravel treated by the jigs were as follows: In test No. 1, No. 1 jig produced 136 lb. and No. 2 jig produced 62 lb.; in tests No. 2 to 5 inclusive, No. 1 jig produced 125 to 166 lb., the average being 140 lb., and No. 2 jig produced 68 to 78 lb., with an average of 71½ lb. The ratio of reduction for tests No. 1 to 5 varied from 13.6 to 1 up to 17.3 to 1, the average being 15.1 to 1. In tests No. 6 to 11, inclusive, No. 1 jig produced from 212 to 280 lb. of concentrates, averaging 237 lb., and No. 2 jig produced 80 to 106 lb., with an average of 93 lb. Ratio of reduction for tests No. 6 to 11 varied from 8 to 1 up to 10 to 1, the average being 9.23 to 1. Specific gravity of the concentrates produced by No. 1 jig varied from 2.78 to 2.842, those produced by No. 2 jig ranging from 2.701 to 2.8.

Test No. 12 was made to determine the effect of continuous running of the jigs. Three cubic yards of material was treated, and in 45 min. of the running time the recovery from No. 1 jig was 81.96%, which was lower than any previous test. Recovery from No. 2 jig was 4.883%, which was higher than any previous test. Results indicated that for continuous running the jigs would be improved by increasing the width and length of the screen. In this test, No. 1 jig produced 600 lb. of concentrates per cu.yd. treated and No. 2 jig produced

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*Associate editor, "Engineering and Mining Journal," San Francisco, California.

200 lb. of concentrates per cu.yd. Seventy pounds of concentrates remained at the end of the tests.

Test No. 13 was made with a sluice box to obtain data for comparison with results of the jigs. Both sluice box and jig worked on material similar in physical characteristics, and the recovery was 88 per cent.

Test No. 14 was made upon fine gravel and sand having physical characteristics similar to the material being worked by the Kampong Kamunting dredges. The results of this test were lower than from material used in tests No. 1 to 12, indicating that further experiments upon this class of material should be made, and that such experiments could best be conducted at the mine.

Tests Nos. 15 and 16 were made upon concentrates from former runs, to determine what additional treatments of the concentrates might be advisable before delivery of the product to the mill. Detail data of test 13 to 16 inclusive are not available and are not at present essential.

Compressed-Air Terms Defined

Upon the recommendation of its technical committee, the Compressed Air Society, with headquarters at 30 Church St., New York, has adopted the following definitions of certain compressed-air terms in order to eliminate confusion as to their exact meaning:

The displacement of an air compressor is the volume displaced by the net area of the compressor piston.

The capacity should be expressed in cu.ft. per minute and is the actual amount of air compressed and delivered, expressed in free air at intake temperature and at the pressure of dry air at the suction.

Volumetric efficiency is the ratio of the capacity to the displacement of the compressor, all as defined above.

Compression efficiency is the ratio of the work required to compress isothermally all the air delivered by an air compressor to the work actually done within the compressor cylinder, as shown by indicator cards, and may be expressed as the product of the volumetric efficiency (the intake pressure and the hyperbolic logarithm of the ratio of compression), all divided by the indicated mean effective pressure within the air cylinder or cylinders.

Mechanical efficiency is the ratio of the air indicated horsepower to the steam indicated horsepower in the case of a power-driven machine.

Overall efficiency is the product of the compression efficiency and the mechanical efficiency.

The society further recommends that the use of other expressions of efficiency be discontinued.

Mining in Siamese Malaya

In an article contributed to the *Penang Gazette* under the heading of "Mining in Southern Siam" interesting details are given, according to Vice Consul C. C. Hansen, at Bangkok, in regard to the highly efficient methods used in the adaptability and inventiveness shown by the ordinary Chinese miners or coolies in the performance of their work. Mr. Hansen says further:

The present methods of alluvial mining are exclusively Chinese, and, although primitive, deserve praise. The simplest method is that known as lampaning, or muanglen. It consists of a drain cut into the hillside into which the water of an adjacent stream is allowed to flow, being conveyed either by a drain or in bamboos, placed one into another to form a pipe. The tin-bearing drift is hoed into this lampan or drain, where it is washed to free it from the worthless material, by one or two men. This method is cheap and invariably adopted by the Chinese where the tin-bearing drift is shallow. Such abandoned workings are seen away up on the slopes of the Main Range several thousand feet above sea level, and the water brought to them from a distance of four or five miles.

The next in favor is shafting (muang roo). The Chinese have recourse to this form of mining where the tin-bearing drift is deep and the overburden thick. A shaft 10 ft. x 5 ft. is carried down until the tin-bearing stratum is reached. The water is lifted by native whips. When the tin-bearing drift is reached it is conveyed to the top by windlasses, a washing trough is made of planks just by the side of the shaft, and washing is done with the water raised from the shaft. At some of the mines owned by well-to-do Chinese, burrowing is done through the tin-bearing drift to meet other shafts 30 or 40 yds. apart. The roof is held up by planks on wooden props. This is dangerous work, and frequently the props give way and let loose a ton of sand and stones, thus burying half a dozen workmen.

The next method adopted is the opencast or lombong. Although there are one or two mines being worked on this system, it is not at all popular in Siamese Malaya, as it requires capital for the initial outlay, and the employment of several hundred coolies for the removal of the overburden.

Next come those mines involving European capital and European management. Bucket dredging is the only form of mining, except in one or two cases undertaken at present in southern Siam, and pride of place must be given to the Province of Tongkah and Renong, on the west coast This form of mining no doubt is the cheapest in the long run, but can be undertaken only where the tin-bearing drift is shallow, 35 to 50 ft., and the nature of the soil sandy and void of large stones and boulders. Such mining areas are only obtained at the coast and in beds of rivers, and these are eagerly sought for by prospectors, who overlook valuable mining areas situated at the foot of the main range which are suitable for other forms of mining. The central provinces may almost be called a mountainous country, certainly a hilly one, enjoying an exceptionally heavy rainfall six months in the year. One would expect to find a general utilization of water pressure as a cheap source of power, but the tin-mining industry is yet in its infancy and a few years hence will see hydraulic mining more generally in use.

In the Province of Nakorn Sritamaraj, in the Amphurship of Si-Choon and Clai, there are tungsten lode mines owned and managed by Chinese. The working of these is primitive, and most of the blasting is done by black powder and the crushing by hand. Where tin stone occurs with the tungsten, no separation is done, but the ore is sold as mixed ore. However, since the outbreak of the war the government has encouraged the use of explosives, under certain restrictions, and consequently the output has greatly increased. A good amount of mixed ore (tungsten and tin) is now being produced by these mines, which is being shipped to the Straits Settlements and the Federated Malay States for separation, and as more areas are opened out the output will increase.

In the Amphurship of Hoyoet, Province of Trang, scheelite lodes and alluvial deposits have been found, and one or two enterprising miners are endeavoring to develop this industry.

The regions in which deposits of monazite sand are found are few in number and small in extent. As far as present knowledge goes, such deposits occur with the tin deposits in certain mining areas in Nakorn Province, but not in workable quantities.

Antimony and galena lodes are known to exist in different parts of the peninsula and one or two lodes have already been found in the Province of Patani. So far no attempt has been made to prove these deposits.

In the Province of Patani gold is found in the beds of one or two streams and panned chiefly by Chinese and local Malaya, who exchange their gold for provisions at the Chinese stores.

A Matte-Storage Furnace erected at the Wallaroo Smelting Works, in Australia, has permitted the bessemerizing of the copper matte to be carried out with greater regularity during ordinary working days and has eliminated the necessity for Sunday work at the converters, according to the report of the Wallaroo & Moonta Mining and Smelting Co., Ltd., for the half-yearly period ended Sept. 26, 1917. The quantity of ore and precipitate smelted during the six months was 33,888 tons, producing 3539 tons of refined copper; in addition, 263 tons of fine copper from Mount Cuthbert blister were dealt with. The acid plant produced 3427 tons of acid. There were 333 persons employed at the smelting works.

Remember the Comfort Fund of the 27th Engineers.

Keep the Home Fires Burning

Like the temple of Janus in the Roman Forum, the doors of which were open in war and closed in peace, the Comfort Fund is always open to the call of the regiment for which it was established. But the call is not always the same. Yesterday, perhaps, a typewriter was needed for regimental business. Again, today, some soldier's family on this side is in need of help. Many undoubtedly do not realize that the contributions received are actually being disbursed in so many different ways. A case in point is the following which has just received attention:

Private X, at present in France, has a mother and two sisters dependent on him for support. At the time of his enlistment, he allotted two-thirds of his pay to them, took out insurance and applied for a pension for the dependent parent. However, up to a month ago, they had not received a cent of the money due them. In the meantime, Private X fell sick and was in the hospital for several weeks, and, being thus unable to sign the payroll, received none of his share of his pay. He was thus led to appeal to the Comfort Fund in behalf of his people at home. The latter are now getting a monthly remittance from the fund equal to the Government allotment they should have received but did not. This will continue until the official tangle is straightened out.

Keep the home fires burning. There is no more important thing to do. How efficient a soldier or miner could Private X be, with such a matter worrying him? Let the cold blooded reason that these things are unnecessary and profitless, but do you send in your check to the Comfort Fund today. The fund stands as follows:

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	5.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis E. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
J. H. [illegible]	10.00
H. A. Kee	10.00
W. S. [illegible]	5.00
Marcus J. Thomas	10.00
L. F. [illegible]	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Francis Thomson	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
Oscar Lachmund (monthly contribution)	10.00
L. F. Mathewson	50.00
Interest to June 1	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Charles Le Vasseur (third contribution)	5.00
Total	$15,410.11

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Contributions are acknowledged only by publication in the *Journal*.

Production and Domestic Distribution of Explosives in 1917

The total production, excluding exports, of explosives in the United States during the calendar year 1917, according to figures that the U. S. Bureau of Mines has received from manufacturers, was 582,475,327 lb. (291,238 short tons), as compared with 505,415,052 lb. (252,708 short tons), in 1916. The amount used in each state is shown in the following table:

AMOUNT OF EXPLOSIVES (EXCEPTING EXPORTS) MANUFACTURED IN THE UNITED STATES AND USED IN THE VARIOUS STATES DURING THE CALENDAR YEAR 1917

State	Black Blasting Powder. *Kegs.*	High Explosives Other than Permissible. *Pounds.*	Permissible Explosives. *Pounds.*
Alabama	260,017	6,319,574	4,322,120
Alaska	86,222	5,083,485	63,700
Arizona	31,510	14,992,697	130,300
Arkansas	140,081	1,400,070	69,300
California	124,048	13,617,199	20,450
Colorado	113,583	7,700,225	994,005
Connecticut	752	632,425	750
Delaware	186	54,750	....
Florida	1,714	1,717,350	760
Georgia	41,184	1,002,789	404,540
Idaho	4,471	5,362,200	....
Illinois	2,020,412	5,644,191	2,379,350
Indiana	1,021,329	2,161,119	242,525
Iowa	444,276	1,996,682	2,700
Kansas	550,705	4,551,628	221,556
Kentucky	545,401	2,169,169	1,042,190
Louisiana	9	1,200,658	62,000
Maine	2,313	531,425	....
Maryland (*a*)	47,043	1,565,975	50,075
Massachusetts	2,977	594,115	13,450
Michigan	34,894	29,099,611	155,100
Minnesota	173,926	11,694,029	....
Mississippi	2,260	438,825	500
Missouri	227,080	20,939,965	240,470
Montana	138,759	7,774,421	51,050
Nebraska	5,002	162,240	1,997
Nevada	6,450	7,693,795	....
New Hampshire	323	112,900	500
New Jersey	2,181	2,434,467	950
New Mexico	30,729	3,741,454	730,375
New York	21,658	8,013,247	1,119,225
North Carolina	23,922	1,816,720	1,050
North Dakota	32,831	345,480	100
Ohio	638,519	7,108,617	82,744
Oklahoma	200,609	9,044,506	566,791
Oregon	18,171	3,089,516	1,550
Pennsylvania	2,504,344	35,831,445	17,521,706
Rhode Island	283	65,275	....
South Carolina	7,541	491,000	2,640
South Dakota	2,699	1,736,930	....
Tennessee	183,151	3,336,285	252,002
Texas	69,361	1,766,550	69,100
Utah	30,135	4,661,250	4,652,950
Vermont	7,485	338,250	2,000
Virginia	148,467	3,289,350	425,775
Washington	39,108	6,031,522	388,100
West Virginia	932,282	4,795,859	6,256,176
Wisconsin	5,073	7,256,455	....
Wyoming	159,265	908,390	498,100
Total ....(*b*)	11,084,741	262,316,080	43,040,722
........(*c*)	277,118,525		
		582,475,327	

(*a*) Includes District of Columbia; (*b*) Kegs of 25 lb. each; (*c*) Pounds.

The production for 1917 is segregated as follows: Black powder, 277,118,525 lb.; "high" explosives other than permissible explosives, 262,316,080 lb.; and permissible explosives, 43,040,722 lb. These figures represent an increase of 61,543,500 lb. of black powder, 7,161,293 lb. of high explosives, and 8,355,482 lb. of permissible explosives, as compared with figures for 1916.

Editorials

The American Zinc Institute

A MEETING of the newly organized American Zinc Institute is to be held in St. Louis on July 29, when the men of the zinc industry will get together and discuss plans, and ways and means. As yet there are scarcely any that are distinctly in mind, and none that have been formulated. There has simply been an expression of the underlying idea that something can and ought to be done to promote the welfare of the industry, and in so doing help the country, whose industries are the bases of its prosperity and success, the insurance of which was never so important as now. The movers in the new organization will look to the leaders of the industry to guide it into good, useful and practical paths. It is the duty of the leaders to respond to this call. That they will do so, there need be no doubt.

The prosecution of this war has emphasized as never before the essentialness of metals in the life of the human race and the existence of nations, whether at peace or in warfare. What was formerly appreciated only by philosophers and statesmen is now known by every man who reads and thinks. Some metals have peculiarly valuable properties, but all metals are needed just for the fact that they are metals, and no one can say that any one is needless, and that therefore the country may be heedless of it. But heedless it may be unless the people who are especially interested take the trouble to look out for their own.

There is not only the present need of our country to be considered, but also there are the big questions of our industrial positions after the war. Among the things that the conditions of this unparalleled war have already induced is a broader vision of the nature of industries and the benefit of coöperation in them. That vision is going to last. The spirit of coöperation for the common good is going to endure. The iron and steel men have seen this already. The zinc men are seeing it and are going to get together with the appreciation that what is good for all is good for each one. The meeting in St. Louis ought to be well attended. It may be made to mark a new era in a romantic and important industry and play a considerable part in our national efforts in the great cause.

The Lead Market

THE great extent to which lead is consigned for consumption, both by the Government and by private concerns, on the basis of average-price contracts, draws attention to certain conditions that embarrass producers who aim in their dealings to be fair and just to everybody. We believe that such is the inspiration among the leading lead producers of the United States. In speaking of the lead market in this article, we are referring to the major market for this commodity, by the terms of which the lead passes directly from producers to consumers, which transactions comprise all but a small percentage of the total. The transactions of dealers and speculators, which are quite minor, do not enter into this consideration.

The trouble with the lead market—and in speaking of trouble our language is purely technical—is that there are in the United States two primary markets and basing points, disregarding the Pacific Coast. These are New York and St. Louis. Other points, such as Omaha, are origins of refined lead. The real difficulty arises from the inequality between the freight rate from St. Louis to New York and from other Western points to New York. The recent advance in rates has emphasized this.

New York has long been the principal basing point for the lead business of the country. It is a primary market in that lead is refined here, affording an immediate supply. In the case of copper, New York is the primary market of unchallenged position, for the greater part of the American copper is both refined and distributed from here. On the other hand, in common zinc New York is not a primary market at all, for no such zinc is produced here, the bulk of it coming from places west of St. Louis, from which gateway it spreads out into consumption. Therefore the market for common zinc is based on a price at St. Louis (although the actual business be done in New York), and prices at other places are determined by adding the freight rate from St. Louis.

A great deal of lead—all the Missouri product—originates from points south and southwest from St. Louis. If all of the Rocky Mountain lead came through St. Louis, or paid a freight rate to St. Louis, or the equivalent, the situation with respect to lead would be the same as with zinc. But such is not the case. By the schedule prevailing previous to June 25, the Western lead, either as refined pig or as base bullion, came East to New York on a smelting-in-transit rate, which made the cost of delivering in New York only 7½c. per 100 lb. higher than the cost of delivering in St. Louis, although the direct rate from St. Louis to New York was 19c. per 100 lb. Since June 25 the rate on lead from St. Louis to New York has been 35c. per 100 lb., and the smelting-in-transit differential has been 27 cents.

These conditions have a direct bearing upon the relative positions of the two primary lead markets. If the Missouri producers can sell in St. Louis, or on the St. Louis basis, all the lead they want to, leaving the New York market to the Western producers, the St. Louis price will naturally be below the New York price only by the amount of the smelting-in-transit differential, namely, 7½ points, previous to June 25, and 27 points now. Any greater demand in that market, causing a further rise in price, would lead the Western producers to put their lead there, which would then cause New York buyers to bid more, and there would be a general rise in prices. There were brief periods during

1917 when lead sold in St. Louis and New York at the same prices, but those were times of great excitement in the market, and the existence of any such condition was only ephemeral.

If, on the other hand, the Missouri producer cannot sell all of his lead in St. Louis or on the St. Louis basis, and must dispose of more or less of his product in the East, he can get no more than what the Western producers are willing to sell for. But in order to meet their price he is obliged to pay a freight rate of 35c. per 100 lb., wherefore his lead nets him that much less on the St. Louis basis. In other words, he is willing to accept what, when reduced to the St. Louis basis, is a price lower than what the smelting-in-transit differential would indicate. But of course he would do no such thing if he could dispose of all of his lead in St. Louis and its territory.

However, suppose that the Missouri producer could not dispose of all of his lead in his own geographical territory, but that the general lead market be so strong that he could require Eastern consumers, unable to secure enough lead in the New York market, to buy in St. Louis and themselves pay the St. Louis-New York freight. Indeed, he could do that, and there would be nothing impolitic or inequitable about it, were it not for the existence of average-price contracts. The willingness of some Eastern consumers to buy in St. Louis and themselves pay the freight should hardly be permitted to penalize those who are committed to the taking of thousands of tons monthly on average-price contracts. The whole question is much like that of the familiar one of action and reaction, which are equal. Much depends upon the point of view, whether it be that of the seller or the buyer. The former can argue strongly for a St. Louis price 27 points below New York and the latter for 35 points (having in mind the present New York quotation of 8.05c.). Our opinion is that the fair thing for a settlement price, reflecting the major market, is to split the difference and make a settlement differential of 31c., or say 30c. for the sake of a round figure.

Pan Grinding and Its Application

IN ANOTHER part of this issue we print an interesting article on methods of ore dressing and gold recovery at a West African plant. A feature of the installation is a battery of Cobbe pans as regrinders, representing a departure from usual practice outside of Australia. The Cobbe pan is an improved modification of the Wheeler, Forward-Down, and other types, which were, in turn, improvements over the original standard grinding and amalgamating pan which figured so prominently in mining machinery catalogs a quarter of a century ago.

The earliest types of pan were used mainly for amalgamation purposes, and the grinding of the charge was of secondary importance. The subsequent adoption of this machine for grinding purposes has led to an unfair condemnation of grinding pans in general; but in those cases where it has been successfully used, it is to be noted that numerous improvements have been made in the design. The maintenance of even grinding pressure between shoe and die was insured by suitable compensating weights which were used when the shoes were worn and the grinding pressure was diminished. The overflow was automatically classified and the oversize returned to the body of the pan for further reduction. Proper provision was made to insure that the feed was delivered between shoes and dies.

As soon as it was realized that grinding was the result of even gravity pressure of the revolving upper part of the machine, and that the same results could not be achieved by undue tightening of the adjusting screw, steps were taken to increase the number, thickness and weight of the shoes. In order to insure the same length of life of both grinding faces, the dies were thickened in proportion. Other steps were taken to regulate the density of the pulp, to determine the proper number of revolutions, and to provide, also, an appropriate size of feed.

All these modifications were the result of many years of patient experimentation, with the result that competitive tests between the improved pan and the modernized tube mill showed much the same result for horsepower expended and cost of upkeep. In addition, the pan commended itself in various instances as superior to the tube mill. All its parts are immediately accessible; and, as the capacity of each unit is comparatively small, there is less disorganization of the entire mill during repairs and renewals. No extra power provision is needed for starting up. The final advantage is in connection with its use as an amalgamator when grinding and its suitability for handling concentrated material from tables or other devices. Its adoption in this connection has often resulted in the ultimate recovery of a large proportion of the gold in a refractory material without the loss of the pyrite with which it may be associated.

The Cobbe pan described in the article to which reference is made is a modification of the ordinary pan and is better adapted for stage grinding than sliming. It possesses a large screen surface, through whch the discharge takes place, whereas with all other types of pan the ground pulp is allowed to overflow. Pressure between shoe and die is kept at a predetermined constant by means of levers and weights so arranged that the dies press against the shoes. Compensating weights are therefore unnecessary, as the pressure is practically uniform, irrespective of the thickness of the grinding plates. Self-dressing edges obviate ridging of shoes or dies as the surfaces are worn, and, consequently, hindered discharge is prevented.

The grinding pan is favored in Australia and is suitable for many other localities, especially where small initial capacity is required and amalgamation is practicable. It has shown its value in many installations where advantage has been taken care of the large number of improvements which have made it an efficient machine for special classes of work.

Increased Postage Rates

NEW rates of postage on magazines became effective July 1. These increases are material, particularly at distances of more than 300 miles from the place of publication. The obvious step would be to raise the subscription rates in distant zones to cover the added postage. For the present, however, the publishers of the *Journal* have decided not to increase the subscription price, trusting that in the interests of national unity Congress will before long repeal the zone law and revert to the universal flat-rate system. Zone rates on magazines obtained in this country before the Civil War, but were abolished in 1863. The publishers hope that they will not find it necessary to increase the cost of the paper to its readers.

The Index—Volume 105

WE INTEND to publish the Index to Volume 105 early in August. Believing that many who receive the Index do not bind their copies, and in compliance with the Government's request to conserve paper, we will send the Index only to those requesting it.

If you want a copy of the Index send in your request promptly. A postcard will do.

BY THE WAY

A husky blacksmith who is also a prospector and miner made the following interesting statement to us:

"I have quit prospecting and mining for the present to help win the war at my trade, not being able to enlist. Mining about Tacoma, Wash., was quiet, and the bottom had dropped out of the molybdenum ores. Will take up prospecting later in eastern Oregon. For the present, it is work and make a stake for the future. They will want ores after the war."

Flotation works in a way that seems very simple, once you have the hang of it. If any little detail of it mystifies you, the following letter received by a friend of ours will probably solve the puzzle:

> dear sir: for 3 year I hev bin runing a floatashun machine and hev fond out why it works and as you told me you dont no why it works I am going to tel you something. the pine oil is just like sope it cleans of the dirt and makes suds and the tar oil works like a magot an draws all the minrel togather you hev to hev enuff sope suds to push the mineral over the top of the spitscasing.
>
> hopping you no why it works and hev you a job for me
>
> yourstruly

After some years of "minin'," Dicky decided to change his trade, and, upon recommendation, secured a job as machinist's helper at one of the mine shops. One of his first tasks was that of drilling a number of holes in a steel plate, and the foreman, after carefully explaining how the drill press operated, told him to be sure and follow the blueprint and "stagger" the holes. This happened toward the end of the day, and Dicky was unable to make a start on the work. The next morning, the foreman was making his rounds when he was accosted by Dicky. "See 'ere, naow, Frank. Last night, w'en I got 'ome, I was puzzlin' an' puzzlin' over that there job o' mine. Couldn't figger out wot thee did'st mean by this 'ere 'staggerin'.' Asked th' old man, an', damme, 'ee's been 'bout this bloody worl' for nigh on to sixty year, an' never 'eard tell o' she. Finally ussen figger'd h'out that thee must mean putten' in they bloody 'oles 'iggledy-piggledy."

An overbearing safety inspector was making his first trip through the large machine shop of a certain mining company in northern Minnesota. In matters of safety the foreman was well posted and had spent considerable time in working out various designs and ideas throughout the shop, and it was considered a model from a safety standpoint. In vain the inspector looked high and low for some flaw to criticise, and had almost given up when he noticed an overhead crane that seemed to be unprovided with the usual steel ladders and guard rails. By this time the foreman was well aware of the critical attitude of his observer and resolved that he would not be bested. "Now, tell me, Mr. M——, how do you manage in regard to oiling that crane?" said the inspector. "Well, you see," replied the foreman, "every time we figure she needs oiling, we run in a locomotive and one of the boys climbs up on top and does the job." "Oh, I see," answered the supercilious one; "but you don't mean to tell me that a man could reach up that distance and do the necessary work, do you?" "Well, not now," replied the foreman, "for Bill Simms, who is nigh on to seven feet, left last week. But for those other guys, we just block the locomotive up, and that does the trick."

Blasting a Frozen Iron-Ore Pile Within a Building

The Pennsylvania Salt Co., at Greenwich Point, Philadelphia, had to shut down last winter for about a week on account of coal shortage. During this time the cold weather was severe. Iron ore, used extensively in the company's chemicals, was piled up inside of a building, which is about 100 ft. long by 75 ft. wide, in the form of the crater of a volcano, that is, high all around the sides and low in the center. This form gives frost a great opportunity to penetrate through the entire mass as the ore becomes thoroughly saturated.

The frame building in which the ore is piled has the engine and boiler rooms at one end, and the acid mixing tanks at the other end. Along one side are long rotating mortars; overhead are automatic cranes carrying dip buckets so that they can move the ore from place to place. The other side of the building is exposed to the open.

At the solicitation of the company an expert blaster visited the plant to look over the work and see what he could do. He started on the outside lip of the crater, placing about 15 charges, using one stick of 40% ammonia dynamite to each charge, the distance between the charges being about two feet. After the charges were set, great care was exercised in tamping and capping; then the men ran their cranes out a distance of about 50 ft. The other machinery kept in motion. The men in the acid mixing tanks moved away for safety sake. After the charge had gone off the crane returned and removed the shattered material, dumping it into the center of the crater. The blaster then moved on around the lip until he had lowered the entire circumference down to the uniform level, and kept on repeating the operation in circles until the entire 10,000 tons of ore loosened and in working condition.

The entire operation used up 450 lb. of dynamite, 900 caps, and consumed 10 days' time of three men, including the blaster. The cost of the operation was $300, but the material could not have been loosened in any other way practicable at the time, and not a board was broken nor was the building in any way damaged by the work.

Personals

Have You Contributed to the Association of the 27th Engineers?

J. B. Tyrrell, of Toronto, visited the Porcupine and Cobalt camps recently.

Capt. Stanley C. Bullock, Royal Engineers, has been awarded the Military Cross.

Maynard Nizel is with the Air Nitrates Corporation, at Muscle Shoals, Alabama.

Edwin E. Chase is in the Wickenberg district of Arizona on mine-examination work.

Dr. W. L. Goodwin was recently elected chairman of the Canadian section of the Society of Chemical Industry.

D. H. Angus has resigned his position as general manager of the Tough Oakes mine at Kirkland Lake, Ontario.

Douglas A. Mutch has been engaged by Coniagas Mines, Ltd., of Cobalt, Ont., to manage its Ankerite property at Porcupine, Ontario.

F. L. Ransome, of the U. S. Geological Survey, attended the Tariff Board hearings held in San Francisco from June 25 to June 28.

James M. Platt has been appointed assistant to the manager of the Sociedad Explotadora de Caylloma Consolidada, at Arequipa, Peru.

A. R. Globe, assistant manager of the Hollinger Consolidated Gold Mines, Ltd., at Porcupine, Ont., is leaving the service of the company.

Royal P. Jarvis, formerly with the Cananea Consolidated Copper Co., Cananea, Mex., is now with the Cia. Metalurgica de Torreon, Coahuila, Mexico.

C. S. Parsons has accepted the position of superintendent of the Joseph Dixon Crucible Co.'s graphite mine and mill at Graphite, New York.

Norman Braly, general manager of the North Butte Mining Co., has returned to Butte, Mont., after a business trip to New York and other eastern cities.

C. A. H. de Saulles has become general manager of the Colorado Department of the American Smelting and Refining Co., with headquarters at Denver, Colorado.

F. A. Botsford has been made general superintendent on the Mesabi range for Pickands, Mather & Co., succeeding **W. P. Chinn**, who becomes general manager.

T. R. Finucane, late manager of the McKinley-Darragh mines, of Cobalt, Ont., will act as managing director. He is succeeded as resident manager by **H. C. McCloskey.**

C. H. Dunning, superintendent of the Big Pine Consolidated Mining Co., of Prescott, Ariz., has joined the Navy, serving as chief machinist's mate. He is succeeded by **D. R. Finlayson.**

Dr. Alfred Stansfield is now in British Columbia, where he has been retained by the Government to investigate the possibilities of smelting the iron ores there by electrical means.

Arthur L. Lee has been appointed engineer for the Electric Point Mining Co., of Leadpoint, Wash. He was previously with the Homestead Iron Dyke Mines Co., Inc., in Baker County, Oregon.

John D. Cooner, a junior member of the American Institute of Mining Engineers, was wounded by shrapnel on Apr. 9, 1918, and is now in a hospital in Paris, where he is said to be getting along nicely.

A. Gordon Spencer, consulting chemist and metallurgist of Montreal, has given up his consulting practice to devote his time to the munitions and other work of Peter Lyall & Sons Construction Co., of Montreal.

Mark Workman, president of the Dominion Steel Corporation, has gone to Sydney, N. S., where he will remain during the summer to supervise the operations now in progress for extending the scope of the company.

W. H. Parker has been appointed safety engineer at the Great Falls Reduction Works of the Anaconda Copper Mining Company. He has previously been with the company at the Anaconda smeltery and the Butte mines.

W. H. Hubbard, Jr., engineer for the Balbach Smelting and Refining Co., of Newark, N. J., for the last four and a half years has accepted a similar position with the Northport Smelting and Refining Co., at Northport, Washington.

H. R. Robbins has severed his connection with the Granby Consolidated Mining Smelting and Power Co., Ltd., for the duration of the war, and has been commissioned captain in the National Army and assigned to special duty with the General Staff.

R. H. Stewart, formerly general manager for the Consolidated Mining and Smelting Co. of Canada, Ltd., has been appointed manager for the Silversmith Mines, a new company organized to operate the old Slocan Star mine, near Sandon, British Columbia.

H. H. Armstead, president and manager of the Armstead Mines, Inc., at Talache, Idaho, has been commissioned a captain in the Quartermaster's Corps, N. A. During Captain Armstead's absence **D. G. McLachlan** will be in charge of operations and **I. F. Thomas** in charge of the office.

Theodore Pilger, formerly mining engineer and geologist at the Black Rock mine of the Butte & Superior Mining Co., has established an office at Anchorage, Alaska, where he will engage in general mining engineering and consulting practice. He will give special attention to mining properties in the interior and tributary to the new Government railway as well as to those on the nearby coast.

Irwin H. Cornell, who recently went to Washington to enter the Government service, is assisting Pope Yeatman, who has charge of the Non-ferrous Metals Section of the War Industries Board, in the handling of lead and zinc. Mr. Cornell has resigned as vice president and sales manager of the St. Joseph Lead Co. He is succeeded as sales manager by **Leonidas H. Besson**, secretary of the company.

John R. Stanton has retired from the presidency of the Wolverine and Mohawk mining companies of northern Michigan. He will spend most of the summer in New York for his health, which has been failing during the last year. His resignation is, in reality, simply a year's vacation from particularly onerous duties. **L. P. Yandell**, vice president of the Mohawk company and representing large interests in both properties, has been elected president. **Theodore Dengler**, general manager of the mines, has been elected a director.

Obituary

Arthur Keen, chairman of Guest, Keen & Nettlefolds, and a well-known British steelmaster, committed suicide on June 27.

Edgar Marburg, secretary-treasurer of the American Society for Testing Materials for the last 16 years, died on June 27, 1918.

Lieut. Thomas C. Gorman, 2nd Tunneling Co., Canadian Engineers, was killed in action in France on Mar. 18 last. He was a member of the American Institute of Mining Engineers.

D. C. Corbin, of Spokane, Wash., died on June 29 aged 83 years. He built the first railroad into the Coeur d'Alenes, the Spokane Falls & Northern R. R., which was the first line to the Rossland district, and the Spokane & International Railroad.

Frederick Bennett Reece died in France of wounds received last April. He was born in 1877 in Liverpool, Eng., and was graduated from the College of Mines of the University of California in 1906. He was serving in the Royal Flying Corps when wounded. Mr. Reece was a member of the American Institute of Mining Engineers.

Societies

Michigan College of Mines alumni of northern Minnesota held their annual banquet on June 22 at Superior, Wisconsin.

Engineers' Club of Northern Minnesota expects to visit the mines of the Cuyuna range sometime during the present month.

Engineering Council held its first meeting on June 27, 1917. In the year just ended the Council has done much to perfect its organization, to strengthen its relationships with the societies and the Government and has accomplished much useful work. In order to have more intimate contact with the branches of the national societies and other local groups of engineers, the secretary is planning to visit the following cities, during July and August, in which there are important bodies of engineers: Milwaukee, Denver, Salt Lake City, Reno, San Francisco, Portland, Seattle, Spokane, Butte, St. Paul, Minneapolis, Duluth, Detroit, Cleveland and Buffalo. In May, a trip was made to Chicago, St. Louis and Pittsburgh, with satisfactory results.

Industrial News

Charles B. Seem, formerly with Perin & Marshall, consulting engineers, of New York, has become actively connected with the Electric Furnace Co., of Alliance, Ohio, as sales engineer.

Aspromet Company, of Pittsburgh, formerly the Asbestos Protected Metal Co., removed its Chicago office on July 1 to the Railway Exchange Bldg. J. T. O'Neill will continue in charge.

Chicago Pneumatic Tool Co., of Chicago, has announced that W. H. Callan, general manager of plants, and W. P. Pressinger, general sales manager, have been elected vice presidents of the company.

Harry Du Bois, who has been in charge of sales of ferromanganese and spiegeleisen for E. J. Lavino & Co., Bullitt Bldg., Philadelphia., has joined the War Industries Board in Washington for the duration of the war.

A. Niedermeyer, for many years connected with the Worthington Pump and Machinery Corporation, most recently as works manager of the Snow-Holly Works of that corporation, at Buffalo, N. Y., resigned on May 31 to devote his entire time to private interests.

Asbestos and Mineral Corporation, Whitehall Bldg., New York, has issued to those interested in asbestos a portfolio entitled "Asbestos Crude and Fibre," containing a photograph of a specimen of Australian chrysotile asbestos included in its collection. This photograph is known as Plate 1 of a series contemplated. The edition is limited.

Trade Catalogs

Buffalo Stationary Forges. Buffalo Forge Co., Buffalo, N. Y. Catalog section No. 108; pp. 32; 5 x 7½; illustrated.

Sullivan "DR-6" Mounted Water Hammer Drill. Sullivan Machinery Co., Chicago. Bulletin 70-H; pp. 16; 6 x 9; illustrated.

Sullivan Rotators, "DP-33; DR-33." Sullivan Machinery Co., Chicago. Bulletin 70-F replacing Bulletin 70-A; pp. 28; 6 x 9; illustrated.

Portable Mine-Car Air Compressors, Class "ER-1." Ingersoll-Rand Co., New York. Bulletin, form 3015-1; pp. 4; 6 x 9; illustrated.

"Spare the Coal Pile." Ingersoll-Rand Co., New York. Form 876; single-page flier; 8½ x 11; illustrated. Discusses barometric condensing plants.

Steam Engines. Ingersoll-Rand Co., New York. Form 883A; single-page flier; 8½ x 11; illustrated. Describes class "FP" steam engines, horizontal center crank type with piston valves.

Rails, Locomotives, Machinery, etc. Walter A. Zelnicker Supply Co., St. Louis, Mo. Catalog No. 237; pp. 72; 3½ x 8½; illustrated. A catalog of new and second-hand equipment for plants.

Leyner Shank and Bit Punch. I-R Type. Ingersoll-Rand Co., New York. Bulletin, form 4039; pp. 8; 6 x 9; illustrated. A machine for punching out holes in bits and shanks of hollow drill steel.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Car Lock for Mine Cages—Serafino Galli, Breezy Hill, Kans. (U. S. No. 1,268,001; May 28, 1918.)

Ore Dressing—Apparatus for Classifying Ores. Henry Kenyon Burch, Miami, Ariz. (U. S. No. 1,267,373; May 28, 1917.)

Refractory Furnace Lining and Process of Making—Spencer B. Newberry, Cleveland, Ohio. (U. S. No. 1,267,686; May 28, 1918.)

Copper—Process of Producing a Hard Copper Alloy with a Small Percent. of Aluminum. Oscar C. M. Knudsen, Brooklyn, N. Y. (U. S. No. 1,267,669; May 28, 1918.)

Blast Furnace and the Like—Thomas Garmondsway Wrightson and Justus Magnus Ringquist, Thornaby-on-Tees, England, assignors to Head, Wrightson & Co., Ltd., Thornaby-on-Tees, England. (U. S. 1,268,732; May 28, 1918.)

Editorial Correspondence

SAN FRANCISCO—July 1

A High Duty on Quicksilver is necessary or the continuation of the industry in the Jnited States, according to H. W. Gould, estifying at the meeting of quicksilver pro- lucers before the U. S. Tariff Commission ield here on June 26. Gradually diminish- ng bodies of ore and rapidly increasing osts of production have placed the industry n its precarious position, and the remedy uggested is that of placing a specific duty f $35 per flask, in addition to the present uty of 10% ad valorem. Costs of pro- uction in Spain are said to be $16 a flask, s compared with the American cost of etween $70 and $75. The Italian cost in 898, the latest available information, was 25 a flask. Meetings were held on June 5 with the antimony producers, June 27 vith the chrome producers and with the ungsten producers on June 28. At the neeting on June 27, the chrome producers ailed to make a representative showing.

The Honolulu Consolidated Oil Co. hear- ng before the U. S. Land Office at Visalia as been completed so far as the adducing f evidence and arguments go. The Gov- rnment contests the issue of patents on he ground that development was begun fter Sept. 27, 1909, the date of the Taft vithdrawal order. The defendant corpo- ation submitted evidence that the develop- nent was started in 1908. The land in uestion is in the Kern River field and has stimated value of $15,000,000. Evidence nd argument have been taken under ad- isement by Frank Laning, register, and oseph Allen, receiver, at Visalia. Produc- on has continued under control of the eceiver pending the hearing, the result of ne land office decision not affecting the naintenance and continuation of the indus- ry. Otherwise damaging depreciation vould have followed the shutting down of ne wells.

Steel Supplies for Oil Well Drilling will e available for necessary work in the de- eloping of oil measures, according to an nnouncement by the United States Fuel dministration. Though the announcement s said to have been made primarily to cor- ect a contrary impression in Eastern fields, alifornia operators are directly interested n the fact, as it strengthens their reliance hat development will not be retarded. he Petroleum War Service Board, at the equest of the Fuel Administration, alls the attention of those engaged n the petroleum industry to the fact that ontrol will be exercised in behalf of in- ustries and activities essential to win- ing the war, and that production of oil nd gas and all kinds of oil-well supplies sed in production and in pipe line trans- ortation has been classed as essential, and hat the control and distribution of iron nd steel should operate to improve the pportunities of oil producers to fill their equirements, especially in the items of ire rope, tubular goods and boilers, of hich there has been an acute shortage. It s urged, however, that economy should be racticed, as every pound of iron and steel r other essential commodity diverted from he building of ships, aeroplanes, munitions nd other essential construction has a pro- ortionally retarding effect on completion f the Government's program.

SALT LAKE CITY—July 3

The Former Decision of the Government o maintain the price of copper at 23½c. a ound for the next two and a half months, oupled with the recent rise in freight rates, aused grave discussion among mining men n this section. The mining industry—al- ays delicately balanced, owing to the ele- nents of risk and depletion of resources eculiar to it—may be said to be caught in a evolving circle of rising prices, with con- tantly increasing diameter, the price of the rincipal metals remaining stable. An fficial of one of the smelting companies perating in Salt Lake Valley places the ise in the cost of operation since 1915 at 50%, with labor in the lead. The company s facing a demand on the part of the work- nen at one of its plants for an increase in vages of $1 a day. Such an increase, if ranted and spreading throughout the min- ng industry, would mean a large tax. The ompany in refusing the demand of the nen gave the reason that the business of the company would not permit of an increase in payroll. The wages at the plant in question are only five cents a day lower than the wages paid at the Government shipyards on the Pacific Coast. As has been before stated, the smelting companies have notified shippers that, in view of conditions, they are unable to bear the increase in freight rates; and in cases where contracts do not exist are making increased smelting charges. The net proceeds of Utah mines in 1917—in spite of an increase of about 1,000,000 tons in output and about $17,000,000 in value over 1916—were more than $8,000,000 less than in 1916. This year production is not going on at so high a rate and costs are higher than ever, and increasing. New enterprises are falling off in number and extent, and many producing mines find themselves unable to keep up the necessary amount of exploration and development work. In other cases mill machinery is being worn down in the effort to crowd through the largest tonnage possible. Mining labor, receiving an increase of 46% in the money value of its wage, is everywhere working an eight-hour day, so that the increased cost to the producer is far greater. Also, calculation based upon the difference between the number of hours required to break down a ton of ore now and before the entrance of the United States into the war places the decrease in efficiency at 16%. This is explained by the fact that many experienced miners have been taken in the draft and to form special mining and engineering units, to the formation of which the mining companies have everywhere given patriotic support. So far most of the mines have been able to adjust themselves to conditions, but the end of high costs all along the line cannot be seen. So large an increase in freight rates—25% on crude ores from mine to smeltery and $5.85 a ton on base bullion to the Eastern refineries, amounting to 55%, coupled with the increased rate on coal and supplies—must of necessity be heavily felt. In addition, as stated, many mines find themselves unable to keep reserves sufficiently ahead for their best welfare. There is every desire on the part of the mining community in this section to do its part in the work of the nation, and the importance of a large supply of metals is appreciated. In summing up the situation, the smelting official before quoted says. "We have reached a point where, so far as profits are concerned, we cannot go ahead, but considering the urgent demands of the Government for copper in war operations, we cannot stop." And that is the crux of the matter. The mining industry must go on, and both the large and the small producer are needed.

Utah Mine Dividends during the first half of 1918 show a decided falling off from those for the same period of 1917, $5,936,275 being the amount of the decrease, and $9,306,570 the amount paid. The chief causes are conservation of resources to meet new taxation, in same cases probably heavier than necessary owing to uncertainty as to what this will amount to, the increasing cost of labor, machinery, and supplies, with labor shortage and lessened efficiency playing an important part. Although there are one or two mines for particular reasons absent from the list, which may possibly come in during the latter half of the year, in view of conditions, the figures for the first six months of 1918 may be said to be fairly indicative of what is to be expected for the entire year. It is true that the best shipping season is still ahead, but although this will make for heavier shipments from outlying camps, it will be little felt in the case of most of the dividend-paying mines, which maintain a fair average of shipments throughout the year.

WASHINGTON, D. C.—July 9

The War Industries Board with the approval of President Wilson, has decided to take over the control of the production and distribution of sulphur materials, says the "Times." This was made necessary by the increased demand from the Government for sulphur in the manufacture of explosives and for other purposes, and by the increasing burdens on the rail and water systems in the transportation of materials. William G. Woolfolk, chief of the section in charge of sulphur and pyrites, has been named to act for the War Industries Board in controlling the production and distribution of sulphur materials, availing himself of such voluntary assistance as he may see fit of individuals or committees representing the producers and users of such materials. Present sources of sulphur supply are from two mines; one at Calcasieu Parish, La., owned by the Union Sulphur Co., producing over 8500 tons a day, and another at Bryan Heights, Texas, owned by the Freeport Sulphur Co., producing over 1000 tons a day. Minor properties in Wyoming, Nevada, and Utah produce a little less than sixty tons a day. Present consumption in the United States exceeds 125,000 tons a month, and this, it is said, will increase to over 150,000 tons a month before the end of the year, due to increased Government use. There are sulphur deposits in both Sicily and Japan, but both these nations have forbidden the exportation of this article.

SPOKANE—July 1.

The Northwest Mining Association today adopted resolutions urging Governmental aid in gold mining. Prominent among the points made are the following: War taxes to be remitted to gold producers; the advance in freight rates not to apply to high-cost gold producers; roads for motor haulage to be built to gold properties now inaccessible; and gold miners to be given a guaranty which will assure adequate returns.

Possibilities of an Electric Furnace in Spokane for treatment of ferroalloys are to be considered by a committee appointed by the Spokane Chamber of Commerce, of which T. S. Lane is chairman. The committee will confer with L. O. Howard, dean of the Schol of Mines of Washington State College, and J. C. Ralston, the two men who first presented the matter to the chamber. The Washington Water Power Co., of Spokane, has developed more electric power than is at present salable.

BISBEE, ARIZ.—July 3

Copper Queen Mining Co. is building up a new organization of workmen. The mine wage today is $5.35 per day, without regard to length of service or relative competency. Hereafter there will be a flat annual bonus of $100 for men who serve a year, with $10 extra for each additional year of service, up to a maximum of $250 per annum. Substantial progress has been made in the concentration plans of the Copper Queen. Sacramento hill, from which most of the low-grade schist for the mill will be obtained, was robbed of its cap by a successful blasting operation lately. The rock of the barren overburden was well broken up for the operations of steam shovels that are working around the hill on terraces and will soon reach the sulphides. The site of the concentrator is being prepared and water for milling already has been developed in the company's new Cochise shaft, which, at depth, is expected to be a material contributor to the main ore supply.

DOUGLAS, ARIZ.—June 30

The New Freight Rates are expected to hit the small mine operator hard. Many of the properties that are shipping are "getting by" with low-grade ores, with the profit mainly in the fact that the return is paying for the necessary development work. During last year one Arizona mine paid $3,500,000 in freight on ores, and this cost will be raised 25%. The average added cost has been figured at $1.25 a ton. Bullion shipments east from El Paso will be raised to $6.50 a ton.

Waste at All Arizona Smelteries is noticeable, with the exception of the plants of the Calumet & Arizona and Arizona Copper companies, in the sulphuric fumes that pour from furnace smokestacks, while arsenic is a second byproduct that could be separated. The C. & A. uses its acid in the leaching of Ajo carbonate ores, with a small surplus for outside sale. The Copper Queen smeltery here could be fitted up in the same manner and could produce twice as much acid as its neighbor, but the installation cost would be a million dollars or more and the market for the output is not a sure or profitable one.

JEROME, ARIZ.—July 2

A Committee of Labor Men, said to represent the Central Labor Union of

Jerome, on June 28 presented a demand to the Verde district operators for an increase in wages amounting to an average of over $1 a day each for all mechanics and laborers employed in and about the various properties and plants. However, the demand asked for an increase of only 10c per day to shovelers. The committee intimated that if such increases were not forthcoming by July 1 there would be a general walk-out of all employees in the camp. The demand was refused by the operators' association in a formal reply, and Secretary of Labor Wilson was informed by wire as to the nature of the demands and the refusal, and requested to send at once a Federal mediator to the district to adjust matters. The announcement of the demand was a surprise to a majority of the men in the district, for it was the first intimation they had of any such contemplated action. On the evening of June 29 a mass meeting was held in Miners' Union Hall, and about 200 men were in attendance. At this gathering a large proportion was composed of the class of labor allowed only a 10c increase in the demand, and on account of such representation, the leaders of the movement thought it wise to change the figures and make a demand for a flat increase of $1.10 per day for all classes of labor. A motion to that effect was put and carried almost unanimously. Then a motion was put which had for its real purpose the declaring of a strike on July 5 in case the demands were not granted by that time, either by the operators or a representative of the Government. It is reported that a large majority of those present did not appear to welcome such drastic and immediate action and wanted to give the Federal mediator time to arrive and adjust the question, but a few of the radicals were insistent and said that it was their purpose to force action at once and walk out in case the increase was not forthcoming. When the motion was put, a majority of those present departed from the hall, leaving only a small body of those of more radical tendencies and the leaders to close the meeting. It would appear that the movement was fostered by three or four of the extreme radicals in camp, and although the rest of the men may be timid of continuing work in case a walk-out is called, the sentiment for the most part seems to be in favor of being loyal to the United States in this time of war and standing by the agreement to abide by the decision of the Federal representatives. Labor leaders assert that they have been trying to get a Federal mediator here for some time past for the purpose of considering their demands, which are based on the high cost of living. The Central Labor Union is composed of representatives of all unions in the district, with the exception of the carpenters, and the latter have come out with a public announcement that they will stand by their agreement not to strike during the period of the war. Labor representatives here are opposed to the matter being settled by Federal mediator Myers and have asked that alternate Hywell Davies be sent here. A wire was received from the latter from Butte in which he said that he would come as soon as possible, and urged the men to await his coming and make an amicable settlement of difficulties. At present writing no action had been taken on his recommendation. Should the War Board recommend an increase in the price of copper, it is said that the producing mines will be willing to grant certain increases voluntarily, but it is certain that any increase will work a great hardship on most of the development companies.

SAN ANTONIO, TEX.—July 1

The Recent Decision made by the Federal District Court of Delaware, in the suit between the Union Sulphur Co. and the Freeport Sulphur Co., in the matter of alleged patent infringement involving the process and appliances for the recovery of sulphur from the saline dome deposits, has attracted a good deal of interest. The original basic patents taken out by Herman Frasch, about 1895 have expired by time limitation but subsequent patents, relating to appliances used in the process and alleged to have been used by the Freeport company in its operations at the Bryan Heights property, Tex., were made the basis of an infringement claim. The court found for the plaintiff on both of these patents in the main contention. The suit also involved a claim relating to a patent issued in 1911 pertaining to the use of a [illegible], but this patent was not sustained. It was alleged that the 1905 patents are essential to the basic Frasch method and that the Freeport company was using these adaptations in its operations. The case will be appealed. In the meanwhile plans for the realization immediately or in the near future of some other partly proved dome deposits may be held up pending the final settlement in this case or the development of other methods of applying the Frasch methods for the recovery of sulphur from the dome type of deposit. The Union and Freeport companies are at present supplying practically all of the large demand of sulphur. Consumption of sulphur in 1913 was about 350,000 tons in the United States. The consumption for 1918 will probably exceed 1,500,000 tons, not including a considerable amount which must go to our Allies to meet the deficiency from the diminished production from the Sicilian deposits owing to the sacrcity of labor, and incidental to the enormously increased demand for sulphur of the Allied governments in Europe.

BUTTE, MONT.—July 3

Grading of Montana Southern R. R., a subsidiary of the Boston & Montana Development Co., which is to run from mining property in the Elkhorn district to Divide, on the Oregon Short Line, a distance of 35 miles, has been completed. The rails have not arrived, and it is possible further action in the completion of the road may be deferred until after the special meeting of the stockholders, to be held on Aug. 6. At that time the company is to consider increasing the capital of the Boston & Montana Co. to $25,000,000.

Reports of Butte Mining Companies for the year ended June 1 have been filed with the county assessor for the purpose of making up assessment rolls on the net proceeds. As was to be expected, they show a considerable falling off as compared with the previous year, on account of I. W. W. labor troubles which extended over June, July and August of 1917. However, all conditions considered, the reports are satisfactory and go to show that the mining companies did practically capacity work in the production of copper, manganese and zinc.

MIAMI, OKLA.—July 8

Results of the Frenzied Efforts to place mills in operation in the Oklahoma section are coming to light, now that lower prices have brought about a lull in development work. In a recent issue the "Miami Record-Herald" says: "In some of the cases reported, the ignorance of the men who have promoted the companies is pathetic. The mills have been built and the ground worked out without the least show of intelligence. Shafts have been sunk which look like sink-holes made by accident and mills built which are laughable to men who are real operators. In one of the mills visited recently, the veteran in charge showed the writer belts which had been put on wrong side out; immense engines which had been jimmed by careless handling; crushers which knocked so that it was impossible to run them more than a few minutes at a time till they could be worked over. The mill had been started that day, and while a jack car could be filled in a short time it was necessary to stop every few minutes and make adjustments. One hundred thousand dollars had been spent in opening the ground and building the mill, but when it was ready to start, the men in charge had no idea how to get out the jack." The readjustment period is on now, and several sales of mines are reported about consummated.

CALUMET, MICH.—July 3

Orders Promulgated by General Crowder will considerably assist the copper and iron mining companies of northern Michigan and Minnesota to solve the labor problem. A reasonable interpretation of the orders is permitted, however, and gives the man with steady work opportunity to secure a position that will carry equal or nearly equal remunerative benefits with the position given up. Such men in the mining districts are being urged to take positions with the copper- and iron-mining companies, and many are doing so. Trammers in the copper mines are now receiving a minimum of $4 a day, the average in the district being $5 with opportunity for overtime. Surface jobs are pretty well filled, as the usual amount of construction work is not being done at present, owing to war conditions, the freight situation and the high prices of timber and steel and other materials. Mining companies are ready to take on more men for underground work.

DULUTH, MINN.—July 3

The Increased Price on Iron Ore granted by the War Industries Board at the request of Minnesota state officials and representatives of the iron industry was gladly received throughout the iron country. Iron-ore prices on the Mesabi range are low, and only in a few cases of the large mining companies are profits obtained. The new price was essential not only to stimulate production but to meet the demands for the increased wage scale and to be fair to independent producers with small properties. The state mining authorities were especially interested in the change, as the state owns 37 operating mines, and on this ore receives a royalty of 25c. a ton.

Ore Shipments from the head of the Lakes to July 1, 1918, for the season, pass the former record for a similar period by over 1,000,000 tons and shipments for the months of June were over 100,000 tons ahead of the same month in any previous year. Former record for the shipments up to July 1 was established in 1916, when 13,654,339 tons of ore was shipped from five docks. The former June record was set last year, with 7,026,069 tons. In past years there has been a larger fleet of boats, but the efficiency practiced this season more than makes up for the lack of tonnage. Shipments during June were 7,157,235 tons, as compared with 7,026,069 tons in June, 1917. Shipments for the season amount to 14,125,708; those of 1917 for the same period were 11,394,621 tons.

An Explosion at the Sliver Mine, Virginia, resulted in the worst disaster in the history of the Mesabi range. The east end of the open pit, operated by the M. A. Hanna Co., contains ore high in manganese which became salable only this year. Several "gopher" holes had been driven into the bank at different elevations, and as soon as completed, these were charged with powder and lead wires carried to the surface,, as it was the intention to blast the entire mass on June 30. On June 26, a violent electrical storm came up and a bolt of lightning struck the wires, causing the explosion. Nineteen men, who had sought shelter in the upper drifts, were caught in the cave, and to date only six bodies have been recovered. The last big disaster on the Mesabi range occurred in 1910, at the Norman mine, when a bank caved, covering 14 men.

PLATTEVILLE, WIS.—July 5

Two Acid Plants with a combined daily capacity of 150 to 175 tons of acid are in course of construction, one at the Skinner roaster, New Diggings, and the other at the National roaster, Cuba City. The bulk of the blende ore roasted here assays 20 to 40% zinc and 10 to 30% iron sulphide The sulphur fumes from the iron content, heretofore wasted in the process of roasting, and the iron tailings, assaying 30 to 35% sulphur, that were sold and shipped to outside plants, will be utilized here. The product to be made will be what is commonly termed fuming gas, known commercially as 20% oleum, a high-grade sulphuric acid. At the National plant the iron tailings will be re-roasted, and for this purpose two multiple-hearth furnaces will be installed. At the same time the company is contemplating the installation of another multiple-hearth furnace to replace the Mathey-type furnaces now in use.

VICTORIA, B. C.—July 3

Mining Activity in the Kootenay and Boundary districts will be accelerated as a result of the orders received in Canada from the British government for a large increase in shrapnel production. It is anticipated that the Trail smeltery of the Consolidated Mining and Smelting Co. of Canada will be worked to capacity, and that the operators of the silver-lead-zinc properties of lower British Columbia will be kept busy in order to do their part in bringing the output up to 220,000 shells a week, which is what the British war office has requested.

Some of the Chrome Deposits of British Columbia are to be developed. Walter J. Nicholls and associates, of Spokane, have purchased claims situated at Cascade, B. C., after an examination and a report by George Crerar, a mining engineer of Spokane. The chrome of Cascade has been reported on by the provincial mineralogist, and the deposit to which he refers, which no doubt is the same as that in question, is within 4000 ft. of the Canadian Pacific R.R. and in the Grand Forks mining division, but little development has been done. In view of the demand for chromite by the Imperial Munitions Commission, and the consequent increased interest in the mineral in the province, it is interesting to recall that W. M. Brewer, resident engineer at Nanaimo, B. C., reported in 1915 that chrome ore exists on Scotty Creek, near Clinton, B. C. The claims were staked, but abandoned and then reopened, but little development was done.

Discussing the Discontinuation by the Dominion government of the provincial statute giving early settlers within the Esquimalt & Nanaimo R. R. belt the right to apply, and, their claims on examination proving sound, to receive provincial title to the coal rights in their lands, the Hon. John Oliver, Premier of British Columbia, recently stated that he saw no reason why the provincial legislature, at its next session, should not be asked to reenact the legislation. This is taken to mean that the province will insist on its power to give the settlers the privilege indicated. It also means that the present British Columbia government is likely to maintain the principle of provincial authority in the case in question. The issue is one of vital import not only to the settlers whose coal lands are at stake but as well to the Granby Consolidated Mining & Smelting Co., which holds provincial title to valuable coal areas, and to the Canadian Collieries, Ltd., which claims title to all the non-alienated coal lands in the railway belt by virtue of the terms of the subsidy granted to the railway company in 1884.

The Mineral Act of British Columbia has been enlarged by order-in-council to apply to tungsten, fluorine, vanadium, radium, and uranium, or any combination of these elements "with themselves, or with any other elements." This action was taken by the provincial government on recommendation of Hon. William Sloan, Minister of Mines. Without exception the importance of these minerals has been accentuated by the war, some to a greater extent than others. It having been brought to the attention of the Department of Mines that there are occurrences of fluorspar and of scheelite in British Columbia, it was decided to lose no time in bringing these and other minerals, heretofore outside the scope of the act but imperative in the manufacture of munitions of war, within its provisions. It may be stated by way of explanation that the Provincial Mineral Act, and its definition of mineral, were drafted twenty years ago, when the minerals in question were unconsidered, so that they have been in the anomalous position of being unstakable under the act in a legal sense, although common sense and the necessities of the times demand their inclusion. Incidentally, it is pointed out that the British War Board has asked the Canadian government to produce as much vanadium as possible, and the need of tungsten also is great. Not an inconsiderable market for fluorspar exists at the smeltery of the Consolidated Mining and Smelting Co. of Canada, at Trail, British Columbia.

TORONTO—July 5

The Imperial Oil Co. has caused some excitement by its entrance into the Peace River, Alta. oil field, which is regarded as definitely establishing the value of the oil discoveries in that region. A. M. McQueen, of Toronto, vice-president of the Imperial Oil Co., has gone to Peace River, where claims have recently been filed covering over 8000 acres. It is expected that development work will be greatly stimulated by the company's action.

Search for Potash deposits has been actively carried on owing to the increasing scarcity and value of potash products, and an important discovery has been made at Horseshoe Lake, between Czar and Metiskow, Alta., on the Canadian Pacific Ry. line to Winnipeg. Officials of the railway have been making a careful examination of the neighborhood and have ascertained that the water of the lake carries a 10% solution of potash. It is proposed to pipe the water to a point on the railway three or four miles distant and manufacture potash from it by a process of evaporation. Potash is also found in considerable quantities around the shores of the lake.

Development of Oil and Natural Gas in southwestern Ontario has been stimulated by the present high prices for these products, coupled with the recent important discoveries by deep drilling in the Trenton formation. A large number of drills have commenced exploration work in widely separated localities where geological formations are favorable. In West Dover Township, Kent County, the Union Natural Gas Co. is operating extensively, having met encouraging success in two valuable wells. The Dominion Natural Gas Co. is also active in this area, and recently made contracts to sink five deep wells on Long Point, 10 miles east of Dover, to test the Trenton formation. The Vacuum Gas and Oil Co. has let a contract for deepening, to the Trenton formation, one of its wells near Aylmer, Ont. The Richmond Gas Co., operating in the same locality, has several good gas wells in the Clinton formation at a depth of about 1400 ft. A new gas pool has been discovered at Port Talbot, about 30 miles west of Aylmer, at a depth of about 1500 ft., the well producing 5,000,000 ft. of pure gas per day, with a rock pressure of 930 lb. The wide extent of the territory offering opportunities for gas and oil development is shown by the sinking of a successful deep well near Stevensville, Welland County, distant about 200 miles from the West Dover wells. In addition, work carried on by companies and private owners near Thamesville, Kent County, and Glencoe, Middlesex County, has resulted in the production of large quantities of oil from the Corniferous formation at depths varying from 375 to 400 ft. In order to conserve the flow of natural gas in the Kent district, and provide a supply for domestic use, the Ontario Railway and Municipal Board has issued an order restricting the amount for large consumers to 5,000,000 cu. ft. per year.

The Mining News

ARKANSAS

Marion County

MORNING STAR (Rush)—Machinery being purchased for a sludge mill. Charles La Vassuer is consulting engineer and general manager.

MORRISON-LEE (Yellville)—To prospect 3000 acres of land on Georges Creek and in Dodd City camp. Prospect work to consist of drilling, shaft sinking and tunneling.

BEATY (Yellville)—Pumping and drilling machinery being installed by Resin Jack Zinc Mines.

BELVA ODELL (Flippin)—E. J. Fenton, owner, to build road from mine and use motor trucks.

Sebastian County

ARKANSAS MINING (Fort Smith)—To build 200-ton mill at estimated cost of $60,000. To purchase lumber, sludge tables, engines, crushers, compressors and other equipment.

ARIZONA

Cochise County

ARIZONA UNITED (Johnson)—Terminated lease made three years ago to Goodrich Lockhart Co., operating as Cobriza Mines Developing Co., and has resumed possession and operation of its Republic and Mammoth mines. Operations conducted by lessees were limited to mining and shipping high-grade direct smelting ores. Owners to increase operations and develop low-grade copper ores.

COPPER CHIEF (Johnson)—Has resumed operations and will carry on extensive development in addition to shipping.

THUNDERBOLT (Johnson)—To install Ingersoll-Rand compressor, 150 hp. gas engine, drill sharpener, and air drills.

Mohave County

RECORD LODE (Oatman)—Plant has been enlarged.

UNITED EASTERN (Oatman)—June production was 9000 tons, having a value of $240,000, the largest output in the history of the property, and netted $165,000.

Pinal County

COLE-GOODWIN (Ray)—Has given option to the Garford interests, of Elyria, Ohio, and examination is being made. Property developed by 400-ft. inclined shaft and shipments have been made. Mill to treat sulphide copper ores is proposed.

MAGMA CHIEF (Superior) Diamond drilling.

Yavapai County

CALUMET AND JEROME (Jerome)—To diamond drill pyritic schist belt.

GADSDEN (Jerome)—Shaft now down 1090 ft., with no change in formation. Station to be cut and lateral development started when 1200 level is reached.

GRAND ISLAND (Jerome)—Enlarging 208 ft. shaft to three compartments.

JEROME SUPERIOR (Jerome)—Shaft has been sunk 550 ft.

SHEA COPPER (Jerome)—Developing east and west from the bottom of 350 ft. incline shaft, both drifts in ore.

VERDE CENTRAL (Jerome)—Cleaning out 1000-ft. tunnel preparatory to continuation to cut mineralized dyke. Property formerly known as Verde King.

VERDE COMBINATION (Jerome)—To prospect 1080 level upon completion of sump and timbering in shaft.

CALIFORNIA

Amador County

OLD EUREKA (Sutter Creek)—Deepening shaft from 2165 ft. to total depth of 3165 ft. Supplies and equipment being removed from Wildman-Mahoney mine. Same interests have bought Wildman-Mahoney, Lincoln and Emerson mines, which will probably be reopened under one management.

Butte County

CHROME ORE of high grade being developed at Lumpkin by W. D. Fowler and John Mulligan. Expect soon to begin shipments from Oroville. Prospecting of adjacent ground has begun.

CHROME ORE in large amounts being shipped from Pulga by W. H. King, Frank Stewart, Ray Stokes, Charles Luvulet and Brume & Stanley.

Calaveras County

MAYFLOWER (Copperopolis) — Shipment of chrome ore made by W. A. Burnham and F. A. Wilson and sold to Holbrook & Maguire, San Francisco. New motor truck road built in Bean Gluch and ore is hauled to Milton.

HOLBROOK-MAGUIRE (Copperopolis) —Concentrating plant for treatment of low-grade chrome ore installed on property situated near Mayflower mine.

Del Norte County

CHROME MINING is creating increased demand for motor trucks to haul ore. Much ore is being packed to wagon road by animal trains, but many points may be reached by motor trucks by widening trails into roads.

Mono County

SILVER-LEAD DISCOVERY reported 2½ miles from old Yellow Jacket mine south of Benton. High-grade ore disclosed at shallow depth.

Shasta County

HAZEL CREEK (French Gulch) — Crystal Creek power house destroyed by fire caused by short circuit. Loss $30,000. Connection to be made with Northern California Co. at Gladstone mine until damage is repaired.

MAMMOTH (Kennett) — Production at smeltery during June amounted to 1,196,000 lb. of copper.

Siskiyou County

CHROME SHIPMENTS since Jan. 1 aggregate 24 cars and 300 tons is now at stations ready for shipment. Eastern Mining Co. recently shipped two carloads and are prepared to ship one car a week. Udell mine has 150 tons ready to ship. Hicks & McCarthy, at Scott Bar, hauling their ore to Eureka. Cramer brothers opening chrome deposits on south side of Forest Mountain.

Solano County

ONYX MARBLE near Tolenas Springs being quarried and shipped by W. H. Conkle.

Trinity County

HYDRAULIC MINING retarded by shortage of water. Expected La Grange and other mines will close in August, if not earlier. Some quartz mines have closed on account of shortage of water for milling.

Tulare County

PORTERVILLE MAGNESITE (Porterville)—Shipping two carloads of magnesite daily.

COLORADO

San Miguel

TOMBOY (Telluride)—General expenses for 1918 estimated at $74,000 per month. To reduce average monthly profit from $30,000 to $10,000 until more favorable conditions prevail

IDAHO

Shoshone County

HIGHLAND SURPRISE (Kellogg)—To increase output upon completion of new Pine Creek branch of the Oregon-Washington R.R. New mill ready for operation.

NABOR CONSOLIDATED (Kellogg) — Ore in bins ready for shipment. Lower tunnel at Lookout Mountain property down 200 feet.

CONSTITUTION (Pine Creek)—To increase mill capacity to 200 tons.

GILT EDGE (Ten Mile)—Machinery being installed.

COEUR D'ALENE ANTIMONY (Wardner)—Completed flotation unit at mill. Ore in bins awaiting shipment.

KANSAS

Joplin District

GREAT WESTERN (Baxter Springs)—To build 500-ton mill and to purchase sludge tables, crushers and belts. O. F. Reneger is superintendent.

STAG (Galena)—To build 200-ton mill and expect to purchase sludge and slime tables, ore crushers, drills and compressors. F. L. Cook is superintendent. To increase capacity of 50-ton mill to 250 tons. R. S. Harris is superintendent of this plant.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—American Bridge Co. beginning construction on 2000-ton flotation plant similar to plant in Hecla mill.

HOUGHTON COPPER (Houghton) — Crosscut on level after 50 ft. of trap and lode rock has cut copper, but of little commercial value.

SENECA (Calumet)—Sunk vertical shaft 99 ft. during last half of June.

SUPERIOR (Houghton)—Cut good copper rock on level in third new lode.

MINNESOTA

Mesabi Range

AJAX (Biwabic)—To repon old mine and will ship this year. T. J. Nicholas is superintendent.

LONGYEAR-BENNETT (Coleraine)—Paving of the road between Grand Rapids and Coleraine has been held up on account of the possible opening up of underlying orebodies.

OLIVER (Coleraine)—Sparks from an engine caused burning of a bridge from Holman pit at Taconite to Trout Lake washing plant.

MISSOURI

Joplin District

KELTNER (Joplin)—Lost mill pond and forced to temporarily close down new mill near Picher.

MONTANA

Silver Bow County

ANACONDA (Butte)—Cutting station at 500 level of Orphan Girl shaft. To crosscut south to cut vein. Sinking resumed at Philadelphia and will continue to 800 level.

EAST BUTTE (Butte)—Smeltery produced 1,999,760 lb. of copper and 63,139 oz. of silver during June.

NEVADA

Esmeralda County

GRANDMA CONSOLIDATED (Goldfield)—To complete sump and drive crosscut to be used for reservoir

ORIZABA (Goldfield)—To crosscut on bottom level to hanging wall and sink winze to cut vein.

Humboldt County

ROCHESTER COMBINED (Rochester) — Mill completed and will be placed in full operation by Aug. 1.

Nye County

BIG PINE (Manhattan)—Milling of oversize dump is proceeding at the rate of [illegible] tons per day.

MANHATTAN CONSOLIDATED (Manhattan)—Raise from third level shows free milling ore from 200 level and is averaging six feet per shift. Centrifugal pump has been purchased and will be installed soon.

MANHATTAN DEXTER (Manhattan)—Lessees securing steady production from Union Mine claim.

TWIN RIVER (Manhattan)—Developing by means of tunnels.

UNION AMALGAMATED (Manhattan)—Two-compartment shaft 80 ft. below 600 level and still in quartzite and limestone.

WHITE CAPS (Manhattan) — Raise driven at east end of east orebody from fifth level now up 62 ft., and entire distance shows milling ore.

TONOPAH DISTRICT ore production for the week ended June 29 totalled 10,038 tons, of an estimated gross milling return of $170,646. Producers were: Tonopah Belmont, 2326 tons; Tonopah Mining, 3200; Tonopah Extension, 2352; Jim Butler, 496; West End, 886; MacNamara, 410; Montana, 266; Halifax, 60 and Cash Boy, 42 tons.

GREAT WESTERN CONSOLIDATED (Tonopah)—Crosscutting resumed on 1100 level. Shaft has been unwatered and new pump installed.

TONOPAH BELMONT (Tonopah)—Prospecting on 600 level of Belmont shaft.

TONOPAH DIVIDE (Tonopah)—To cut station and pump at 360 level. New compressor has been purchased.

TONOPAH EXTENSION (Tonopah)—Upon installation of water column and pumps, to resume sinking shaft.

WEST TONOPAH (Tonopah)—Installing pump. To crosscut on 950 level to cut vein.

OKLAHOMA

Joplin District

SAFEGUARD (Commerce) — To build 200-ton mill at an estimated cost of $70,000. Will purchase boilers, engines, crushers and sludge and slime tables.

MONTREAL (Douthat)—Sinking new shaft on No. 2 mine south of Kansouri mine, in Kansas.

MIAMI SUNRISE (Lincolnville) — To build 200-ton mill and to purchase sludge tables, jigs, drills and air compressors.

NEMO (Lincolnville)—To remodel 200-ton concentrator. Sludge tables, belts, crushers and drills will be purchased.

LEAD HILL (Miami)—Has taken over Eleven O'clock Mine, near Sunnyside. Sinking shaft and plan development.

PICHER-OKLAHOMA (Miami) — To build 800-ton mill. Require sludge and slime tables, crushers, air compressors and ore cars. A. J. Harrington, Carterville, Mo., is superintendent.

POTOSI (Miami)—Completed tramway connecting field shaft with mill. William H. Blount, is general manager.

SAMMY (Miami)—Sinking shaft on lease south of Quapaw, considered out of mineralized zone previous to drilling. Vern E. Thompson, Miami, is president.

UNITED DEVELOPMENT (Miami)—To build 250-ton concentrator. Crushers, belts, and air compressors will be purchased. V. E. Conkle, Oklahoma City, is superintendent.

DALLAS-MIAMI (Peoria)—Has begun construction of 250-ton mill and to purchase sludge and slime tables, motors, belts, ore cars, crushers, boilers, engine and compressor. A. J. Henington is superintendent.

KING BEE (Peoria)—To build 200-ton mill and to purchase sludge and slime tables, drills, compressors, belts and ore cars.

COMMONWEALTH (Picher)—Fire destroyed 500-ton Darling mill on June 20.

QUAPAW (Quapaw)—To build 250-ton concentrator. To purchase sludge and slime tables, drills and air compressors.

QUAPAW JACK (Quapaw)—To build 200-ton concentrating plant and expect to purchase compressors, sludge tables, drills, belts, crushers and conveyors. B. W. Ward is superintendent.

RICH STRIKE (Quapaw)—To build 300-ton concentrator. To purchase crusher, jigs, sludge and slime tables and ore cars. A. O. Baker, Shawnee, Okla., is superintendent.

MIAMI WONDER (St. Louis, Mo.)—Frame of new mill up and machinery being installed

UTAH

Quab County

TINTIC SHIPMENTS for the week ended June 29 amounted to 182 cars.

CHIEF CONSOLIDATED (Eureka)—New pumping equipment nearly completed.

GODIVA (Eureka)—Knight lease on 700 level, producing rich ore, shipped one car, and two more will be sent out soon. Thirty to forty lessees are working.

TINTIC DELAWARE (Tintic Junction)—To ship ten tons of lead-silver ore daily. Mine in West Tintic.

Salt Lake County

EMMA CONSOLIDATED (Alta)—Work to be resumed soon.

MICHIGAN-UTAH (Alta)—To place new rope on tramway. Sinking 50-ft. winze in Patsy Marley tunnel and to drift east and west.

Summit County

PARK CITY SHIPMENTS for the week ended June 29 amounted to 1804 tons as compared with 1824 tons the week preceding. Shippers were: Ontario Silver, Judge Mining & Smelting, Silver King Coalition, and Daly West.

SILVER KING CONSOLIDATED (Park City)—Spiro tunnel in 7300 ft. Experiments with ore from old workings and from California-Comstock stated to show good zinc recoveries.

WASHINGTON

Okanogan County

NEUTRAL GROUP (Chesaw)—Making regular shipments of iron ore to calcining plant of Northwest Magnesite Co. at Valley, Washington.

CANADA

British Columbia

HEDLEY GOLD (Osoyoos)—Using pebbles from Anacortes, Wash., but claim they are less durable than those formerly obtained from Baltic sea.

INTERNATIONAL NICKEL (Port Colborne)—New refinery plant began operations July 1.

CONSOLIDATED MINING (Trail)—Made voluntary bonus of 15c. a day to men working in May and 25c. a day beginning June 1, continuing to Dec. 1. At next pay day men will get back pay to the amount of increase. Company store now operating on cash basis.

Ontario

DOME (Porcupine)—To drift on 1200 level to Dome Extension boundary to strike orebody cut on the 1150 level.

THOMPSON KRIST (Porcupine)—Drifting on the vein being developed on the 425 level of the Vipond-North Thompson has extended 15 ft. into the Thompson-Krist.

GIFFORD (Cobalt)—Cobalt-calcite vein cut at the 350 level.

HARGRAVES (Cobalt) — Examination being made of property to determine extent of future operations. High-grade ore has recently been mined.

TECK HUGHES (Kirkland Lake)—Closed down owing to a strike of miners.

DAVIDSON (Matachewan)—Negotiations for the purchase of property by Mining Corporation of Canada have fallen through.

MILLER INDEPENDENCE (Boston Creek)—New shaft down 80 ft. and vein carries good ore.

THOMPSON-McLEOD, (Bourkes Station)—Free gold and tellurides showing in veins. Shaft to be sunk deeper.

HILL (Munro Township)—Construction of the new 70-ton mill completed, and it is being tried out. Cyanide process to be adopted.

MEXICO

Sonora

NEWLY DISCOVERED DEPOSITS of tungsten and molybdenum in the Yaqui River district below Tonichiare are attracting attention. The tungsten occurs as scheelite in extensive deposits. Douglas, Ariz., interests have taken an option on the property.

HERMOSILLO COPPER (Sonora)—Has again continued operations. To sink shaft to sulphide zone and to install flotation.

PERU

Junin

CERRO DE PASCO (Cerro de Pasco)—June production was 2937 tons of blister copper.

The Market Report

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence	July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence
4	...	...	48$\frac{13}{16}$	8	4.7530	99⅝	48$\frac{13}{16}$
5	4.7530	99⅝	48$\frac{13}{16}$	9	4.7530	99⅝	48$\frac{13}{16}$
6	4.7530	99⅝	48$\frac{13}{16}$	10	4.7530	99⅝	48$\frac{13}{16}$

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar ilver, 999 fine. London quotations are in pence per roy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
uly	Electrolytic	Spot.	N. Y.	St. L.	St L.
4		†	...	...	.....
5	*26	†	8.05	7.75	8.50 @8.62½
6	*26	†	8.05	7.75	8.50 @8.62½
8	*26	†	8.05	7.75	8.50 @8.62½
9	*26	†	8.05	7.75	8.45 @8.55
10	*26	†	8.05	7.75	8.40 @8.50

* Price fixed by agreement between American pper producers and the U. S. Government, accordg to official statement for publication on Friday, eptember 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the ice for which has been fixed by agreement between merican copper producers and the U. S. Governent, wherein there is no free market) are our ppraisal of the average of the major markets based nerally on sales as made and reported by producers d agencies, and represent to the best of our judgent the prevailing values of the metals for the liveries constituting the major markets, reduced to sis of New York, cash, except where St. Louis is e normal basing point.

The quotations for electrolytic copper are for cakes, gots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. low the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime estern brands. We quote New York price at 35c. r 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
ly	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
4	110	110	125	337	337	29½	54
5	122	122	137	340	340	29½	54
6	...	...	...	...	...	...	
8	122	122	137	340	340	29½	54
9	122	122	137	345	345	29½	54
10	122	122	137	350	350	29½	54

The above table gives the closing quotations on ondon Metal Exchange. All prices are in pounds erling per ton of 2240 lb. For convenience in mparison of London prices, in pounds sterling per 40 lb., with American prices in cents per pound e following approximate ratios are given, reckoning change at \$4.7515.: £29½ = 6.2576c.; £54 = 11.4545c.; 10 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; 280 = 59.3937c.; £300 = 63.6362c. Variations, £1 0.2121205c.

Metal Markets

NEW YORK—July 10, 1918

There is scarcely anything of interest out the markets to be reported this week. ead is very scarce and strong, while zinc a shade easier.

Copper—The chief matter of interest nce the advance in price has been the question of contracts entered into between May 31 and July 2. Where producers have sold copper at 23½c., but had not made delivery previous to July 2, they will without any doubt supply the copper at the price agreed upon. The matter of supplies to the Government and to foreign governments is different. In connection with them there was no general agreement. Some orders were given and accepted, but other orders that were given were not accepted. There has been no official ruling on this question. The position of manufacturers who entered into contracts for their wares on the basis of 23½c., and neglected to cover their requirements for raw material, is another complication.

Copper Sheets are not quoted, as there is a wide diversity in prices of different dealers. Copper wire is quoted at 29 to 30c per lb. f.o.b. mill, carload lots.

Tin—At the close of the week 95c. per lb. is asked for Banka afloat. There is none in stock. Tin of 99% grades is quoted at 96@97c., spot, but it is difficult to find supplies. The market for Straits, both in Singapore and London, was stronger. Singapore quoted £349½, c.i.f., London, on July 5; £352 on July 8 and 9; and £352½ on July 10.

Lead—Late in the afternoon of July 3 the price was advanced to 8.05c., New York, but this did not become effective until July 5. This advance was simply to compensate for the new freight rate. The conditions leading to this readjustment are discussed on the editorial page.

There was a large and insistent inquiry for lead this week, but supplies for delivery earlier than September are very scarce. This means the free supply over and above what producers have reserved for the Government. Japan again inquired for lead this week.

Zinc—The market was very dull, with a slightly easier tone toward the close. Whereas a few weeks ago contracts for forward delivery commanded a small premium over prompt, producers are now more anxious to make forward contracts, and they can be effected at a discount.

High-grade and refined zincs are quoted at 11 @ 12c. per lb., according to analyses.

Zinc Sheets—Unchanged at \$15 per 100 lb, less usual trade discounts and extras as per list of Feb. 4.

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Price was established June 1 and will continue to Sept. 1. There is practically no aluminum available at the Government price except to manufacturers who are engaged on Government contracts.

Antimony—The market turned a little easier. We quote spot at 13 @ 13¼c. We quote futures, July shipment, 11¾ @ 11⅞c., c.i.f., in bond. This is figured as being equivalent to about 12⅞c., delivered here, duty paid. For August-September shipments, 12½ @ 12¾c., duty paid, is quoted.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This market is quoted at \$1.50 per pound.

Magnesium—Quoted at \$2 per lb. in ton lots.

Nickel—Market quotation is 40 @ 45c. per pound.

Quicksilver—Steady at \$125 @ 130. San Francisco reports, by telegraph, \$116, firm.

Thallium—Quoted at \$21 per lb. in 100-lb. lots.

Tungsten—Ferrotungsten and tungsten powder quoted at \$2.35 @ 2.40 per lb. of metallic tungsten contained.

Gold, Silver and Platinum

Gold—Transvaal gold producers, according to the "New York Sun," have recently organized in London and appointed a committee of six to present their claims for a higher fixed price to the British Government. Simultaneously a movement is said to be on foot in Washington to aid producers of gold in this country, by putting all labor engaged in gold mining in the deferred class as to the draft; by securing preferential treatment for gold-mining companies as to taxes; and by providing for a bonus over the present price of \$20.67 an ounce for all new gold produced. Such action, it is believed, would go a long way toward removing the difficulties which have been hindering a full output of this very necessary metal for the last year or so, and incidentally would improve the earnings position of all concerned.

Silver—China exchanges are permitting the export of silver, but the inquiries on account of the British Government have absorbed most of the offerings. The most recent advices from India report continued coinage of rupees. Exports for week ended July 6, 1,242,000 ounces.

Mexican dollars at New York: July 5, 77; July 6, 77; July 8, 77; July 9, 77; July 10, 77.

Platinum, Palladium and Iridium—Prices fixed at \$105, \$135 and \$175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., July 6.—Blende, per ton, high, \$75.90; basis 60% zinc, premium, \$75; Class B, \$60; prime western, \$55@50; calamine, per ton, 40% zinc, \$35@25. Average selling prices: Blende, \$48.55; calamine, \$36.46; all zinc ores, \$48.07.

Lead, high, \$99.75; basis 80% Pb, \$97.50; average selling price, all grades of lead, \$94.60 per ton.

Shipments the week: Blende, 10,610; calamine, 433; lead, 1234 tons. Value, all ores the week, \$647,610.

With a goodly portion of the mines closed from the 3d, nevertheless buyers were in action and shipped and bought a large tonnage of ore, larger than a normal production. The production is around 9000 tons, with the shipment of all zinc ores 11,000 tons. The purchase for next week's delivery is believed to be in excess of 11,000 tons.

Prices were boosted \$2.50 per ton on most of the prime western grade of ore sold.

Platteville, Wis., July 6—Blende, basis 60% zinc, highest price reported paid for premium grade was \$74.60 per ton; high lead blende sold down to \$47.50 per ton. Lead ore, basis 80 per cent lead, \$90 per ton. Shipments reported for the week were 1852 tons blende, no galena, and 503 tons sulphur ore. For the year to date the total are 18,288 tons blendes, 3594 tons galena and 27,104 tons sulphur ore. During the week 2796 tons blende was shipped to separating plants.

Other Minerals

Pyrites—Control of the production and distribution of sulphur materials has been taken over by the War Industries Board, with the approval of President Wilson, it was announced on July 9. Increased demands from the Government for sulphur for munitions and increasing burdens on transportation systems made the step necessary, it is said. William G. Woolfolk, chief of the section in charge of sulphur and pyrites, was named as controller. Spanish pyrites is quoted nominally at 17c per unit on the basis of 9s. ocean freight, buyer to pay war risks, less 2% and excess freight. Domestic pyrite sold at prices of 25 to 30c. per unit, f. o. b. mine.

Tungsten Ore—The market continues firm, with prices ranging from \$19 to \$24 per unit, according to grade. High-grade ores free from impurities are quoted at from \$23 to \$24 per unit for 65% and 70% WO_3, respectively; low-grade ores containing impurities are quoted at \$19 to \$20 on the basis of 60% or over.

Chrome Ore—Unchanged at \$1.50 per unit, f.o.b., shipping point, basis 40%, but considerable business is reported to have been done at \$1.70 in ore of 50% grade, silica content to run under 5 per cent.

Molybdenum Ore—Unchanged at $1.25.

Manganese Ore—Unchanged at the prices fixed by agreement with the War Industries Board.

Iron Trade Review

PITTSBURGH—July 9

The War Industries Board has cleared a misapprehension that existed in some quarters regarding its regulations of June 6, prescribing the preference list. It is not necessary that priorities be filled before shipments are made on the preference list; it is sufficient that they be provided for, the producer simply being satisfied that he can ship the priority material as it will be required. Next, the board has introduced some additional nomenclature, for convenience. The priorities, which were formerly A and B, are expanded to AA, A and B, and designated as the respective classes. The preference schedule is designated Class C, and the remaining material, if any, is designated as Class D. By the resolution of June 6 shipment of what is now Class D was made subject to permit. A blanket permit is announced, covering all shipments up to five tons, with the proviso that each month the producer report the individual shipments made under this blanket permit and certify his belief that they were all "in the public interest." Thus the sequence in which deliveries shall be made is as follows: Priorities AA, A and B, in their order, the buyer securing the priority, which is exhibited to the producer. Class C, material embraced in the preference list, or "schedule of purposes entitled to preference treatment" in the order named, emergency fleet, food production and preparation, railroad, etc., the producer using his own judgment and not having the precise tonnages prescribed for him. Class D, material going to buyers not entitled to any special preference, permit to be applied for by the shipper, required for lots over five tons.

Iron and steel production is proceeding substantially the same as formerly. There has been a practically uniform rate for three months, about 95% of capacity in pig iron and about 90% in steel ingots. Pig-iron production is slightly restricted by coke shortage, and ingot production is restricted by the poor quality of scrap there being less than the usual proportion of heavy-melting steel. Labor supply is somewhat short, but conditions are better at this time than was expected, and improvement is looked for through Governmental activities, particularly the functioning of the Federal employment service, through which all labor recruiting for war work is to be done after Aug. 1.

Pig Iron—Practically all shipments are against contracts, the War Industries Board indicating which contract shipments shall take precedence. Allocations are much less than formerly. Consumers appear to be fairly well supplied. The set limits remain: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, all f.o.b. furnace. A conference is being held in Cleveland today to determine whether another meeting of the American Pig Iron Association will be held, to consider the unfortunate case of certain high-cost furnaces, particularly in Tennessee and Virginia.

Steel—There is no market activity in soft steel, but a little business is being done in discard steel, it being requisite that the buyer be represented in the preference schedule. Soft steel remains at $47.50 for billets, $50 for slabs and $51 for sheet bars and small billets, f.o.b. Pittsburgh or Youngstown.

Ferroalloys — Ferromanganese remains relatively quiet, at $250 delivered for 70% and $4 a unit extra for higher manganese content. Spiegeleisen, 16 to 18%, is quoted at $70 furnace, for late deliveries, sellers quoting about $75 for early deliveries. Offerings are scant but there is not much demand.

Coke—Furnaces have got over the Independence Day period without the usual worry. Some had accumulated supplies, while an effort was made in the Connellsville region to run Wednesday night of last week to make up for the Fourth. There seems to be a sufficient supply of coke, yet the country as a whole is making a trifle less than 41,000,000 tons of pig iron a year when there is basis from past performance and new furnaces built, for estimating capacity at fully 43,000,000 tons. The "Courier" reports production in the Connellsville and Lower Connellsville region in the week ended June 29 at 352,590 tons, production for nine weeks previous having been close to 341,000 tons each week. By-product output continues to increase.

STOCK QUOTATIONS

N. Y. EXCH.†	July 9
Alaska Gold M	3
Alaska Juneau	1¾
Am Sm & Ref. com	79
Am. Sm. & Ref., pf	105½
Am. Sm. Sec., pf., A	88½
Am. Zinc	19½
Am. Zinc, pf	51
Anaconda	68
Batopilas Min	1¼
Bethlehem Steel	83
Bethlehem Steel, pf	‡88½
Butte & Superior	29
Butte Cop. & Zinc	12⅜
Cerro de Pasco	34
Chile Cop	16¼
Chino	40¼
Colo. Fuel & Iron	47
Crucible Steel	68
Crucible Steel, pf	89
Dome Mines	7½
Federal M. & S	10
Federal M. & S., pf	33½
Great Nor., ore ctf.	32½
Greene Cananea	43⅞
Gulf States Steel	84
Homestake	68
Inspiration Con	55½
International Nickel	30¾
Kennecott	33¼
Lackawanna Steel	84¼
Mexican Petrol	100¾
Miami Copper	29⅜
Nat'l Lead, com.	59⅝
National Lead, pf.	101
Nev. Consol	20⅛
Ontario Min	11½
Ray Con	24½
Republic I.&S., com.	93
Republic I. & S., pf.	99¾
Sloss-Sheffield	63¼
Tennessee C. & C.	20¼
U. S. Steel, com.	106⅜
U. S. Steel, pf.	111⅛
Utah Copper	82
Va. Iron C. & C.	‡71½

N. Y. CURB†	July 9
Big Ledge	1 1/16
Butte & N. Y.	‡.75
Butte Detroit	*⅛
Caledonia	.46
Calumet & Jerome	1 1/16
Can. Cop. Corpn.	1¾
Carlisle	‡2
Cashboy	.05½
Con. Ariz. Sm.	1⅞
Con. Coppermines	5¾
Con. Nev.-Utah	‡1/16
Emma Con.	.21
First Nat. Cop.	2⅛
Goldfield Con.	.22
Goldfield Merger	.02
Greenmonster	‡⅜
Hecla Min	‡4¼
Howe Sound	‡4¼
Jerome Verde	5/16
Kerr Lake	5.45
Louisiana	1/16
Magma	32
Majestic	‡.23
Marsh	‡ 04½
McKinley-Dar-Sa	.27
Milford	‡ 75
Mohican	‡ 06
Mother Lode	37
N. Y. & Hond.	‡12½
Nipissing Mines	8½
Nixon Nevada	.45
Ohio Cop	⅞
Rawley	‡2¼
Ray Hercules	4¼
Richmond	‡.56
Rochester Mines	.37
St. Joseph Lead	14¾
Standard S. L.	.75
Stewart	.16
Success	.10
Tonopah	2⅞
Tonopah Ex	1½
Tribullion	‡1/16
Troy Arizona	.14
United Cop.	‡9/16
United Verde Ext.	39½
United Zinc	‡1½
Utica Mines	‡ 08

SAN FRAN.*	July 9
Alta	.02
Andes	.06
Best & Belcher	.04
Caledonia	.03
Challenge Con	03
Confidence	.04
Con Virginia	36
Gould & Curry	.01
Hale & Norcross	.01
Jacket-Cr. Pt.	.06
Mexican	.26
Occidental	.51
Ophir	.12
Overman	.02
Savage	.03
Sierra Nevada	10
Union Con	.43
Utah Con	.01
Belmont	2 90
Jim Butler	61
MacNamara	19
Midway	04
Mont.-Tonopah	.11
North Star	07
Rescue Eula	08
West End Con	.99
Atlanta	.05
Booth	02
Comb. Frac.	‡ 02
Florence	09
Jumbo Extension	08
Kewanas	02
Nevada Hills	03
Nevada Packard	27
Round Mountain	29
Silver Pick	02
White Caps	12
Big Jim	‡ 75
United Eastern	3 15

BOSTON EXCH.*	July 9
Adventure	.50
Ahmeek	77
Algomah	.15
Allouez	51
Ariz. Com., ctfs.	14
Arnold	.20
Bingham Mines	9¾
Bonanza	.17
Butte-Balaklava	.25
Calumet & Ariz.	68¼
Calumet & Hecla	450
Centennial	12½
Copper Range	48½
Daly West	1¾
Davis-Daly	6
East Butte	9¾
Franklin	4½
Granby	77
Hancock	6⅝
Hedley	‡12
Helvetia	20
Indiana	.25
Isle Royale	26
Keweenaw	1
Lake	6
La Salle	2¾
Mason Valley	3½
Mass	‡5¼
Mayflower	3¼
Michigan	2¾
Mohawk	60
New Arcadian	2⅜
New Idria	14
North Butte	14½
North Lake	.65
Ojibway	.60
Old Dominion	42
Osceola	52
Quincy	70½
St. Mary's M. L.	52
Santa Fe	.65
Seneca	10½
Shannon	4½
Shattuck-Ariz	16
So. Lake	1⅜
So. Utah	.10
Superior	‡4¼
Superior & Bost.	2 1/16
Trinity	3¼
Tuolumne	.99
U. S. Smelting	42
U. S. Smelt'g, pf.	43½
Utah Apex	1¾
Utah Con	9⅞
Utah Metal	2¼
Victoria	2½
Winona	1½
Wolverine	29
Wyandot	.50

BOSTON CURB*	July 9
Alaska Mines Corp	12
Boston Ely	80
Boston & Mont.	53
Butte & Lon'n Dev	13
Calaveras	50
Calumet-Corbin	‡ 01
Chief Con.	2½
Cortez	07
Crown Reserve	15
Crystal Cop.	.23
Eagle & Blue Bell	2¼
Gila Copper	‡17
Houghton Copper	65
Intermountain	‡.05
Iron Cap	18
Mexican Metals	.40
Mines of America	1⅛
Mojave Tungsten	.09
Nat. Zinc & Lead	.12
Nevada-Douglas	.45
New Baltic	.80
New Cornelia	18
Oneco	.20
Pacific Mines	‡ 35
Rex Cons	.08
Yukon Gold	1

SALT LAKE*	July 3
Bannack	‡ 26
Cardiff	‡3.00
Colorado Mining	.08
Daly	1 92½
Empire Copper	‡ 92
Gold Chain	‡ 05
Grand Central	50
Iron Blossom	41
Judge	5 50
Lower Mammoth	‡ 03
May Day	.01½
Moscow	‡ 05
Prince Con	55
Rico Wellington	10
Silver-King Coal'n	1 20
Silver King Con.	1.62½
Sioux Con	.02¼
So. Hecla	.68
Tintic Standard	‡1.91
Uncle Sam	.00½
Walker Cop.	‡1.25
Wilbert	.08
Yankee	92

TORONTO*	July 6
Adanac	.08
Bailey	.03
Beaver Con	.24
Chambers Ferland	11½
Coniagas	2 75
Hargraves	.04¾
La Rose	.39
Peterson Lake	09½
Temiskaming	30½
Wettlaufer-Lor	04
Davidson	.34
Dome Exten	09½
Dome Lake	.14
Hollinger	4 55
McIntyre	1.32
Newray	.10
Porcu. Crown	.13
Teck-Hughes	‡ 30
Vipond	.11
West Dome	08

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 9
Cresson Con.	4 50
Doctor Jack Pot	.03
Elkton Con.	.04½
El Paso	.10
Gold Sovereign	‡ 02
Golden Cycle	1.62
Granite	.19¼
Isabella	.03½
Mary McKinney	.05½
Portland	.83
United Gold M	.13
Vindicator	45

LONDON	Apr. 15		
Burma Corp.	£4	0s	0d
Cam & Motor	0	11	0
Camp Bird	0	7	9
El Oro	0	8	6
Esperanza	0	8	6
Mexican Mines	5	5	0
Min. Corp. Can.	0	16	3
Nechi, pfd	0	10	6
Oroville	0	17	9
St. John del Rey	0	16	0
Santa Gert'dis.	0	12	9
Tomboy	0	17	3

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	......	30.000	40.110	......
Aug.	66.083	85.407	......	31.498	43.418	......
Sept.	68.515	100.740	......	32.584	50.920	......
Oct.	67.855	87.332	......	32.361	44.324	......
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417		31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.109	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	......	128.409	......	140.409	......
Aug.	25.380	......	122.391	......	137.000	......
Sept.	25.073	......	117.500	......	135.250	......
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(*a*)	207.443	318.875
April	55.910	(*a*)	220.171	329.905
May	63.173	(*a*)	245.114	364.217
June	62.053	(*a*)	242.083	331.925
July	62.570	......	242.181	......
August	62.681	......	243.978	......
September	61.542	......	244.038	......
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(*a*) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	......	10.644	......	30.500	......
August	10.594	......	10.518	......	30.500	......
September	8.680	......	8.611	......	30.500	......
October	6.710	......	6.650	......	30.500	......
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	......	8.473	......	54.000	......
August	8.360	......	8.190	......	54.000	......
September	8.136	......	7.966	......	54.000	......
October	7.983	......	7.813	......	54.000	......
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45		53.80		53.95	
August	54.17		50.37		53.95	
September	48.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

Engineering and Mining Journal

SPECIAL SMELTING NUMBER

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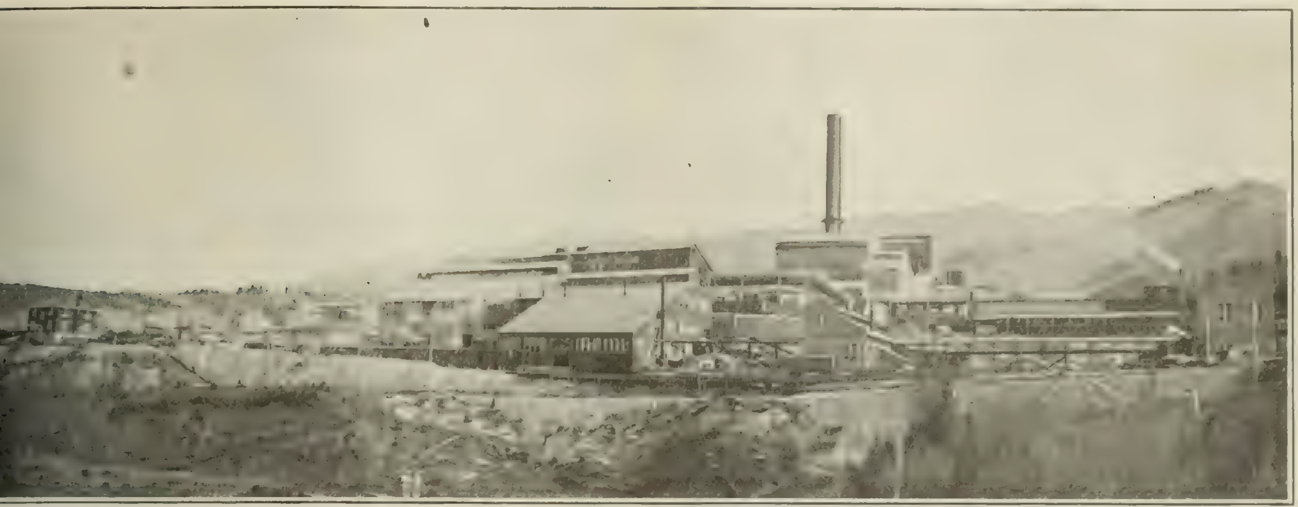

GENERAL VIEW OF BUNKER HILL AND SULLIVAN WORKS

Use of Pulverized Coal at the Bunker Hill and Sullivan Smelting and Refining Plant*

BY C. T. RICE

A description of the Holbeck return system for the use of pulverized coal, and the particular application of the method at the Bunker Hill & Sullivan works, where it is used for boilers, furnaces, and kettles. The adoption of this comparatively new system permits the use of a cheap slack coal in place of expensive fuel oil; heat intensity can be controlled to a nicety, and the process assures perfect cleanliness of operation. The system is gaining in popularity elsewhere.

THE Bunker Hill lead smeltery is the newest and most complete in the United States, for the furnace product is not shipped as lead bullion, s is the practice at most of American lead smelteries, ut is treated further, the output being marketed as efined lead, silver and gold. Within a few months the ntimony in the ore will also be worked up and a nished product disposed of as hard lead. The plant as designed by Jules Labarthe, of Bradley, Bruff & abarthe, San Francisco, Calif., and was erected under he direction of Mr. Labarthe as consulting engineer nd W. K. Mallette, engineer in charge of construction. he original idea and location of the smeltery must be redited to Myron A. Folsom, as executive head of melting affairs. Mr. Folsom recently arranged a fair djustment of the ore contract between the Bunker Hill ompany and the American Smelting and Refining Co. Having creditably and satisfactorily completed his part f the work, he has been succeeded by Mr. Labarthe as xecutive head of smeltery affairs, who also continues s consulting engineer in charge of the operations at the smeltery. M. H. Sullivan, formerly of Trail, B. C., is smeltery superintendent; A. F. Beasley is superintendent of refineries; and Arch Donaldson is superintendent of the gold and silver refining department.

The smeltery is built at Bradley station, on the O. W. R. & N.'s Cœur d'Alene branch, about a mile west of the company's concentrator and the mouth of the Kellogg adit, through which the orebodies of the Bunker Hill & Sullivan company and of its subsidiaries, the Sierra Nevada and Caledonia, are worked. The smeltery was designed to treat the ordinary run of concentrates obtained at the Bunker Hill & Sullivan and Hecla mills, together with crude ore from the Hecla, the Caledonia, and the Sierra Nevada mines; but the high price of lead not only greatly changed the proportion of crude ore and concentrates coming from the Hecla mine, but also caused that company to mine more ore from its zinkiferous vein, increasing considerably the difficulty of eliminating the sulphur at the roasters. The litigation which ensued between the American Smelting and Refining Co. and the Bunker Hill & Sullivan Co. regarding the Bunker Hill smelting contract (now compromised agreeably to both parties) excluded Bunker

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*The first of a series of articles on the design and operation of he Bunker Hill & Sullivan Smelting and Refining Works.

Hill & Sullivan concentrates for a considerable period, and increased still further the difficulty of eliminating the sulphur, as Bunker Hill ore carries little zinc. Changes have therefore been necessary at the smeltery, not only to adjust the capacities of the different departments, but also to increase the capacity of the smeltery as a whole.

USE OF PULVERIZED COAL

A notable change in the original plans was the decision, owing to threatening shortage of fuel oil, to use pulverized coal instead of oil in the boiler at the crystallization plant and for heating the various furnaces in both the lead and the silver refineries.

Near the copper sulphate plant, and west of the silver refinery, is the coal-pulverizing plant, which to the visitor appears surprisingly clean. There is absolutely no coal dust in the air about the building, as can be seen from Figs. 1, 2, 3, and 4, which I took while the plant was in operation and without any cleaning in preparation for picture taking. The reason for this is that the return-circuit Holbeck system of the Bonnot Co., Canton, Ohio, is used, in which the crushing is done in close circuit and under partial vacuum, and the powdered coal is also circulated in closed circuit throughout the plant, the excess returning to the bins of the system after the desired amount of coal has been drawn off by means of deflectors to burners at points desired. As the pulverizing plant had been in operation several weeks at the time that these pictures were taken, one may see how perfect this system of handling powdered coal really is. In this respect it is so different from many of the other methods that it is worthy of special mention.

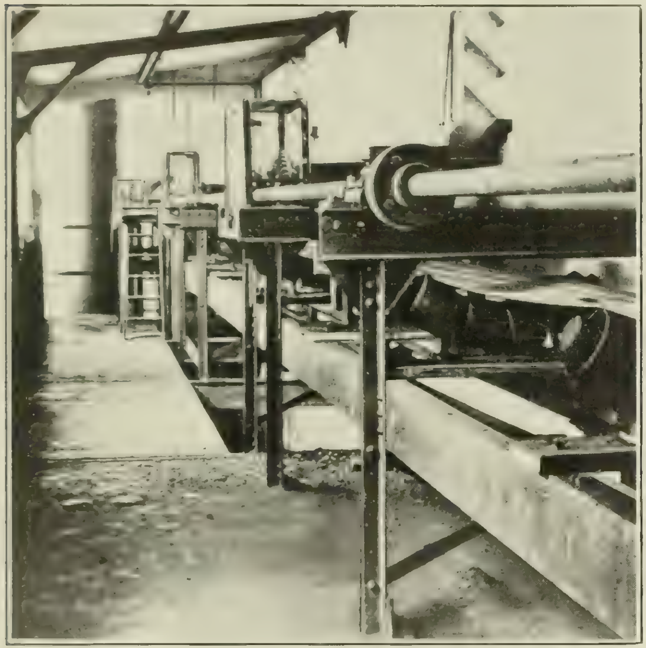

FIG. 1. CONVEYING SYSTEM AT PULVERIZER PLANT

The success with which powdered coal has been used for heating the boiler, various furnaces and kettles is one of the most notable features of the Bunker Hill smeltery. Probably it is the greatest recent advance in metallurgical practice, for by permitting a cheap fuel like slack coal to be used in firing the kettles and furnaces, instead of a much more expensive one such as fuel oil, it has made possible a considerable saving in the cost of refining.

The slack coal is dumped from railroad cars into bins alongside of the coal-pulverizing plant, and then is fed by screw conveyors to an 18-in. conveyor belt, (Fig. 1) which takes the slack coal to an automatic scale that dumps it into the feed hopper of the rotary drier (Fig. 2). The dry coal goes to a one-ton bin, from which it is fed by plunger feeder to the pulverizer, (Fig. 3). Bonnot coal pulverizers are used in each of the two units into which the installation is divided for the crushing of the coal. The powdered coal is drawn vertically upward through a separator from the pulverizer by an exhaust fan that sends it to a collector over the pulverized-coal bin, (Fig. 4). This bin, which is the supply bin of the powdered-coal circuit, has a capacity of 25 tons. The coal that is fine enough to travel in the air current rises to the coal collector, while that which is too coarse is caused by the baffle arrangement in the separator to fall back into the feed hopper, and again passes through the pulverizer. The size of the powdered coal delivered to the system is therefore determined by the velocity of air current used at the pulverizers, and not by a screen, which would continually be giving trouble by becoming choked. Screen tests show that the coal which goes to the burners is so fine that only about 5% will stay upon a 100 mesh, though practically 85% will pass a 220-mesh screen.

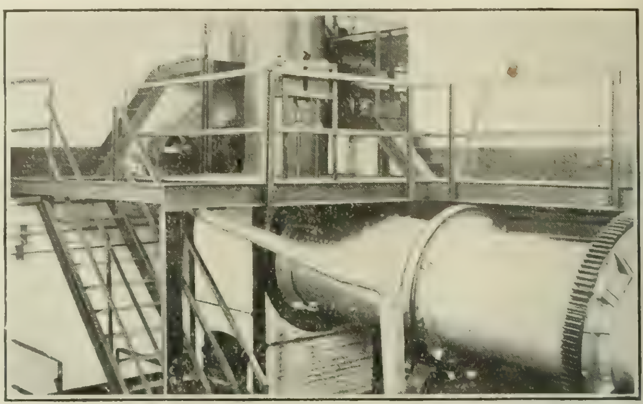

FIG. 2. WEIGHING MECHANISM AND ROTARY DRIER AT PULVERIZER PLANT

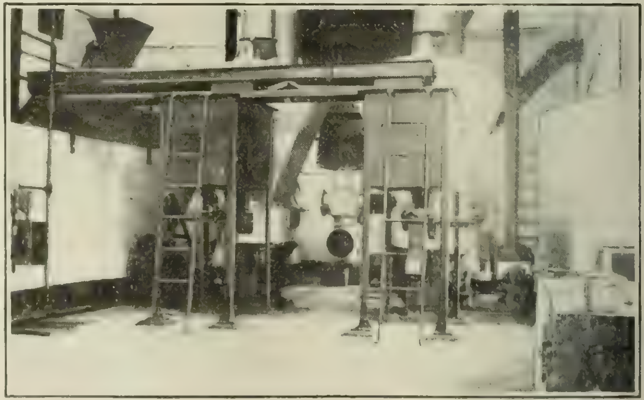

FIG. 3. COAL PULVERIZERS, FEED BINS, AND COAL COLLECTORS

From the pulverized-coal bin the product is fed into the system only as required and is controlled automatically by a regulating device (Fig. 5), that keeps the air pressure constant in the pipes of the circulating system. This controlling mechanism consists of an air-regulating valve mounted on the intake pipe of the distributing blower of the system. Attached to the stem of this valve is an electrical device for regulating the speed of the motor which drives the feeder at the pulverized-coal bin that serves the system. In this way the amount of coal which is fed into the system is made proportionate to the amount of air entering through the intake of the distributing blower. Consequently when a burner is opened so as to take air and powdered coal out of the system the air pressure in the line drops, and this drop in pressure causes the blower to pump more air in, making the valve on the intake pipe of the blower open slightly so as to admit more air. The movement of this valve then causes the motor of the coal feeder to speed up proportionately, so that the relation of coal to air in the circulating mixture is kept constant.

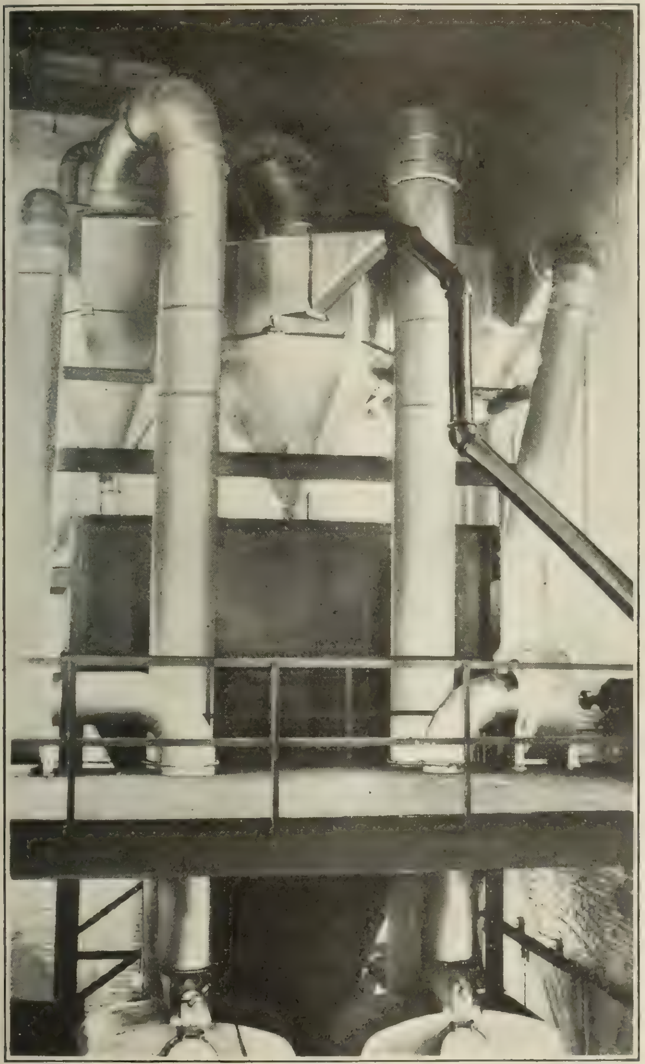

FIG. 4. COLLECTORS AND POWDERED-COAL BINS

Each dust collector has an air outlet which connects with the intake pipe of the distributing fan, so that any dust which refuses to settle is drawn into the distributing blower of the main circuit, and sent through the distributing pipes to the burners. One collector is placed on each of the two coal-pulverizer circuits, and one on the powdered-coal distributing system, making three main collectors in all. In the Holbeck system the air pressure in the circulating pipes is low, the distributing pipe line being 15 in. in diameter at the start, and reduced as air and coal are taken out, so as to keep the velocity of the circulating air approximately constant throughout the system. The return pipe is

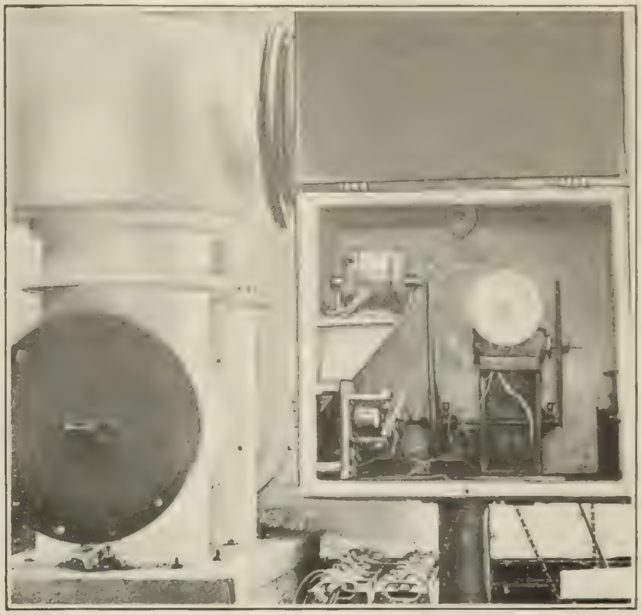

FIG. 5. REGULATING MECHANISM FOR POWDERED-COAL CIRCUIT

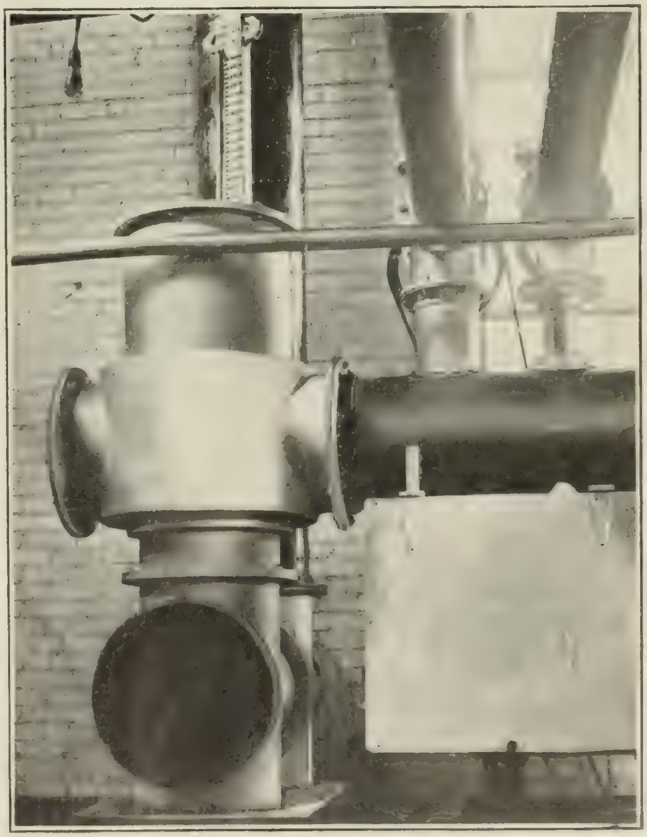

FIG. 6. REGULATING VALVE PULVERIZER DISTRIBUTING SYSTEM

only 8 in. in diameter. The length of the distributing pipe at present is 1240 ft., but it will soon be increased when more furnaces and kettles are included.

AVOIDANCE OF EXPLOSION INSURED

In the Holbeck return-circuit system, the feed of air and powdered coal to the distributing pipe is so proportioned that an excess of coal is carried at all times in the distributing line, and the mixture of powdered coal and air circulating through the system is kept well above a dilution that permits dust explosions to occur. As the mixture passes the valve of the burner, a baffle in the distributing pipe deflects a portion of the air and coal. Sufficient air is added to the coal mixture at the burner to obtain complete combustion, and thus a long, hot flame is obtained as the powdered coal is permitted to project from the discharge nozzle. The amount that the burner valve is opened determines the quantity of powdered coal drawn off through the burner, and therefore the heat obtained from the flame; and the shape of the burner nozzle controls the length of flame obtained.

The excess coal in the system is piped back to the return dust collector, where it falls into the pulverized-coal bin, thus keeping powdered coal storage in motion, and is again sent through the system. The return air, with any coal dust in it that refuses to settle in the dust collector, goes to the air-intake pipe of the distributing blower and is returned immediately to the system. As both air and powdered coal travel in closed circuit, the Holbeck method of burning powdered coal must of necessity be clean and economical.

The coal pulverizers will crush about 20 tons of coal in an eight-hour shift. This will run the smeltery for 24 hours, even when all the refining furnaces, kettles, and retorts are fired with powdered coal, so that the plant will require only one man and a helper on day shift to operate it. Except when coal is being crushed, it runs almost automatically. At present powdered coal is used to fire the softening, lead-refining, Faber du Faur, cupel, and the silver-refining furnaces, as well as the 150-h.p. Geary boiler which furnishes the steam used at the copper-sulphate plant.

Recovery of Potash*

The industrial production of potash demands its recovery from the raw material in a soluble form and a high concentration.

Potash from Silicates—This problem has confronted the chemist for many years. It is not a question of actual recovery, but of cost, that determines the success or failure of the process. Many tests have been made and patents granted, and these may, for convenience, be classified under three heads:

1. Wet methods. These involve a treatment of the raw material with some chemical reagent with or without added pressure, and a recovery of the salt from solution by evaporation and crystallization.

2. Sintering methods. Heat the raw material with one or more chemical reagents without volatilizing the potash. Treat the clinker with water alone or with the addition of some chemical reagent, and recover the potash from solution by evaporation and crystallization.

3. Volatilizing methods. These employ heating with reagents to a temperature sufficient to volatilize the potash recovered by solution and evaporation.

The first two general methods have not, up to the present time, been applied in commercial practice. The third is in use and gives much promise for the production of potash as a byproduct in the cement and iron industries. An outline of the process as employed at the cement plants is as follows: The mixture is prepared as for the production of cement, with or without the addition of small quantities of calcium fluoride, calcium chloride, or sodium chloride. It is heated and the potash volatilized. The salts are condensed and collected by the Cottrell fume precipitating process. Treatment with water and filtration separate the soluble material from the insoluble dust. The potash is finally recovered by evaporation and crystallization.

Potash from Alunite—A general process for the recovery of potash from alunite is to crush the ore, mix it with powdered coal, and roast it in a rotary furnace. This treatment drives off part of the sulphur as an oxide, and forms potassium sulphate and aluminum oxide. Leaching with water dissolves the potassium sulphate and filtering separates it from the insoluble alumina. The salt in solution is recovered by evaporation and crystallization.

Potash from Brines and Saline Deposits—Brines are evaporated and the salts crystallized. The brines from the Nebraska lakes, when treated by this process, yield a product which, when dried, contains 27 to 28% of potash (K_2O), and is put on the market in this form. Many brines, however, when evaporated as in the preceding process, do not yield a product sufficiently high in potash. At Searles Lake, California, the brines are evaporated and the first crop of crystals is removed. This, consisting largely of sodium chloride, with only a small quantity of potash, is discarded. The liquor is then further evaporated and a commercial product obtained. Saline deposits are leached with water and filtered to separate the soluble from the insoluble material. The solutions obtained are treated as brines and yield potassium compounds of high or low concentration, according to the composition of the original deposit, the methods used and the amount of recrystallization.

Potash from Kelp—It has been known for a long time that kelp contained potash, which was recovered by burning the seaweed and extracting the ash with water. Recently the enormous kelp beds along the western coast of North America have attracted attention, and numerous plants are deriving potash from this source. The processes of extraction, as practiced in America, are to harvest the kelp, dry and grind it as a fertilizer, or char at a low temperature and grind as a fertilizer. When refined potash salts are desired, the wet or the charred kelp is leached with water and the pure salts are obtained from solution by evaporation and fractional crystallization.

Potash from Other Sources—Wood ashes, beet and cane sugar molasses, distillery slop, tobacco stems, and woolen ashings are minor sources from which potash is obtained. Potash is recovered from wood ashes by leaching and evaporation of solutions.

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*Abstracted from an article on "Potash" by W. F. Coolbaugh, professor of chemistry, in the Colorado School of Mines Magazine, June, 1918.

The Maintenance of High Ampere Efficiency in Electrolytic Copper Refining

By M. H. MERRISS* and M. A. MOSHER†

Practical notes on methods suggested to insure the maintenace of high ampere efficiency in electrolytic copper refining. Conscientious and painstaking attention to detail is insisted upon, and it is suggested that high efficiency among employees should be rewarded by a bonus or cash prize. The importance of freshly cleaned and oiled contacts is emphasized and details are given as to the correct methods of hanging and controlling the sheets. The use of the voltmeter to detect short-circuits and bad contacts is explained, and the duties of helpers are outlined.

THE maintenance of the proper standard of ampere efficiency in an electrolytic tank room for the refining of copper by the multiple system is to a large degree dependent upon attention to details. Granted that good workable anodes are furnished, each operator, from the man who starts to prepare the tank for the placing of anodes to the one who gives it the last lining up after it is completely filled and just before the current is turned on, must perform his own particular duty conscientiously and with painstaking attention to detail. If any part of the work, no matter how seemingly unimportant, is slighted and hastily or carelessly performed, it may nullify the effect of the efforts of all those who attend to the subsequent operation of the tank. An attempt is here made to define, in as practicable a form as possible, some of these material points, attention to which is all-important.

During discharging and refilling of the tanks the following precautions are essential:

FRESHLY CLEANED ELECTRICAL CONTACTS MUST BE PROVIDED

The partitions between the several tanks are usually topped by a piece of capping board, about 1 in. thick, of the proper length and width. When the anodes are taken out of the tanks, this capping is removed, the top of the partition beneath it given a coat of coal-tar paint, and a fresh piece of capping put in its place. Then copper triangular bars, which have been boiled over night in a dilute sulphuric acid-copper sulphate solution, are placed on the clean capping. All dirt, hard grease, or tarry matter must be removed from these bars, on which the anode and cathode contacts are made.

CONTACTS SHOULD BE OILED

In the ordinary tank room, cranes pass many times, during the run, over each contact, carrying their cathodes or anode scrap, from which solution is bound to be dripping. In well-ordered plants, the crane runner will see to it that his load remains stationary over the tank from which it has been lifted until most of the drip has ceased, but it is uneconomical from a time standpoint to wait until there is absolutely no further dripping. The drops fall upon the capping and bars, and the copper sulphate contents crystallize out, creeping up and fouling all contacts. This is prevented by giving all bus-bars, triangular bars, and anode and cathode contacts a light coating of machinery oil, daubed on with a small mop.

THE THIN CATHODE STARTING SHEETS MUST BE CAREFULLY HUNG

A thin sheet of pure copper is hung between the anodes as the starting point for the cathode deposit. In most refineries this thin sheet is placed upon a slanting table for straightening (Fig. 1). The result desired is that each sheet may be hung in its place free from warps, curls, or twists, and this perfect flatness depends almost entirely on the way in which the workman strikes the sheet with the flat wooden flapper (Fig. 2) which is provided for that purpose. The sheet must not be struck heavily, but, rather, briskly, starting at the far upper corner and proceeding around the border of the sheet, with a final diagonal flap in the middle to prevent curling. Ten or twelve blows are sufficient, and an experienced man can do good work with fewer. If this operation is hurried at the expense of thoroughness, the initial number of short-circuits, when the current is turned into the tank, will be high, and the cathodes will give trouble throughout the run.

ANODES AND CATHODES MUST BE PLACED EQUI-DISTANT AND PROPERLY CENTERED IN THE TANK

Much depends on the careful lining up of the anodes and cathodes after they are in the tank. A skillful "liner," as he is called, must not only space anodes evenly with regard to each other and the sides of the tank, but keep them in alignment with those of the adjacent tanks, so that the cathode rods can be placed in their proper places on the triangular bars. He also pinches the cathode loop closely around the rods with long special pincers (Fig. 3) and places the slotted end of the cathode rod carefully on the triangular bar. The cathodes must be symmetrically placed between the anodes and must not touch the tank walls. A tank which is poorly lined up will give continuous trouble for several days, with a resultant loss of ampere efficiency of from 2 to 3 per cent.

THE RESULT OF EFFECTIVE TEAM WORK

Each tank in the multiple system contains, electrically speaking, a large number of parallel circuits, and the ideal of all this preparatory work is so to arrange the electrodes and connections that the ohmic resistance of each small circuit shall be exactly equal to the ohmic resistance of every other circuit. If this is the condition, when the current is turned on exactly the same number of amperes will be flowing through each little electrical circuit, hence through each anode and through each cathode, and therefore the rate of deposition upon all cathodes will be entirely uniform. None of these operating details can be overlooked, and since time is such an important factor in electrolytic production, the utmost in team work and systematic coördination is necessary to secure both speed and a quality of work conducive to high current efficiency from the tanks.

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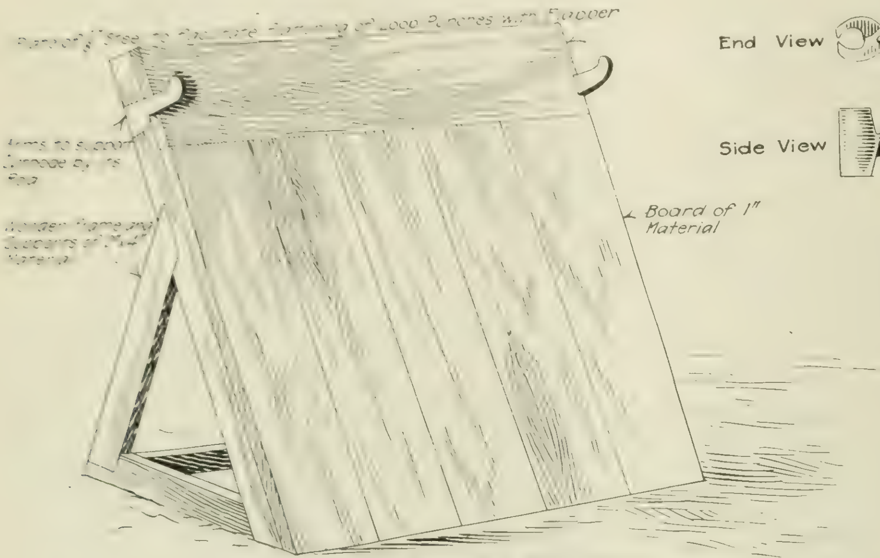
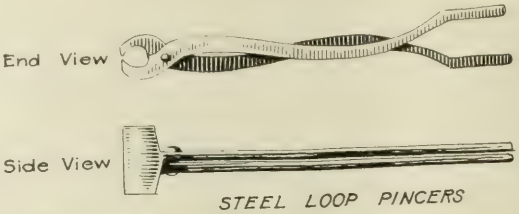
In most refineries it is the custom, after 24 or 48 hours, to lift each cathode from the tank and again flap or "straighten" the thickened cathode, but it will be found that this operation may be dispensed with if the precautions mentioned are taken. If the tank can once be really started right, "sheet-straightening" does more harm than good.

As soon as the current is allowed to pass through the tank, and until the cathodes are heavy enough for "pulling" some days later, the operation of the tank is in the hands of an entirely different set of men—inspectors, metermen, hot-sheetmen, or whatever name they go by in the various refineries. The function of each unit in this "inspection gang," as it may be called, is briefly delineated subsequently.

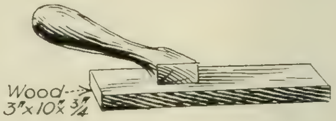
The use of the voltmeter (Fig. 5) for anode to cathode



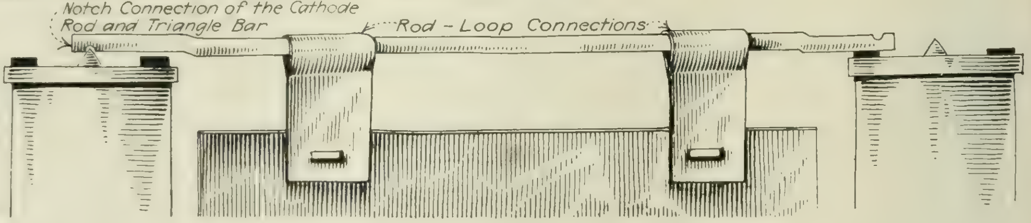
FLAPPING BOARD
FIG. 1



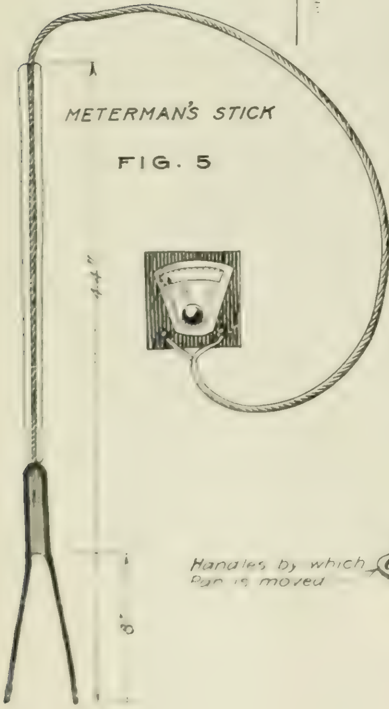
STEEL LOOP PINCERS
FIG. 3



FLAPPER
FIG. 2



CATHODE CONNECTIONS
FIG. 4



METERMAN'S STICK
FIG. 5

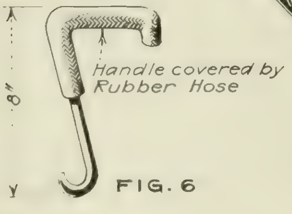


FIG. 6

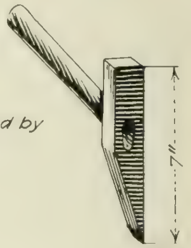


FIG. 7

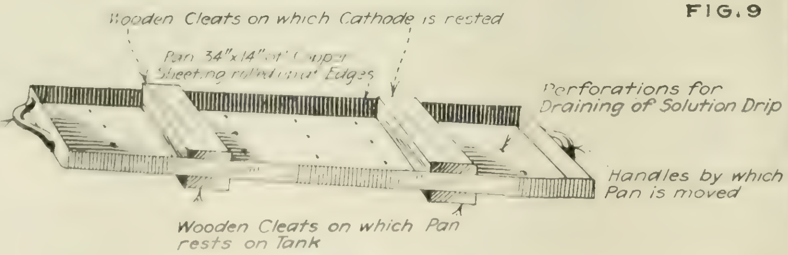

Wooden Cleats on which Cathode is rested
Pan 34"x14" of Copper Sheeting rolled up at Edges
Handles by which Pan is moved
Perforations for Draining of Solution Drip
Handles by which Pan is moved
Wooden Cleats on which Pan rests on Tank

FIG. 8

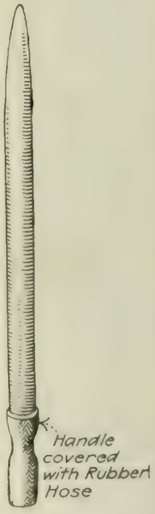


FIG. 9

inspection on the electrolytic tanks has two main purposes: (a) the detection of poor contacts or bad connections, and (b) the location of short-circuits. The former is its more important function, since the meter is the only practical means of quickly discovering anodes or cathodes that are not working. With regard to the position of short-circuits, although it may indicate their presence, it is not nearly as reliable as the hand work, described in a succeeding paragraph. If a poor connection is found either at the anode or the cathode contact, it is best for the operator first to try to make the voltage normal by moving the contact with a sharp kick of his foot. If this does not correct the cathode trouble, he should feel the cathode rod, and if it is not hot, mark it as a bad contact. If the trouble is at the anode connection, the lug is marked for correction. Poor lug connections are frequent during the last few days before anodes are to be removed, as the anodes are light, and dirt and slime-drip from the changing of scrap get under the contact. It is just as important that the anodes be kept working uniformly as that the cathodes should. Though the meterman can accomplish much by trying to correct poor contacts with his foot, he must be careful not to overdo it; for he may make the connection worse than it was, or so disturb the anodes and cathodes as to cause short-circuits. In addition to this, he slows up his progress over the tanks and soon tires himself out. Any contact which he does not correct he should mark with chalk in such a way that the other members of the gang may know what is wrong, and correct it. It may be said, in passing, that most of the poor cathode contacts are at the notch connection of the rod and triangle bar, and seldom at the rod-loop connection (Fig. 4). Many such connections remain uncorrected because the hot-sheetmen will not understand that the wedge notch usually used touches only the sides of the triangle bar. They polish the rod-loop connection and the top edge of the triangle bar, but the poor contact on the sides of the bar remains dirty.

Uses of Voltmeter

There are three ways in which the voltmeter needle indicates a short-circuit—first, by a wavering, oscillating motion; second, by an abnormally low reading, and third, by an abnormally high reading. These are given in the order of the frequency with which they occur. The first can often be seen while the needle is moving toward its maximum, as its progress may be uncertain; but sometimes the oscillation is very slow, and the short-circuit may easily be missed if the operator is working fast. The second indication is sure to impress the meterman, as it is the same as that for a poor contact; hence there is little chance of passing by a short-circuit of this type. The third classification is rarely encountered, most cases being those where the short-circuit is so bad that the cathode is carrying a large share of the current. These indications become much more clear and certain to the operator with practice, and after a month or two he can move along at a good rate. However, it has been noticed that most of the best metermen do not go fast, but, rather, work steadily.

In making his anode-cathode contacts for the meter readings, the voltmeterman uses a pair of copper prongs, mounted fork fashion at the end of a light 36-in. stick, which also carries the wires connecting the prongs with the voltmeter terminals (Fig. 5). With this arrangement he can make the contact below the surface of the solution and stand erect while doing it. The handling of the meter itself is of considerable importance. It should be held as nearly horizontal as possible, and in such a position that the needle can be clearly seen by the operator without turning his head too far or jerking the meter forward. The importance of this is due to the significance of the needle's movement from the start.

The meterman's function in electrolytic copper work is best described by the term "inspector." With clean conditions and conscientious work by the other units to which reference will be made, he would not be missed as much as any other member of the gang, but he is usually needed to check up the work of the other men in the gang by going over their tanks at least once a day, and also to keep the anodes and cathodes in the old and dirty tanks working at an even voltage.

Lump Men or Heavy-Copper Fixers

The heavy-copper men are those who, operating in pairs, attend to the proper working of the cathode sheets after they have aged sufficiently to be too heavy to be lifted out by a single man, the light-copper fixer. In other words, they take care of the copper from the time it is four or five days old until it is "pulled." They correct cathodes (or anodes) marked by the voltmeterman and also determine the position of short-circuits themselves by going over their sections "by hand," which is the term applied to feeling each cathode rod in a tank successively. If there is a short-circuited cathode, its rod quickly becomes noticeably hot, owing to the fact that this cathode will take far too large a proportion of the current. The tools used by the men in this work consist of two short-handled copper hooks (Fig. 6), a chisel-shaped hammer (Fig. 7), and a pan on which to rest the cathode (Fig. 8). The pan is perforated in the middle to allow the solution drip from the cathode to flow back into the tank. The workmen stand on opposite sides of the tank, each placing his hook under his end of the marked cathode rod, and together they lift the cathode up on the pan, which has been placed as near as possible. One man steadies the sheet while the other removes nodules and short-circuit growths or straightens it with the hammer. If the contacts are dirty they are sandpapered, and then the cathode is carefully replaced in the tank.

Cleanliness Imperatively Necessary

It is essential that these heavy-copper men should use care not to slop or spatter any more solution than is absolutely necessary in removing, striking, and replacing the heavy cathodes. When the cathode rod has become noticeably dirty they should replace it with a freshly cleaned one; and, if they encounter an exceedingly rough or irregular cathode, they should throw it out and replace it with a carefully flapped starting sheet. Other pointers as to their work are common to the work of the light-copper fixer, and are taken up later, as they are more important in his case.

The name "light-copper fixer" is given to the man who handles the copper from the time it is started off in the tank as a thin "starting sheet" weighing about 7 or 8 lb., until it becomes heavy enough to require two men to lift it out of the tank. His work is the most important done by any man in the tank room, as regards efficiency. When the tank is first started, he gives it what is called a "special lining up." If this work is thoroughly done by a competent man, the tank gets a good start; and a good start almost invariably means high final efficiency. The light-copper fixer, acting as a special liner, looks out for the following things as he goes over each cathode in the tank: He first slides the sheet along the rod, by means of one loop, to the side of the long anode lug until the sheet touches the tank, and then back about ½ in., so that it hangs free. It is best to repeat this once or twice to shine the contact between the inside surface of the loop and the rod. The loops are then pinched around the rod with the fingers and bent back and forth once or twice until the top edge of the sheet hangs directly under the rod. The final operation is to lift first one end of the rod and then the other and "feel" the sheet into its place between the anodes, so that it hangs free and does not touch them.

EFFICIENT CONTROL RESULTS FROM EXPERIENCE

It is this part that requires practice, as the beginner is unable to "feel" a cathode touching the anode. However, an experienced liner can tell almost instantly, upon lifting one side of the sheet and letting it down gently, whether or not it is hanging free.

The special liner may carry a short, light knife of $\frac{3}{16}$-in. steel (Fig. 9) with him to good advantage. It saves using his hands on solution-wet sheets and can be used in moving anodes that are out of line, or in straightening rods and badly bent cathodes. This is the only tool used by light-copper fixers; and these men become very expert in striking the sheets with it in such a way as to make them hang straight. They also use the knife to remove short-circuit growths.

Careful lining accomplishes two main purposes: It lessens the initial number of short-circuits, and it puts rods, loops, and sheets in better position for the whole run. Much benefit results from lessening the initial number of short-circuits. It means fewer sheets for the light-copper fixer later to lift out and correct, so that he can do better work on those that remain. Also, by lessening the number of short-circuits in a tank, the remaining ones are made to show up more distinctly, because if there are 10 or 12 short-circuits in a tank the current is divided among so many that it is difficult to discover all of them.

CAREFUL LINING PUTS PARTS IN PROPER POSITIONS

It has been noticed that a tank will often "go bad" as it begins to get heavy. This is generally due to cathode loops being originally off center, with the result that the sheets do not hang directly under their rods. Though such a cathode may be all right the first three or four days, it will later change its position and by its own weight hang straight down from the rod—usually causing it to touch an anode. The same is true in regard to the loops touching the anode lugs. The loops should be so placed at the start that there will be no likelihood of their swinging over and touching the anode lug when the cathode becomes heavy. Bent top corners of the cathode which may later grow across to the anode also come under this heading and are always straightened by the careful liner.

Special lining-up affords probably the best method of keeping in touch with tank conditions. The special liner sees at first hand the kind of gang work that is being done, such as sheet and loop punching, sheet flapping, and the cleaning of tanks, triangle bars and rods. He can check up the work of the regular liners as to both anode lining and cathode lining. In addition to this, he can observe the circulation, solution, and anode conditions. For these reasons a careful and alert man on special lining can be of great service to his foreman from an informative standpoint, as well as from his ability to increase current efficiency.

DETAILED AND SYSTEMATIC INSPECTION IMPERATIVE

After the tank has been lined up, as outlined, it is good practice to give it a thorough going over "by hand," then a voltmeter inspection, and then one more thorough "hand" correction, on the first day. More inspection is found unnecessary, as the starting sheets have acquired little deposit and are too thin and springy to be worked readily. On the second day of the run the cathode weighs 20 to 25 lb., and the deposit is sufficiently heavy to make the sheet pliable and easy to work with the knife. It is important that the tank be corrected thoroughly and carefully at least four times on this day, as it is the first and last opportunity permanently to cut down the number of short-circuits and give the tank a good start on its run. The first day the starting sheets are difficult to work and the third day it is too late because of the efficiency already lost. In addition, the light-copper fixer knows that he can save himself and the heavy-copper men a great deal of subsequent work if he can get the section in good condition at this time.

Another duty of the light-copper man is to go over the old tanks which contain anodes too thin to be allowed to remain in the tanks over night (and risking collapse of the anode, with resultant cutting of the lead lining) and mark this scrap for removel. This he does by testing the strength of the lugs by pressure with his foot.

POINTERS FOR THE LIGHT-COPPER FIXER

The following are some special points as to the light-copper fixer's work: If he finds the same cathode short-circuited several times in succession, he turns his attention to the adjacent anodes, and probably finds that one of them, instead of hanging plumb, is leaning toward the cathode. He then plumbs the anode by bending the lugs with a hammer in the direction he wishes it to lean. If he finds any projections on the anode he makes a slight indentation in the cathode to conform to it. Any torn sheets, or ones which touch the tank walls as a result of careless punching-on of the loops, are thrown out and replaced with perfect sheets. This work is important, as cathode contacts with the tank walls cause deposition on the lead and considerable loss in current efficiency. In replacing every cathode he has corrected, the light-copper man "feels" it into its place between the anodes, lifting it first on one side, then on the other, as already described. When he encounters a bad contact, he scrapes the contact on the triangular bar with his knife and sandpapers the notch contact and loop contacts of the cathode rod, or, better still, replaces the rod with a clean one. He also straightens or replaces any bent or "rolling" rods which may have found their way into the tank. The light-copper man's work is summed up in the statement that he should never leave a short-circuit or bad contact until he has done everything possible permanently to correct it.

The success of the inspection gang is dependent largely upon the spirit with which the gang goes about its work. If there is thorough coöperation, under the good leadership of either a meterman or a light-copper fixer, preferably the latter, high ampere efficiency will almost invariably result. Such a spirit can best be maintained by constant competition among the various inspection gangs for some kind of cash bonus or money prize for high efficiency.

The Gasoline Locomotive at Smelting Plants

In slag disposal at lead- and copper-smelting plants the trolley and electric locomotive system is used to a arge extent. It may be unnecessary to point out that the installation of this system requires direct current generators, switch-board equipment, and additional engines or motors in the power plant, as well as the stringng of trolley wires about the plant. There is an additional element of risk introduced by the presence of the trolley wire, which is usually placed in a low posiion. In spite of these facts, the trolley locomotive has displaced the steam locomotive for slag haulage.

The gasoline locomotive has reached a development hat makes it worthy of careful consideration by the meltery manager. It possesses the advantages of being elf-contained and requires no additional power-plant quipment for its operation. The trolley wire is dispensed with and the only additional equipment required t the smelting plant is a charging station and gasoline torage. From an operating standpoint the gasoline ocomotive is more economical of fuel (where power is generated by steam) than the electrical installation. This is particularly true where fuel costs are high. In he matter of repair costs, a well-designed and well-onstructed gasoline locomotive should compare favorbly with the trolley locomotive. In many smelting esablishments the gasoline locomotive offers a convenient olution of the haulage problem.

Continuous *vs.* Intermittent Tapping

Early blast-furnace smelting was on such a small scale hat intermittent tapping successfully answered most equirements. With the increase in size of the smeltng units and the rapidity of smelting, the tapping of he furnace became more laborious and its operation ess satisfactory. This was particularly so in the case f copper-matting furnaces. Attempts to apply coninuous tapping to the ordinary tapping-hole arrangements were failures, on account of the difficulty of roper control. The invention and application of the lag well or trapped-blast form of slag spout, eliminated, o a considerable extent, all of the objections to connuous tapping. Water-cooled slag-well spouts naturally ollowed and are now standard on most copper-matting furnaces.

The application of continuous tapping to lead blast furnaces has not been so universally applied, principally for the reason that in some cases furnace charges have been such as to produce fluid products that do not work well with the continuous tap. A charge high in zinc or arsenic and antimony has a strong tendency to produce crusts in the crucible of the furnace. With the continuous tap, these crusts are likely to accumulate and produce conditions inimical to the proper operation of the furnace. With intermittent tapping, a considerable amount of slag and partly fused crust-forming products accumulate, which are flushed out, and, as a consequence, the accumulation of crucible crusts is retarded.

The prudent metallurgist will carefully consider the nature of the charges and the products resulting before he specifies his tapping arrangements, and will prefer intermittent tapping when there is a wide variety in the chemical composition of the charges, and where crust-forming elements are conspicuous. Where the charges produce clean, fluid slags and there is an absence of such elements, the continuous slag tap is selected. Facilities for slag disposal are a necessary limitation in some cases, but usually they can be adjusted to permit of continuous tapping of the furnace. Where this cannot be done, intermittent tapping is practiced.

Buffalo Bill Over There

By R. W. Raymond

According to abundant evidence, there is a general impression in the German army that the American troops are savage and cruel. A German officer, captured in a recent battle, made to one of our reporters the surprising statement that the Americans mutilated the bodies of the wounded as well as the dead; and numerous German prisoners have expressed great surprise at being kindly treated after capture. How could this strange misconception—antedating even the arrival of Americans in the fighting line—have originated?

The answer is—Buffalo Bill! The "Wild West" show produced in Germany a profound sensation, and was visited by millions of people, who regarded it as a picture of American warfare. The German soldiers now in the ranks, cherishing the traditions of their childhood, have been expecting the American infantry to assault them with wild war-whoops, to torture prisoners, and to scalp the wounded as well as the dead. The cavalry horses were to advance upon their hind legs, pawing the air, or bucking and jumping while their riders fired unerring shots from immense revolvers. In vain have been the official declarations that the Americans were insignificant in number, or inexperienced in warfare, or even cowardly. The common soldiers have been afraid of personal contact with them. If artillery and machine guns failed to stop them, there was nothing to do but run away from them. Even calling them "crazy" has not helped the matter. At close quarters an army of lunatics is the most terrible of all.

Our boys have contributed something to the confirmation of this superstition by going gayly into battle with Indian war-whoops, college yells, football slogans and other "savage" shouting. It is an amusing phenomenon that the Huns, who have been the representatives of unprecedented ferocious "frightfulness," should be so scared by the memory of Buffalo Bill!

Japan's Supplies of Iron

Notwithstanding the tranquil state of the steel market, with prices comparatively low, the price of pig iron keeps rising, owing to the demands from steel works and shipbuilders. The scarcity of materials in Japan is attributed to the difficulties in securing goods from foreign markets, according to the *Evening Post*.

Pig iron is produced in Japan in quantity, but production is far from sufficient to meet the needs of the country. Formerly pig iron was imported from Canada, and particularly from India and China. India, however, stopped its exports last year, so that today only a small quantity is received from this source, with licenses issued by the Indian government. The Canadian government is absolutely embargoing exports of pig iron. China is the only country on which Japan can rely for a part of her needs.

It is true that there is an abundance of this metal in China, but, on account of the unreliable customs, trading can be carried on only with two or three large firms. Many of the smaller concerns are eager to form connections with Japanese consumers, but their goods cannot be handled with confidence, for they are often adulterated with some other cheaper metal. The import of pig iron during 1917 was estimated at 387,086,509 lb., against 278,071,986 lb. in 1915.

In view of the accelerating demand, the only alleviation seems to be to discover or develop some means of obtaining supplies from abroad. Movements are on foot within the country to increase the output in Japan by the importation of ores; however, no substantial progress has been reported on this matter.

Accidents at Metallurgical Works in 1916

The Bureau of Mines, in Technical Paper 201, compiled by A. H. Fay, gives the accidents at metallurgical works in the United States for the year 1916. The report shows a reduction in fatal accidents at smelteries and ore-dressing plants. The non-fatal injuries show an increase, but this is said to be due to the more complete returns, which cover 150 smelting plants treating copper, lead, zinc and quicksilver. The iron blast furnaces are not included. The ore-dressing plants represent concentrating plants for copper, lead and zinc ores, stamp mills, cyanide plants and iron-ore washeries. The fatalities on a basis per thousand 300-day workers is 1.41 for ore-dressing plants and 0.73 for smelting plants.

Auxiliary works include machine shops, carpenter shops, yards, and general construction, all a part of metallurgical plants, but should not be included in actual operating departments. Reduced to a 300-day basis, the fatality rate is 0.89 per 1000. Fifty-seven per cent. of these fatalities were due to falls or falling objects. At ore-dressing plants 33% of the fatalities were caused by machinery, 6% by falls, and 21% by haulage systems. Of the injuries, 18% were from machinery, and 6% from haulage systems. At smelteries 22% of the fatalities were caused by machinery, 25% by falls, 17% by haulage systems, 11% by burns and 11% by falling objects. At auxiliary plants 35% of the fatalities were from falls, 14% from electricity and 14% from falling objects. A separate compilation of copper metallurgical plants shows the fatality rate per thousand 300-day workers as 1.06 at the mills and 0.81 at the smelteries.

ACCIDENTS AT ORE-DRESSING PLANTS (*a*) IN 1916

State	Men Employed	Average Days Worked	Killed	Injured
Utah	3,017	356	5	711
Arizona	2,380	332	3	524
Michigan	2,255	312	2	137
Montana	2,153	300	3	168
Nevada	1,556	330	1	133
Colorado	1,382	300	4	176
Missouri	1,375	291	1	186
New Mexico	1,346	345	4	310
Alaska	925	360	0	127
California	794	295	0	118
New Jersey	715	337	3	45
Idaho	611	309	0	75
New York	567	269	4	73
Virginia	475	286	1	43
Tennessee	460	262	1	48
Wisconsin	421	268	0	90
South Dakota	362	320	0	51
Minnesota	286	251	0	48
Arkansas	173	247	0	20
Vermont	137	307	0	8
Oklahoma	94	226	0	15
Alabama	92	179	0	9
Kansas	80	298	0	7
Oregon	77	155	0	2
Georgia	68	286	0	9
Texas	60	290	0	7
Illinois	58	185	0	4
North Carolina	55	276	0	3
Pennsylvania	25	313	0	1
Maryland	9	155	0	1
Other States (*b*)	340	274	1	35
Totals	22,348	215	33	3,184

(*a*) Concentration plants for copper, lead and zinc, stamp mills, cyanide plants, iron-ore washeries.

(*b*) Washington and West Virginia not reported.

ACCIDENTS AT SMELTING PLANTS (*a*) IN 1916

State	Men Employed	Average Days Worked	Killed	Injured
Oklahoma	5,181	318	1	817
New Jersey	4,870	365	6	646
Illinois	4,735	344	2	1,356
Kansas	3,611	339	3	695
Arizona	3,470	349	1	1,112
Montana	3,200	306	3	333
Colorado	3,099	300	1	508
Pennsylvania	2,583	361	3	610
Utah	2,401	365	8	622
Missouri	1,532	354	2	317
Maryland	1,300	351	1	605
California	1,146	333	1	224
Washington	1,045	336	1	135
Michigan	1,001	326	1	251
Texas	963	365	0	179
West Virginia	932	364	0	148
Nevada	870	351	0	90
New York	570	271	1	361
Arkansas	410	184	0	154
Virginia	251	346	0	39
Tennessee	200	351	1	241
So. Dakota	16	147	0	1
Vermont	8	50	0	2
Wisconsin	5	300	0	1
Other States (*b*)	360	361	0	209
Total	43,739	338	36	9,656

(*a*) Copper, lead, zinc and quicksilver, but not iron.

(*b*) Alabama, Alaska, Georgia, Idaho, Minnesota, North Carolina, New Mexico, and Oregon not reported.

ACCIDENTS AT AUXILIARY WORKS (*a*) IN 1916

State	Men Employed	Average Days Worked	Killed	Injured
Montana	3,027	324	6	307
Arizona	2,512	341	4	385
Pennsylvania	1,398	363	2	168
Oklahoma	1,381	332	0	187
Illinois	1,325	351	0	300
Utah	857	362	0	231
Missouri	815	310	0	103
Washington	642	365	0	121
Virginia	418	327	1	11
West Virginia	375	335	0	94
California	280	363	0	56
Texas	215	358	1	102
New Jersey	148	364	0	14
Tennessee	123	347	0	136
Idaho	88	232	0	2
Wisconsin	85	158	0	8
Michigan	77	345	0	1
Nevada	70	267	0	3
New York	50	296	0	2
Kansas	16	335	0	9
Other States (*b*)	23	194	0	0
Total	13,925	338	14	2,240

(*a*) Machine shops, carpenter shops, yards and general construction.

(*b*) Alabama, Alaska, Arkansas, Colorado, Georgia, Maryland, Minnesota, New Mexico, North Carolina, Oregon, South Dakota and Vermont not reported.

Mechanical Scotch-Hearth Smelting

By WILLIAM E. NEWNAM*

The suitability of hearth smelting for comparatively small quantities of galena concentrates and the advantage of low first cost. Type of installation should be determined by local conditions and requirements. The production of matte and its subsequent smelting treatment with concentrate are discussed, and comparative details given. It is suggested that there is scope for the extension of Scotch-hearth smelting. The ideal installation.

FOR the last two years there has been a marked revival of Scotch-hearth smelting, attributable to the introduction of the mechanically operated hearth, which has improved the efficiency of the operation, greatly lowered the cost of smelting, and eliminated the objectionable features of the old hand-operated hearths. In the middle West practically all of the latter have been replaced with mechanically operated hearths, and several new plants of this type are being successfully operated. There are now 43 mechanically operated hearths in use in the district mentioned, and several new plants are projected. In Canada and Spain mechanically operated hearth plants are now in operation and a new plant is under construction in England which will supplant the old hand-operated Scotch hearths and Flintshire furnaces.

The extreme elasticity of the hearth-smelting operation recommends this furnace where the tonnage of galena concentrate is comparatively small, and under conditions which in the past would have made the construction of a regulation lead blast-furnace plant impracticable. Where electric power can be purchased, as is the case throughout the greater part of the Mississippi Valley, the construction cost of a hearth plant is relatively low as compared with the ordinary smelter construction. Any mine having a daily production of 20 tons or more of suitable galena concentrate can economically smelt this at the locality of production.

Several hearth plants having a capacity of 100 tons of concentrate per day are now in operation, and accompanying illustrations are intended to illustrate a typical installation. The plant shown is designed for the production of chemical lead from non-argentiferous concentrate containing an average of 70% or over in lead content, the plant site being comparatively level ground. Two types of installation are in vogue. In the first, the hearths are placed in a straight line facing in the same direction, all being right hand and with interchangeable parts. This type of installation is preferable in the case of small plants, or where there is ample space available, as it enables the placing of the flue system outside the hearth building, which greatly reduces the temperature of the hearth room and obviates the necessity of collecting the flue dust within the building, thus greatly improving the working conditions. It is shown in Figs. 1 and 2. In the second type of installation the hearths are placed in two lines facing in opposite directions, one line being right-hand and the other left-hand hearths, with the flue system between the two lines. This arrangement is employed in cases where the space is limited or where a large number of hearths are installed. (See Fig. 3.)

In localities where it is impossible advantageously to sell the resultant gray slag, this product is accumulated and periodically smelted in a small lead blast furnace. This gray slag is admirably adapted, both physically and chemically, to blast-furnace smelting; and, owing to its low sulphur content, is productive of little matte.

From each ton of original galena concentrate treated there is produced at the blast furnace about 40 lb. of matte, or approximately 2%. I have found that this matte, when granulated or crushed to ¼ in., and bedded with the concentrate, can be perfectly roasted at only the expense of granulating or crushing and bedding. It has been found that as much as 6% of matte can be mixed with the concentrate and treated in this manner with little diminution in the lead extraction in the hearths. The following is a comparison of analyses of gray slag from smelting straight concentrate, and a mixture of concentrate and matte.

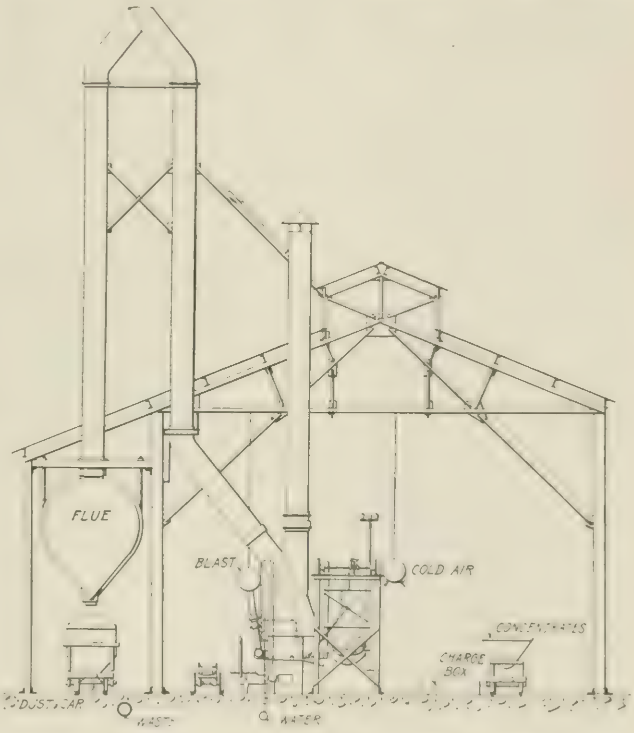


FIG. 1. END VIEW OF HEARTH PLANT

	Pb	Insol.	FeO	CaO	S
Concent. only, per cent....	47.0	7.4	9.0	8.4	2.6
Concentrate and matte, per cent	45.1	6.0	19.5	7.0	2.5

Much less fuel is used in the hearth when smelting the concentrate and matte mixture, on account of the higher sulphur content resulting from the addition of the matte.

Though the Scotch hearth has been employed almost exclusively in smelting non-argentiferous galena for the production of chemical lead, there is no reason, consid-

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*Superintendent, St. Louis S. & R. Co., Collinsville, Illinois.

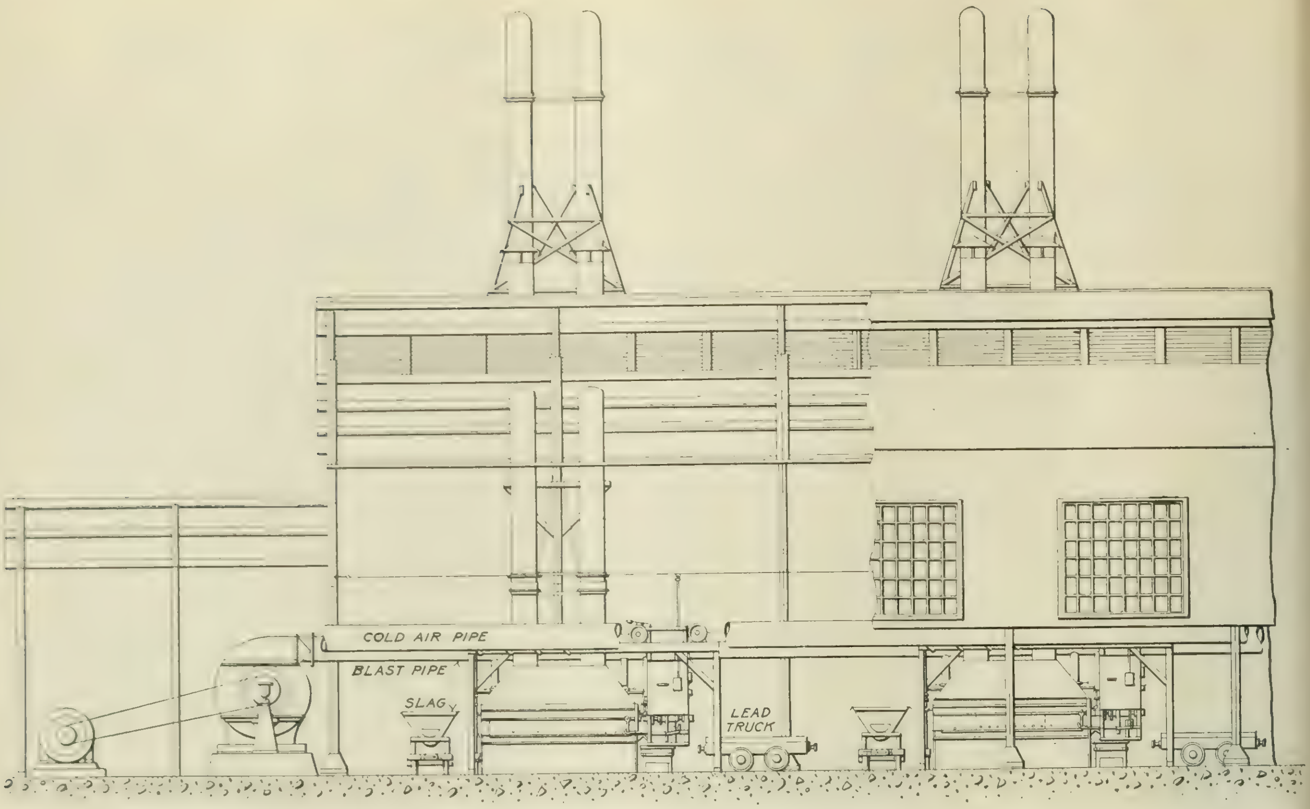

FIG. 2. FRONT VIEW OF HEARTH PLANT

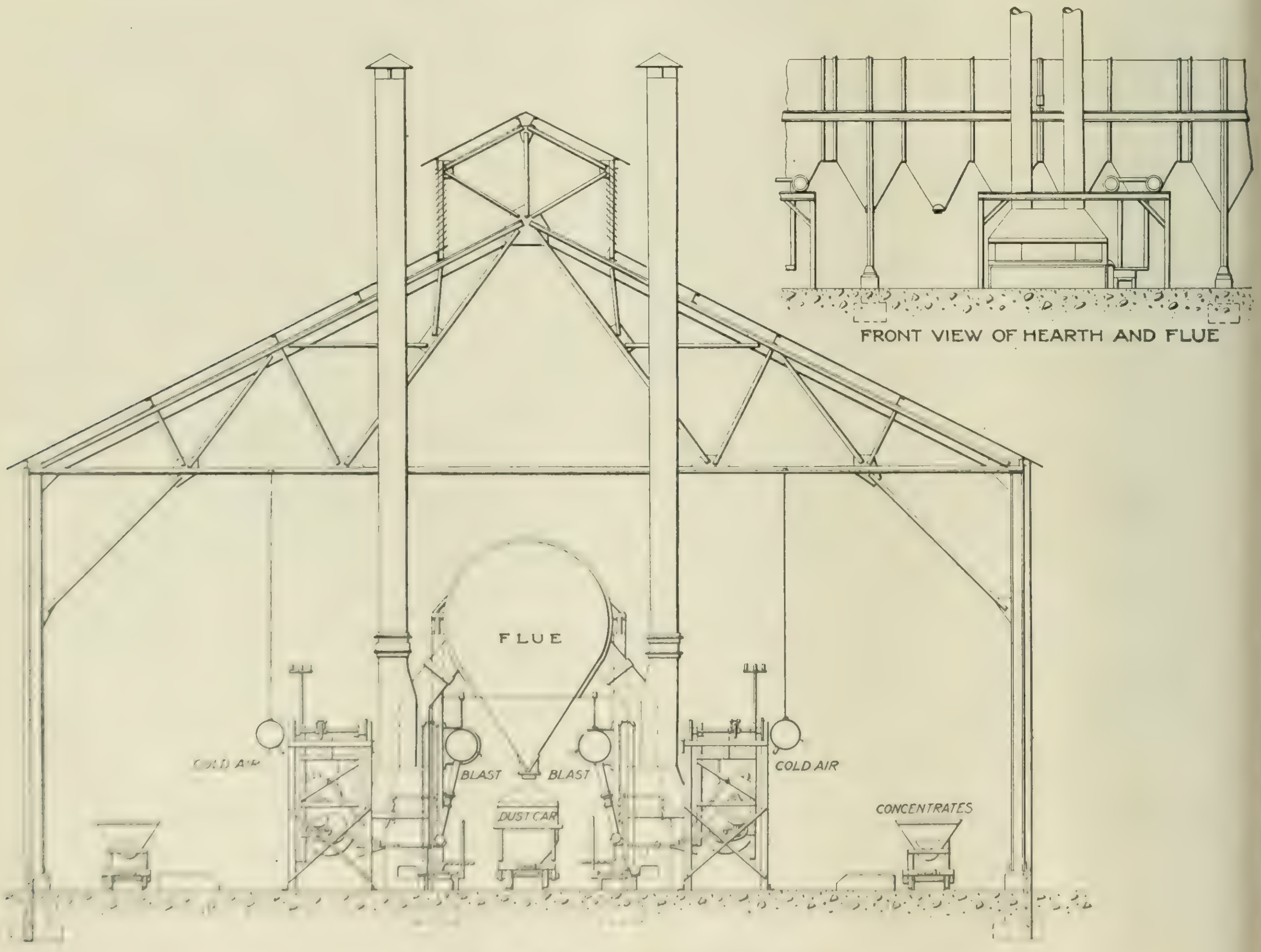

FIG. 3. END VIEW OF HEARTH PLANT

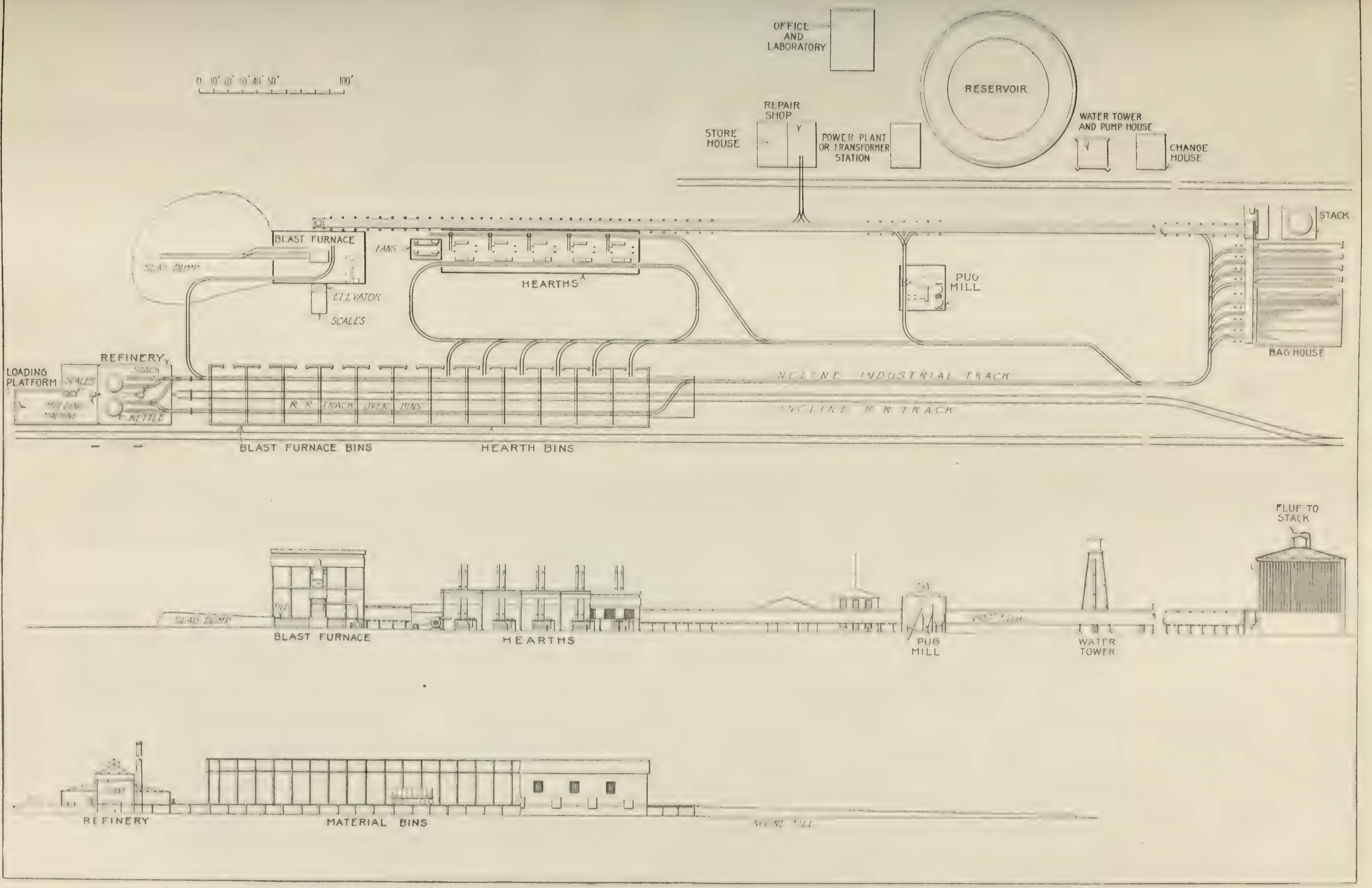

FIG. 1. GENERAL PLAN AND ELEVATION OF LAYOUT OF MECHANICAL SCOTCH HEARTH PLANT

ering the low lead loss in correct hearth smelting, why argentiferous galena cannot be economically smelted and refined lead produced by adding the necessary refining facilities and equipment. In cases of plants employing the roasting or sintering and blast-furnace process, where a part of the lead-bearing material is too low in lead content to be economically smelted in the hearth, the hearth can be advantageously employed in smelting the higher-grade concentrate, with a reduction of the total smelting cost. This fact has been demonstrated during the last year.

The general design of the plant here shown (Fig. 4) provides for five mechanically operated hearths having ample capacity for the smelting of 100 tons of concentrate per day, and for the resultant byproducts, such as flue dust from the hearths and blast furnace, burnt bag-house fume, and like material. The gray slag is thrown into dump cars as it is taken from the hearth, and at the end of each shift the car is switched over the storage bins and dumped. The pig lead is stacked on trucks as it is molded, at each hearth; and the loaded trucks, at the end of each shift, are switched to the refinery and the pig lead is charged into the drossing kettle by means of the overhead crane. The flue dust is collected in closed hopper cars, and taken to the pugging department, where the dust is elevated into a closed storage bin and periodically run through the pug mill with a small percentage of quicklime and ferrous sulphate. The pugged flue dust is delivered into dump cars, which are switched over the concentrate storage bins and bedded with the concentrate.

The baghouse fume burns with great facility into a dense crystalline mass. This fume, after burning, is loaded into dump cars and switched over the concentrate storage bins and bedded with the concentrate and pugged flue dust. Owing to the high lead charge in the blast furnace, the lead is run in a continuous stream into pots of the two tons' capacity, which, when filled, are switched to refinery and by means of the overhead crane poured directly into the drossing kettle.

In the plan shown herewith provision is made for hearth and baghouse expansion, and space is also provided for the installation of roasting or sintering equipment in the event of the receipt of flotation concentrate or concentrate too low in lead content to be smelted economically by the hearth process. In case of expansion, the required additional radiating surface of the flue can be obtained by the introduction of multiple goosenecks into the flue system.

Mason Valley Mines Co.

The Mason Valley Mines Co., operating a copper mine at Thompson, Nev., and a smeltery near Wabuska, reports a net profit for the 1917 operations of $358,278 after charges for interest, depreciation, etc., aggregating $242,672. Total ore smelted was 294,958 tons, of which 114,273 tons was from its own property. The production of blister copper totaled 7038 tons, which contained 1036.636 oz. of gold, 46,258 oz. of silver and 13,914,764 lb. of copper. Development work aggregating 2949 ft. was done during the year.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Tennessee Copper and Chemical Corporation

The report for 1917 of the Tennessee Copper and Chemical Corporation, which was organized in the latter part of 1916 for the purpose of refinancing the Tennessee Copper Co., which is still the operating unit of the organization at Ducktown, Tenn., indicates gross profits of $1,346,082. This total is reduced by interest and depreciation items to a net profit of $911,150, which, added to the surplus of $1,717,884 reported at the beginning of the year, gives a total of $2,629,034, but from this there is deducted $733,630, as a charge covering settlement of sundry claims and losses, leaving $1,895,403 carried to surplus. Ore production and tonnage costs, development work and estimated ore reserves at the various mines are summarized in Table I. At the smeltery 457,902 tons of its own ore yielded 10,547,708 lb. of fine copper, or 23.035 lb. per ton.

TABLE I. MINE OPRATIONS AND COSTS, TENNESSEE COPPER CO., 1917

	Burra Burra Mine	London Mine	Polk Co. Mine	Total
Development:				
Underground	2,290 ft.	697	120	3,107
Diamond drilling	1,754 ft.	759	838	3,351
Cost per ft.	$2.58	$1.58	$2.43	$2.31
Ore Production and Cost:				
Ore tonnage	311,902	83,394	60,641	455,937
Cost mining	$1.013	$1.271	$1.805	$1.165
Cost development	.131	.215	.078	.139
Total cost per ton	1.144	1.486	1.883	1.305
Ore Reserves:				
Available tonnage	3,214,346	182,805	88,562	3,485,713 (*a*)
Broken in stopes	225,000	27,000	3,000	255,000 (*a*)

(*a*) Figures do not include the Eureka mine.

TABLE II. COPPER PRODUCTION COSTS, TENNESSEE COPPER CO., 1917

	Copper Cost Per Lb.
Mining expense	$0.05603
Railway expense	.00290
Smelting expense	.07002
Converter expense	.00585
Polk County slag	.00051
General expense	.01330
Leaching expense	.00041
Total operating costs (exclusive of N. Y. charges)	$0.14902

The total cost per ton of ore treated was $3.433, equivalent to 14.902c. per lb. of fine copper, subdivided as shown in Table II. The total tonnage of ore and fluxes smelted was 671,015 and of coke 37,798. The smelting cost was $1.631 per ton of ore, and the converter cost was $0.00585 per lb. of fine copper. The production of sulphuric acid for the year was much the largest in the history of the company and amounted to 262,858 tons of 60° acid, as compared with 181,637 tons in the previous year.

Canadian Fluorspar—According to the Bulletin of the Canadian Mining Institute the fluorspar marketed in Canada in 1916 was 1283 tons, and in 1917 4213 tons, or about one-third the requirements of Canadian steel makers. Increased demand has sent the price sky-rocketing. In 1916 the average price received by the producers at Madoc, where the entire supply is mined, was $8 per short ton. In 1917 this rose to $16. The price is still on the up grade, $40 per ton now being offered for spot delivery, although contract prices are considerably lower. In February last the Mining Corporation of Canada purchased and is now operating the Wellington and Munro property, near Madoc village. Development is also proceeding on the Kane property. Geologically the veins cut all the formations from the young Paleozoic limestones to the older crystalline rocks. The vein walls are well defined, and calcite is usually associated with fluorspar.

Safety Appliances in Smelteries and Refineries

BY GEORGE M. DOUGLASS*

A description of the devices in use in modern smelting plants to prevent accidents, and an appeal for the better understanding of "Safety-First" principles. The causes of various common accidents are described and preventive measures discussed, chief of which are the education and cooperation of employees. The need for care in the design and construction of safety appliances is emphasized and the importance of cleanliness and order in and around a plant insisted upon.

THOUGH certain safety devices or appliances used for the protection of workmen in smelteries and refineries may be specially designed for their particular use, similar apparatus may be adopted with the same success in many other industries. The words "device" and "appliance" cover a wide field, and though a safety goggle or a safety legging is a device used to protect the worker, one can say with justification that a safeguard over a dangerous machine is also a device to protect him. When considering safety devices, there may possibly be instances where the condition to be overcome or made safe could be termed a smeltery proposition, as the metallurgists say; but in the main the majority of such appliances used in smelteries or refineries can be used in other industries with equal success.

ACCIDENTS

In attempting to cover a wide field, in outlining the use of the various devices for the protection of the worker, it is well to realize that, notwithstanding the great value of safety devices which prevent accidents, this type or class of accident is possibly not over 40% of the total number occurring in these industries. Purchasing protective apparatus or paying for installations is the easiest part of the work; getting them adopted properly is quite another matter, and for that it is necessary to rely on the efficiency of the plant safety organization.

The moral effect of the use of safeguards and safety appliances on the average workman is considerable. It is the tangible way of showing the worker that, however apathetic he may feel toward the safety work of the company, the boss is doing his part. Whether he thinks the boss's motives ulterior or not, the "Safety-First" campaign is positive evidence of genuine effort to prevent accidents. To the worker who is interested in safety measures, it is sufficient proof of his employer's willingness in that regard.

CLASSIFICATION OF ACCIDENTS

Presuming that everything is being done to prevent 40% of the total number of accidents, by means of appliances or safeguards, there still remains 60% to be taken care of in other ways. A large number of accidents cannot be prevented by mechanical devices or appliances of any sort. Such being the case, the proposition resolves itself into one of education and right thinking, especially the correct mental attitude of all concerned. What are termed accidents are often the results of conditions—the condition of the worker and the condition under which he labors. Both can be and are being improved. How quickly the object can be attained, however, depends on how willingly and intelligently the coöperation of every one concerned is given. In smelteries and refineries probably most accidents occur around the furnaces and their accessories, the casting wheels, settlers, slag and matte ladles, pots, and trains. Converters and roasters are included as causatory of burns from hot metal, hot calcines, and the tools used in this work.

PREVENTION BETTER THAN CURE

In the scientific prevention of what are called accidents, efforts should be made to avoid certain contingencies by ascertaining the cause, instead of tinkering with effects. It must be realized that the safety appliances mentioned in this paper are more or less makeshifts which deal with effects. With present knowledge it is not always possible to control trouble at the source, but an endeavor is being made to negative the possible consequences of untoward happenings by the use of safety devices.

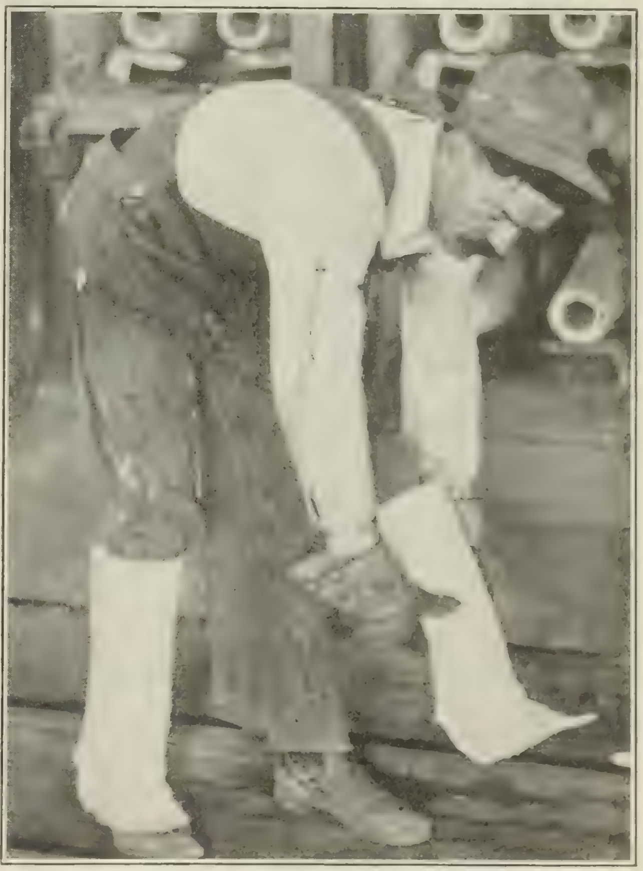

FIG. 1 PROTECTIVE LEGGINGS

Helmets, respirators, and special clothing are used in handling hot calcines and flue dust, on account of the disagreeable nature or condition of the material. More efficient mechanical methods for doing this will, without doubt, be available in the near future. The problems of fume and dust are being handled with increasingly satisfactory results; and it is a consolation to realize that the use of certain devices, especially those worn on the person, may not always be necessary.

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*General safety inspector, American Smelting and Refining Company.

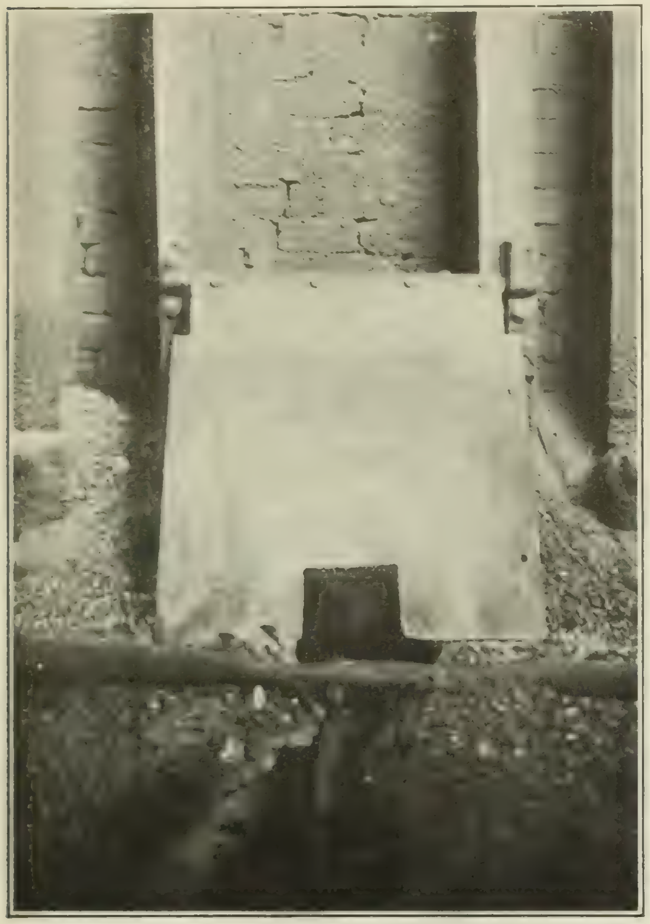


FIG. 2. GUARD TO MATTE TAP

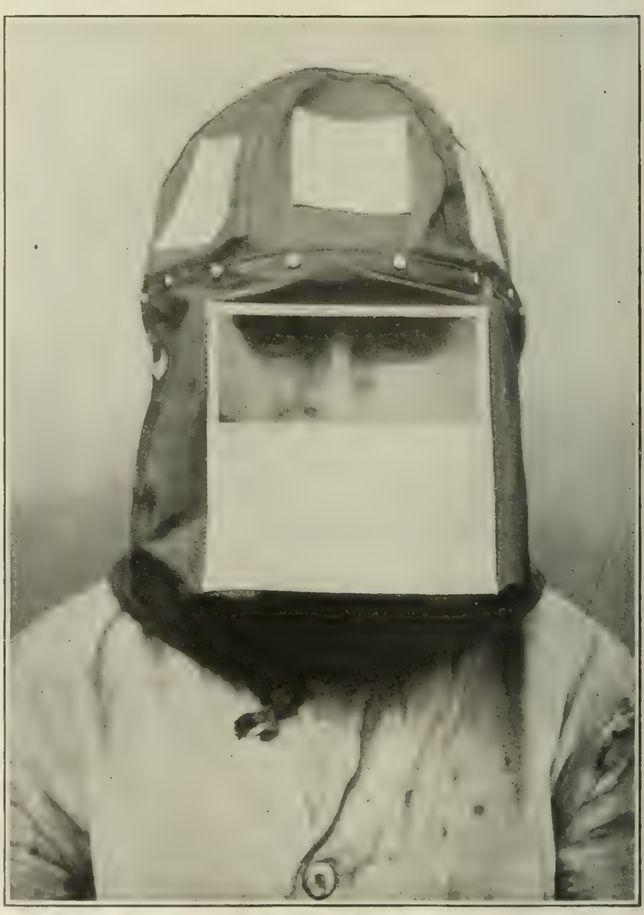
Burns are caused by splashes, spills of matte and slag, and by handling hot objects. Protective appliances (as worn on the person) are goggles, leggings, gloves, aprons, woolen shirts and felt hats. A suitable legging will prevent many burns on lower limbs and feet to which handlers of hot metals are liable. A good legging (Fig. 1) is made of fireproofed canvas or chrome leather upon a spring-steel frame, which holds it lightly over the leg. There is an extension which practically covers the worker's shoe, permitting him to wear the style he likes best. This is important, as considerable opposition is encountered when the wearing of certain styles of so-called safety shoes has been insisted upon. A molder in a foundry, for instance, can wear a shoe that a smelterman cannot wear. The molder stands or stoops to do his work on a comparatively cool soft floor, but the smelterman stands on hard and hot surfaces, and must have comfortable footwear.

If the legging and extension are kept in good order, the maximum of protection is afforded the foot and lower limb. A hot-metal worker is fairly well equipped to do his work in safety when provided with a good canvas fireproofed apron, which should reach from waist line to below top of leggings; a woolen shirt, a pair of safety goggles, and a felt hat.

USE OF SAFETY GOGGLES

The wearing of safety goggles has become a habit with many workers, and there are few departments in any plant where they are not required. Objections were made by men wearing the metal-frame goggle where intense heat is encountered, such as at the reverberatory furnace slag bay; and with the object of overcoming this trouble, experiments are being made with a new style of goggle. The new frames are made of material that will not absorb heat so readily, and the goggle is shaped to fit closely to the eye socket, is dust proof, and ventilated in such a manner that particles cannot enter. It is fitted with side lights and held in position with an elastic band. The necessity for protective goggles is admitted.

Light fireproof helmets for workers under calcine hoppers in the roaster department; masks, headpieces, and respirators for those obliged to go into fume and dust, with gloves and hand leathers, all of which are used with considerable success in preventing injuries, constitute the rest of the devices that can be worn by the workers in copper and lead smelteries and refineries. In their special uses such appliances are of undoubted value, and they will be employed until the industry learns how to control causes that bring about the effects which make their use necessary.



HELMET FOR USE IN HOT PLACES, SOMETIMES FITTED WITH AIR CONNECTION TO EXCLUDE DUST AND LOWER TEMPERATURE

The value of all such appliances depends upon how faithfully or conscientiously they are worn. Furthermore, it must not be forgotten that a supply of safety appliances for a large establishment involves a considerable outlay. An efficient distributing and checking system is also necessary, not only to know who are using the different devices, but in order that they may be kept in proper repair. Goggles and leggings cannot be distributed indiscriminately; the workmen must be properly fitted. A man cannot be expected to do his work well if his goggles are not suitable. Leggings should be made for right and left leg, in order to be really comfortable. The little things count in the endeavor to get men to use safety appliances, and to want to use them. Unless the men appreciate their value, they will try to avoid wearing them. The first consideration is to have them comfortable.

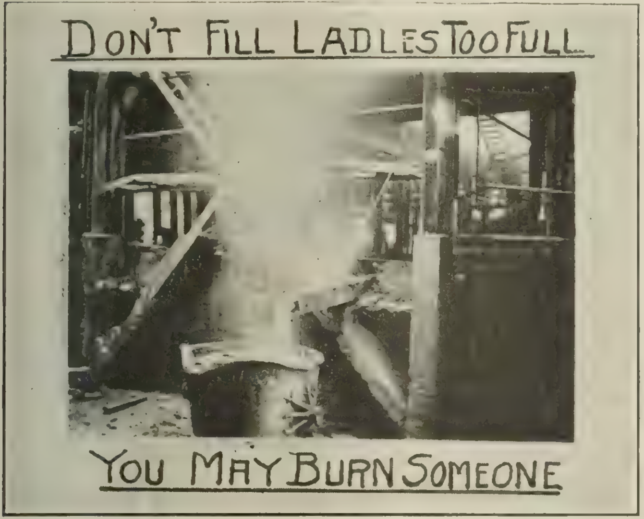

DON'T FILL LADLES TOO FULL
YOU MAY BURN SOMEONE

FIG. 3. SAFETY BULLETIN

Coming to the more strictly mechanical safety appliances in connection with the work of handling hot metal, a picture is shown of different methods adopted to prevent slugs and sparks flying from tap holes and slag bays. Fig. 2 shows a simple guard fitted to the matte tap of a reverberatory furnace. A chain curtain is sometimes used for the same purpose with considerable success where openings are large. Tools can be passed through and work done while a clear view is obtained of the interior of the furnace. Fig. 3 reproduces a picture used as a safety bulletin warning workmen against filling ladles too full for safety. There are times when this cannot be avoided, but to make a regular practice of filling pots or ladles so full that the movements to which they are necessarily subjected cause slopping over of molten material, that has cost fuel and effort to smelt, is not only inefficient from the point of view of economy, but is most dangerous to life and limb.

ROASTING-PLANT PRECAUTIONS

In the transportation of the hot calcine from roasters to reverberatories, workers are necessarily exposed to red-hot fine ore and dust. Burns must be guarded against, and it is essential that the workers' heads and feet be well protected. Even when every precaution is taken, it is difficult to avoid slight spills occasionally. The abrasive quality of the ore causes wear of surfaces, permitting leaks until repairs can be made. The lorry car while loading is virtually closed by having an extension from the underside, or discharge from hopper, let down in such a manner as to act as a cover for the top of the car, thereby retaining dust and preventing spilling over the edges. This extension is fitted with pipe-sleeve connections on each side, leading back to the upper part of the hopper, and permits dust to return into the upper chamber instead of permeating the atmosphere below. It is a good plan to have the track floor under hoppers evenly concreted to the level of the under side of the rails, so that there are neither holes nor recesses where hot calcines may lodge, and into which a worker could step and be burned. A smooth floor means an easy floor to keep clean; and the resultant economy, both in the reduction of number of burns to workmen and in the force of clean-up men needed, makes the expense of concreting well worth while.

FUMES AT LEAD BLAST FURNACES

At lead blast furnaces the question of protecting the worker from escaping fumes of matte, slag, and lead is extremely important, and no expense should be spared in the attempt to minimize the danger to health from inhaling these poisons. The attention given to this subject at lead furnaces during the last five years has resulted in a gradual elimination of what is known as plumbism. Cleanliness on the part of the worker is inculcated, and he is provided with every convenience in the form of wash and change rooms, lunch rooms where he cannot eat until he has washed his hands, and constant medical supervision. Fig. 4 shows the hoods over the slag flowing from the furnace tap to the pot. Note the dense fumes from the pot, none of which escape into the surrounding atmosphere. Fig. 5 illustrates a matte pan hood, raised for opening the tap hole. Note the safety rod, hooked under the edge of hood in case the suspension cable should break. Fig. 6 shows the tap spout and lead well hoods. Note how efficiently the fumes are inducted into the hoods.

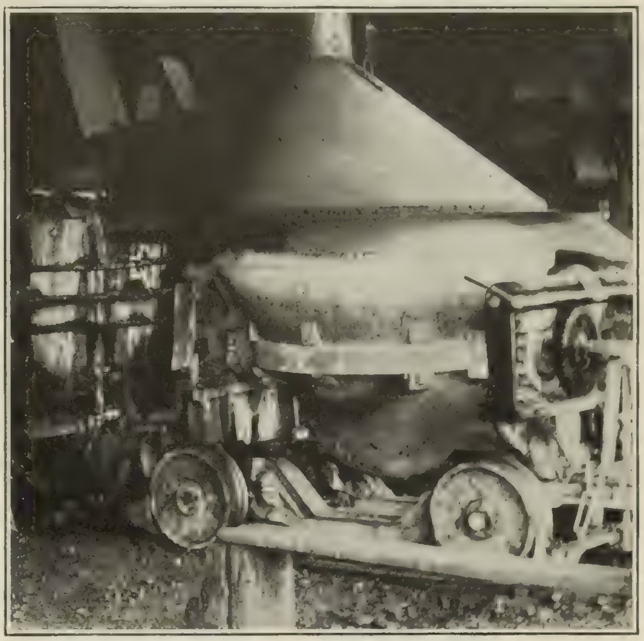


FIG. 4. TYPE OF HOOD TO COLLECT FUMES

Some of the simplest methods of making plants safe for workers, and in ways which are now known as standard (that is, resulting in a maximum of safety with a minimum of expense) are often neglected as not being of sufficient importance to warrant careful attention. Results in the prevention of fatal and serious happenings during the last five years, however, give eloquent testimony to the value of such work, carried out according to standards set for the more scientific prevention of accidents. The matter of hand railings or guard railings for stairways, trestles, runways, and walkways, in and around the different structures and yards of a large plant, although relatively a simple proposition, is today considered most important from the point of view of safety. Persistence is needed to get the average carpenter, pipefitter, or structural ironworker to lay out a guard railing differently from what had been the custom or habit for many years, any old contraption in the form of a railing often being considered good enough. Some 2 x 4 in. posts, usually 30 or 36 in. high, pitched sometimes 15 or 20 ft. apart, with a rail 1 x 2 or 3 in. running along the top and the whole thing *nailed* together, was formerly considered adequate.

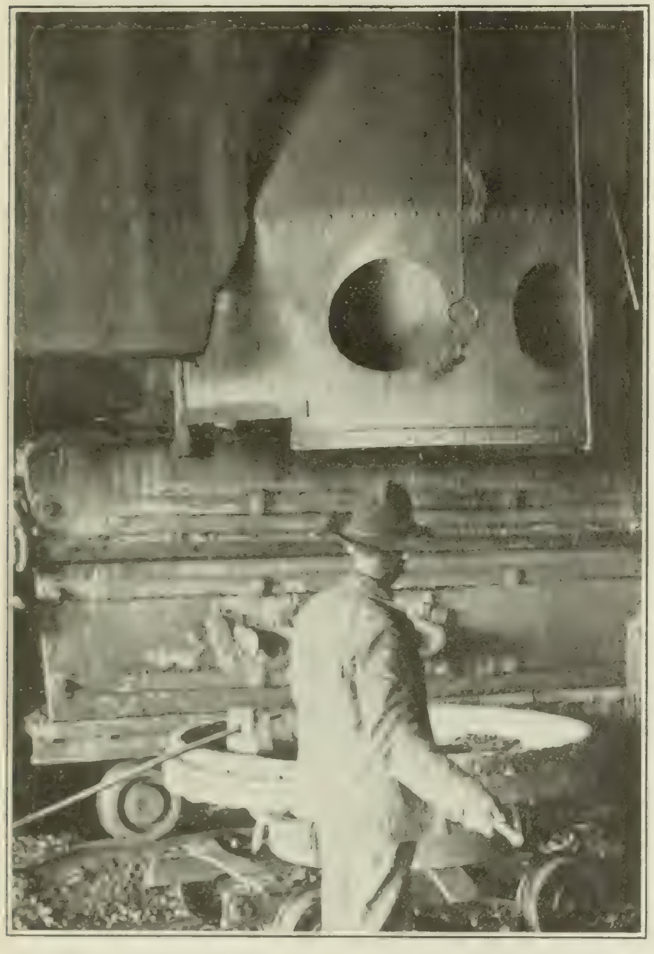
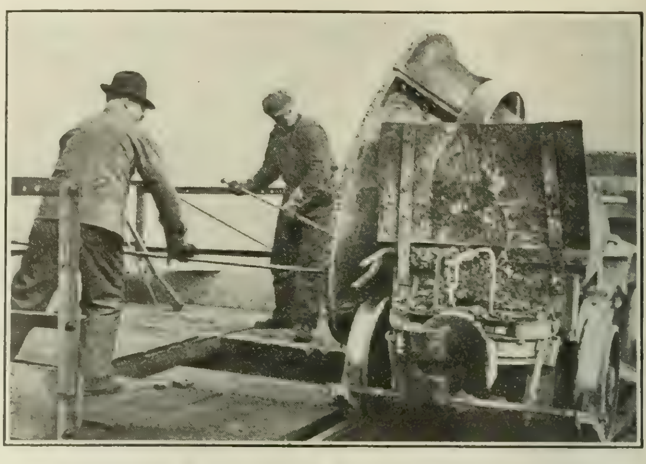


FIG. 5. MATTE PAN HOOD WITH SAFETY HOOK

Standard Safety Railing

The standard safety railing today, whether of wood, pipe or structural steel, is made 42 in. high. It is rigidly supported and secured to posts set not over 10 ft. apart. These posts are bolted to the main structure at their base (not nailed in the case of wooden posts) and have what is termed a toe or base board not less than 6 in. wide from the floor level up, and preferably higher. In some instances, notably where a product may accumulate or pile high, the base board is taken up to the middle rail.

Steel angles make a more satisfactory railing than screwed pipe, as angles lend themselves more readily to the fitting of the toe or base boards. At points where there is the possibility that a section of a guard railing may have to be removed, it can be bolted, instead of riveted or nailed. All railings around belt drives, and whether of wood or steel, should be erected in such a manner as to permit of being readily taken apart, and as readily replaced. A section of railing taken down to make hurried repairs, unless so built, is likely to be left down until a more convenient moment, and there is a danger of some one being hurt or killed. Once a safeguard has been installed and the worker accustomed to the protection afforded, it is the height of folly to leave the place unguarded for a moment.



SHELLING A POT WITH PROPER PRECAUTIONS

Railings and other appliances for safety purposes should be properly constructed. Makeshifts are a waste of material and time, and do not prevent men from being injured and killed. The guarding of conveyor head pulleys, trippers, and like accessories, is most important. Numbers of serious and fatal accidents occur when men go too close to the intake of the pulley. All such parts should be guarded in such a manner as positively to prevent attendants from getting their arms within a couple of feet of this danger point. A

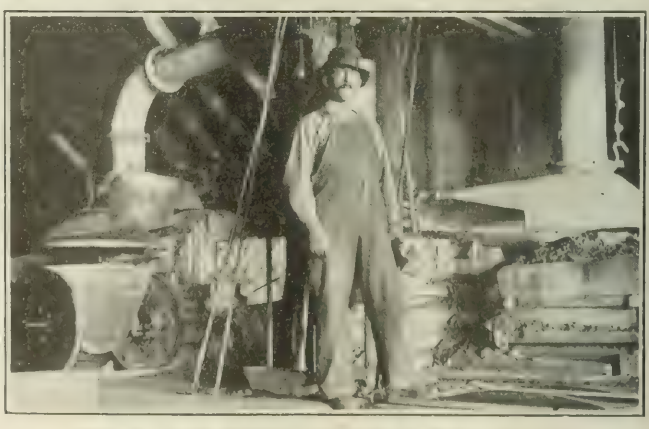


FIG. 6. TAP SPOUT AND LEAD WELL HOODS

suitable guard to prevent accidents is highly desirable. Opening a bottom-dump car with an ordinary open jaw wrench is a hazardous proceeding, as the large number of serious injuries and deaths from doing so indicates. There are several excellent safety wrenches on the market, and one of these should always be used. Some railroads fit their cars with safety wrenches for the purpose. The rough handling of rolling stock and the unavoidable exposure contribute to the poor condition in which wrenches so provided are found, to the great danger of the men who may be detailed to use them. It would be better if roads omitted such equipment from the cars, as all gangs having this work to do prefer to use their own wrenches, which, of course, are usually kept in good condition, and the workmen are accustomed to their use. If this practice were universal, many serious and fatal accidents would be avoided.

ORDERLINESS

Cleanliness and order in and around any plant, and particularly around a smeltery or refinery, will do wonders in starting men on the right road to an interest in safety work. A general clean-up should be the prelude to a safety campaign; where there is disorder there is little organization, and without organization there can be no efficiency. A plant that might be justly criticised in this respect would be a much better producer in quality if not in quantity if disorder and accidents were eliminated. Even though it did not produce more tonnage of product, the amount it did produce under proper conditions would be equivalent, on a money basis, to an increase. This has been proved so often and so irrefutably in recent years that it seems a waste of words to restate it; yet there are still untidy and dirty plants, and plants that have entirely too many killings and maimings because those in control are fearful that any attempt to give safety a free hand might interfere with production. "If safety seems to interfere with hurry, cut out the safety," is a pernicious axiom often promulgated to the detriment of real safety endeavor.

With the right organization and the undivided interest of heads of departments (and this can be secured by any manager if he says the word), the safety department given a free hand to push the work to the limit, is there a manager who can maintain that production or tonnage cannot be increased by cleanliness, order, and safety measures?

Poor tools and tools in bad condition are the cause of many needless injuries. All tools should be kept in good order, and scrapped as soon as this is impossible. A standing rule with the department responsible for the upkeep of tools should be that any chisel, chisel bar, cutting bar, or tapping bar sent to have its point dressed must not be allowed to leave the shop until the head also is attended to. All burred or mushroomed heads should be made safe before leaving the shop. It is better to waste an inch or two of steel than to have an eye put out.

The foundation of all safety work is the plan of campaign, the organization, and the safety rules from which to work. The safety rules should be compiled with the assistance of the men who will have to enforce them; and rules must be obeyed just as soon as they are learned and understood. The foreman is the big man in this work. He has to know, therefore, and he must learn before he can teach his workmen safety rules and methods.

The purchasing department should be in close coöperation with the safety department and the plant engineers, in order that all plans and orders for new machinery and construction should include the necessary safety features. Where this cannot be secured from the manufacturer, and guards have to be made at the plant, this should be done before the machinery is operated. Many serious accidents occur because machinery and structures are operated while guards are being made.

Experiments in Fettling Reverberatory Furnaces

BY FOREST RUTHERFORD*

When the reverberatory furnaces of the Copper Queen Consolidated Mining Co., Douglas, Ariz., were built, in 1912, they were among the first in the country to have holes along the sides of the arch through which the fettling was dropped for the protection of the side walls. Some interesting experiments were made on these furnaces, which influenced the adoption of the method at present generally used of feeding the hot charge along the sides of the furnaces, instead of in the center. Work has been done at Cananea along somewhat similar lines, but the material was markedly different to that used at the Copper Queen plant, and is so well known that I will confine my remarks to a description of what was done at Douglas.

With the adoption of this method of fettling, especially when using highly siliceous materials, serious troubles were run into, such as silica floaters and the formation of a siliceous scum or blanket over the slag, which effectually interfered with furnace operations and caused high metal losses. This was indeed our experience, using, at first, a crushed barren quartz of over 90% SiO_2, for the furnaces averaged only 225 tons per furnace day, and made slags averaging 0.63% Cu and higher, on a 45% Cu matte. It was up to me as superintendent to find a remedy, so the following experiments were made:

In the first experiment, the barren quartz was displaced by a siliceous ore analyzing SiO_2 80%, Fe 3.5%, Al_2O_3 3.3%, Cu 4.5%, (as carbonate and silicate). We felt that a metal-bearing material should be used, and perhaps on account of the physical character of this ore it would stick up better along the walls. The results were rather suprising, for the slag immediately jumped up to 0.75%, and at times went over 1% Cu, though the floaters and scum were no better. An examination of the slag and scum showed shots of metallic copper all through, and proved that the copper carbonate and, perhaps, the silicate were simply reduced to the metallic form, held up in the sticky scum, and carried out of the furnace. Crushed limestone was thrown over the scum through the skimming door, but helped so little that we decided to try something else.

In the second experiment the ore used was of almost exactly the same analysis, but the copper was all present as sulphide. The floaters and scum still bothered, but the copper content of the slag immediately dropped to 0.55% and under, with no shot copper visible. This proved that the copper should be present as sulphide, or that sulphur should be added with which the copper could combine to make matte; and, in a hot and liquid form, cut through the scum to the matte bath below. I then made up my mind that a siliceous ore was entirely unnecessary, and immediately took steps to get an ore as nearly self-fluxing as possible in which there was sufficient sulphur to matte the copper. The ideal material seemed to be screenings from the Copper Queen ores as hoisted from the mine at Bisbee, which analyzed as follows: SiO_2 23%, Fe 26%, CuO 2%, Al_2O_3 7%, S 16%, Cu 5.7%, and, as received, contained from 8 to 12% moisture. With this material the third experiment was started, and as a result, its use became practice at the plant until such time as the remodeling of the furnaces, the addition of roasters, a sulphide crushing plant, etc., allowed us to begin to again displace it with hot calcined ore.

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*Consulting metallurgical engineer, 120 Broadway, New York.

Immediately, however, on using the screenings a decided change was noted in the furnace. The floaters practically disappeared, the slag dropped to 0.49% Cu and under, on a 36% Cu matte, and the tonnage increased slightly over 60 tons per furnace day; the men, who until this time were totally discouraged, immediately took heart and became enthusiastic, and a big load was lifted off the shoulders of the superintendent.

In relating these experiences, I realize that they will not particularly interest the men operating most of the larger reverberatory plants today, as most of these plants are new or have been remodeled. As a result of the work done at Cananea and at the Copper Queen, such plants have adopted the method of side-feeding hot calcines, as against center feeding of the hot calcines and side fettling with siliceous material. I hope, however, that the notes may be of interest to some of the metallurgists who are not so fortunately placed, and are still using siliceous ores along the side walls of their reverberatory furnaces, with all the attending troubles. All that is necessary is that the material used contains sufficient of value to make its smelting profitable, and that these be present as sulphides, or that enough sulphur be present to matte the copper. The more nearly self-fluxing the material, the better the results.

Miami Copper Company

The annual report of the Miami Copper Co., of Miami, Ariz., reflects the result of the labor strike which curtailed mining operations in that state to such a large extent during the second half of 1917. The property was closed for seven weeks, but by the end of the year was back to normal conditions. Net copper production for the year was 43,863,699 lb., of which 30,597,006 lb. was produced during the first half of the year. The profit-and-loss balance of $6,215,636 reported as of Jan. 1, 1917, was reduced by charges for depletion during this and the previous year to $2,560,535. Profits for 1917 were $4,952,137, and gave a total balance available of $7,512,672, from which $2,801,677 was paid in dividends, leaving $4,710,994 in the profit-and-loss account. Two additional dividends aggregating $3,735,570 were deducted from the surplus account, so that total dividend payments for the year were $6,537,247. Copper sold and delivered in the year brought 29.15c. per pound.

MIAMI MILL OPERATIONS AND COSTS, 1917

Ore milled	1,640,206 tons averaging	2.032% copper
Concentrate produced	53,639 tons averaging	43.040% copper
Copper in concentrate	46,172,332 lb.	
Copper per ton of ore	28.15 lb.	
Mill recovery	69.24%	

Direct crushing expense, per ton	$0.297
Direct concentrating	.214
Tailing and concentrate handling	.051
Water for concentrating	.100
Experimental	.029
Total	$0.691

The ore mined during the year was 1,641,507 tons, from various sources as follows: Development, 63,372 tons; top slicing, 561,335 tons; shrinkage stopes, Captain orebody, 1,000,521 tons, and other orebodies, 16,279 tons. The total cost per lb. of copper and per ton of ore was as follows:

	Per Ton Ore	Per Lb. Copper
Mining	$1.268	$0.0474
Milling	.691	.0259
General	.325	.0121
Net total	$2.28	$0.0854
Concentrate expenses		.0412
Gross total		$0.1266
Less silver proceeds and misc. credits		.0011
Net		$0.1255

Underground development work totaled 25,476 ft. Churn drilling was continued for the purpose of more clearly defining the low-grade orebody. Ore reserves at the end of the year were as follows: High-grade sulphide ore, 14,760,000 tons, averaging 2.40% copper; low-grade sulphide ore, 28,000,000 tons, averaging 1.06% copper, and mixed sulphide and oxide ore, 6,000,000 tons, averaging 2.00% copper.

Avoidable Damage Not Actionable

By A. L. H. STREET

Applying the general principle of law that one aggrieved by another's breach of contract is bound to make his damage as light as he can in reasonable effort to minimize loss, it is held by the U. S. Circuit Court of Appeals for the Eighth Circuit, in an opinion handed down in the case of Bear Cat Mining Co. *vs.* Grasselli Chemical Co., 247 *Federal Reporter,* 286, that where plaintiff, as lessee of a mine, sublet to defendant, and defendant wrongfully suspended operation of pumps pending expiration of 30 days' notice that defendant would surrender its rights under the sublease, and the original lessor canceled the lease to plaintiff because of consequent flooding of the mine, plaintiff could not recover from defendant the value of the lease rights thus lost to plaintiff; it appearing that at a comparatively small expense plaintiff could have operated the pumps and thereby avoided forfeiture of the main lease. In other words, the measure of damages directly and naturally resulting from defendant's failure to operate the pumps until termination of the sublease by lapse of notice that it would be terminated, was the cost to plaintiff of doing this.

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[*] Attorney at law, 820 Security Bldg., Minneapolis, Minnesota.

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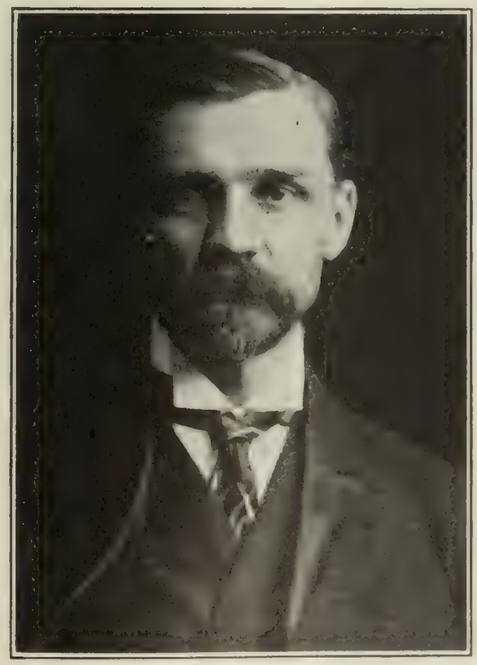

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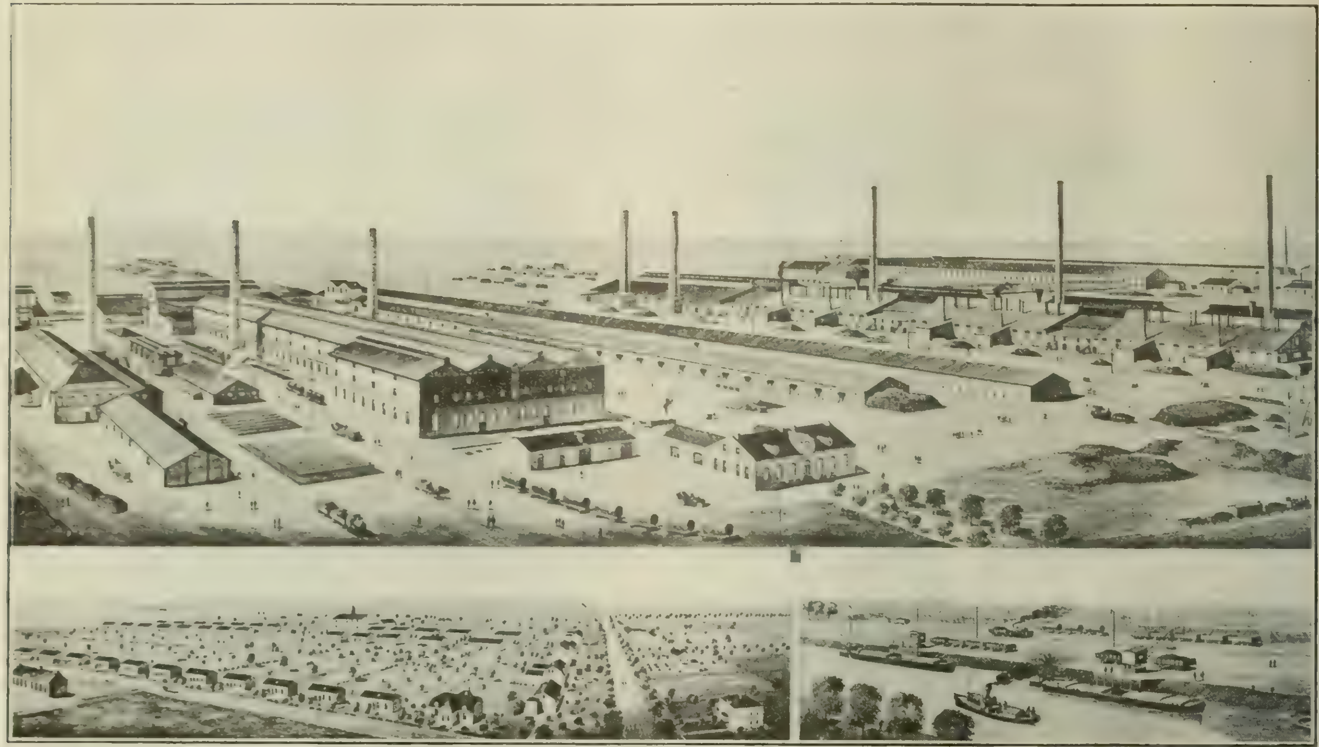
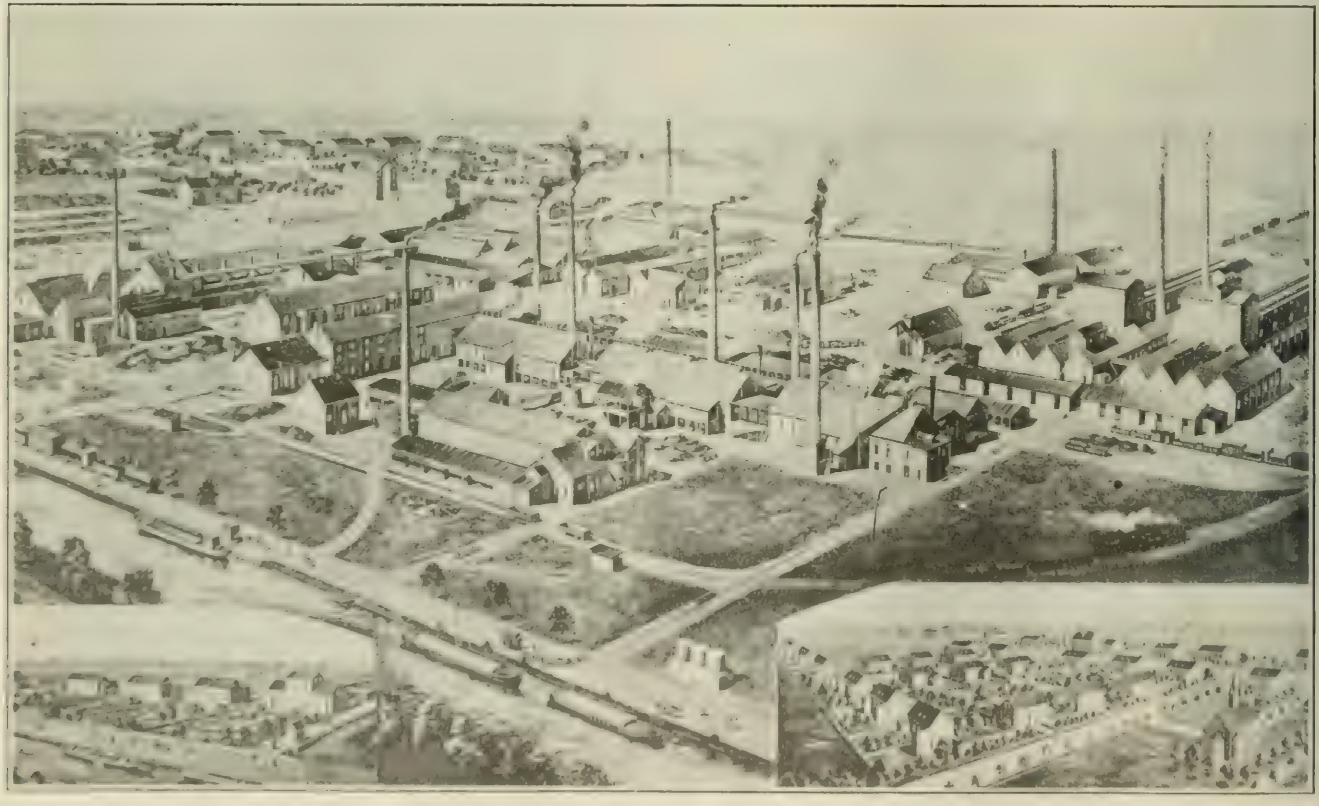
ERNEST A. HERSAM
University of California

Some Foreign Zinc-Smelting Plants

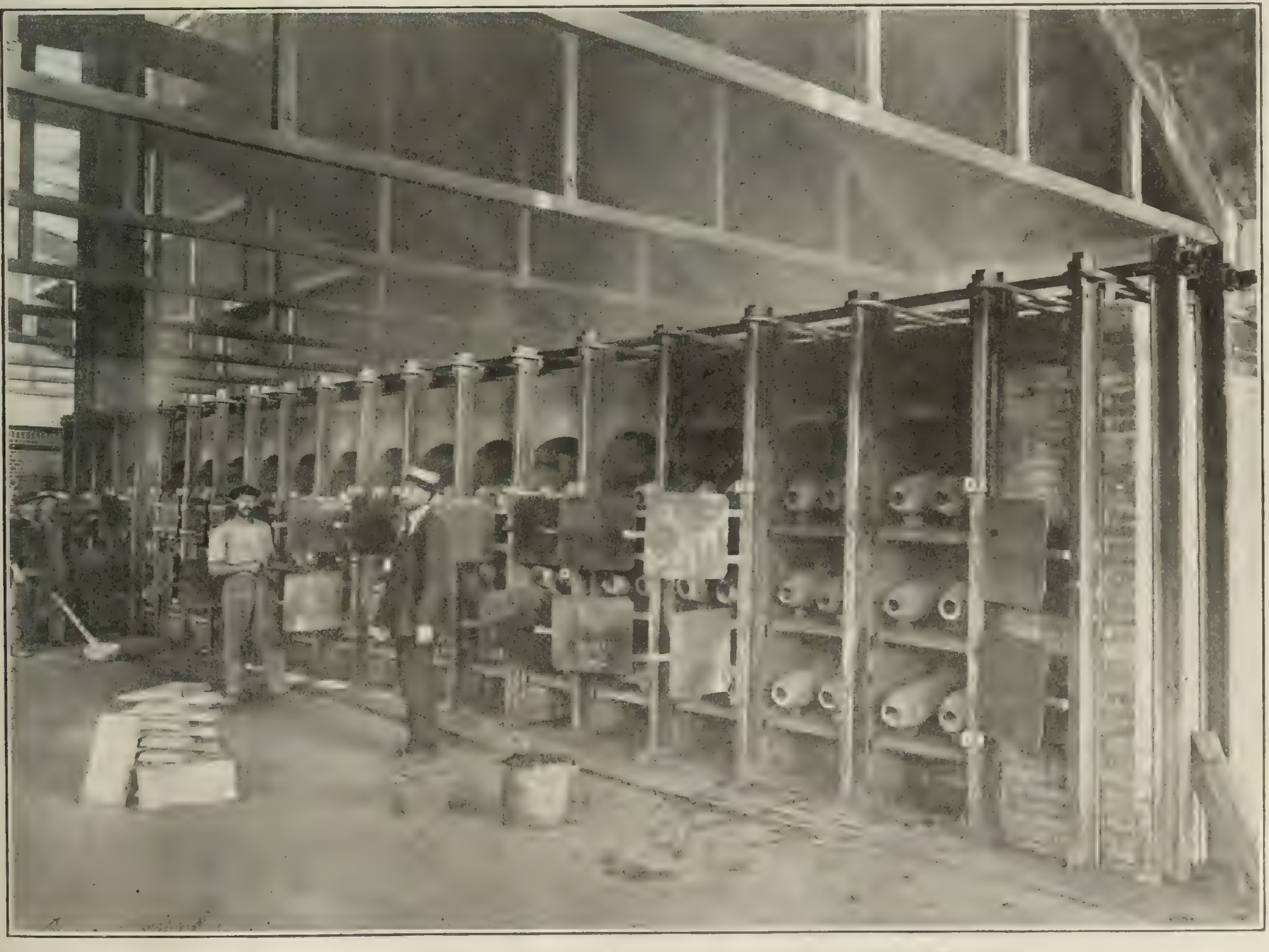


WORKS OF SOCIÉTÉ MÉTALLURGIQUE DE LOMMEL, AT LOMMEL, BELGIUM



COMPAGNIE DES MÉTAUX ET PRODUITS CHIMIQUES D'OVERPELT, AT OVERPELT, BELGIUM

ZINC-SMELTING WORKS OF THE SOCIETA DE MONTEPONI, VADO LIGURE, SAVONA, ITALY



DISTILLING FURNACE IN THE VADO LIGURE ZINC-SMELTING PLANT

Useful Metallurgical Details

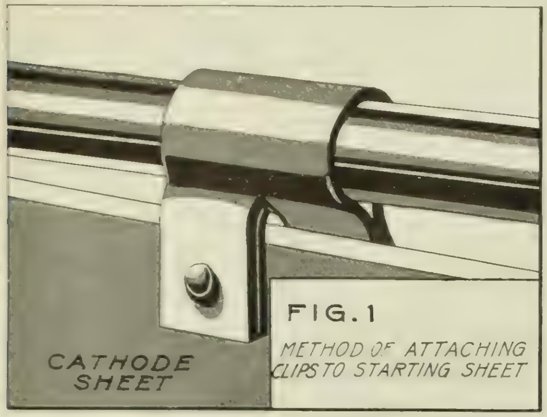


FIG. 1

METHOD OF ATTACHING CLIPS TO STARTING SHEET

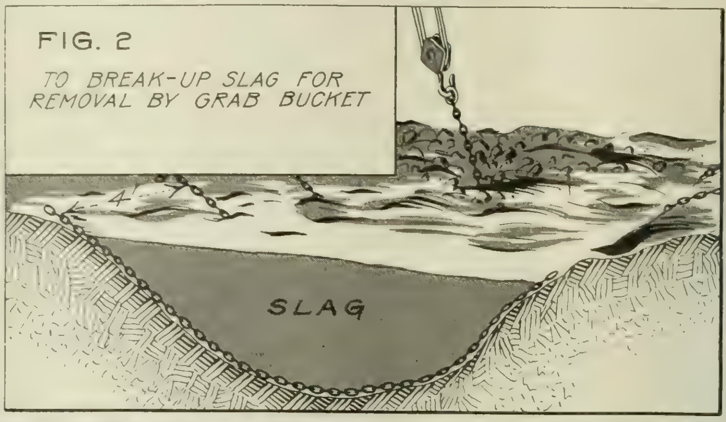


FIG. 2

TO BREAK-UP SLAG FOR REMOVAL BY GRAB BUCKET

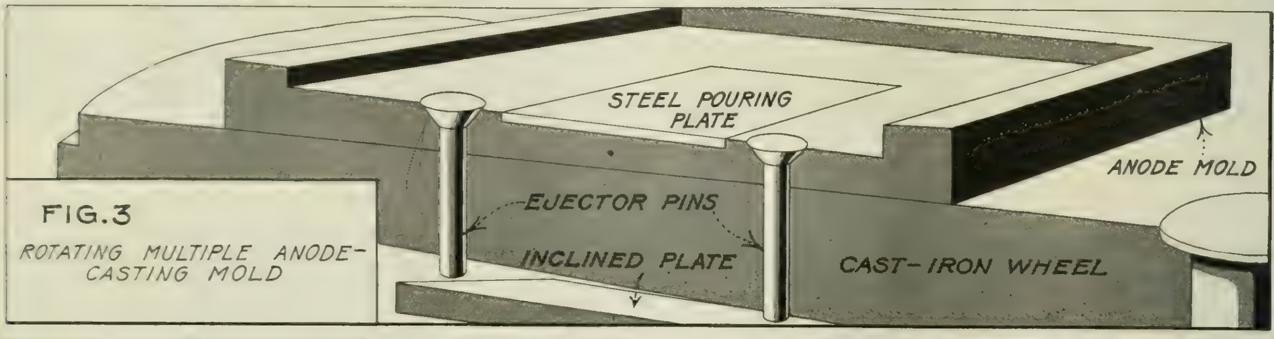


FIG. 3

ROTATING MULTIPLE ANODE-CASTING MOLD

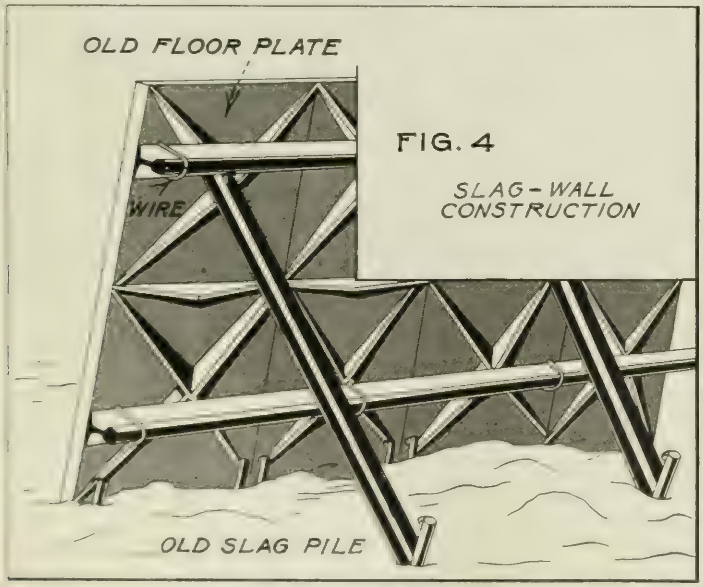


FIG. 4

SLAG-WALL CONSTRUCTION

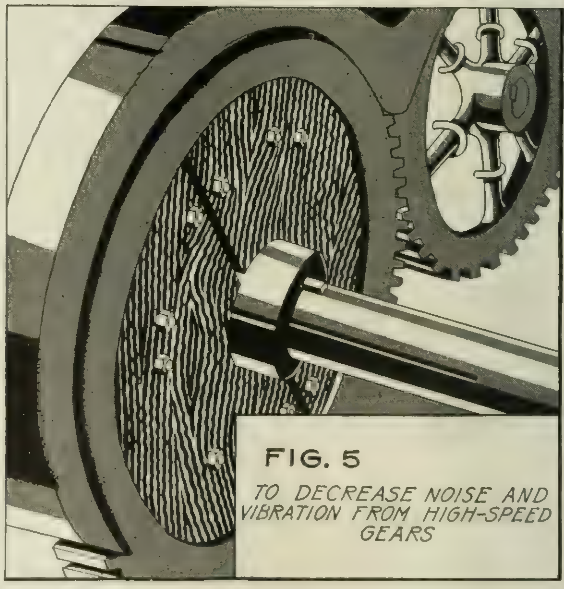


FIG. 5

TO DECREASE NOISE AND VIBRATION FROM HIGH-SPEED GEARS

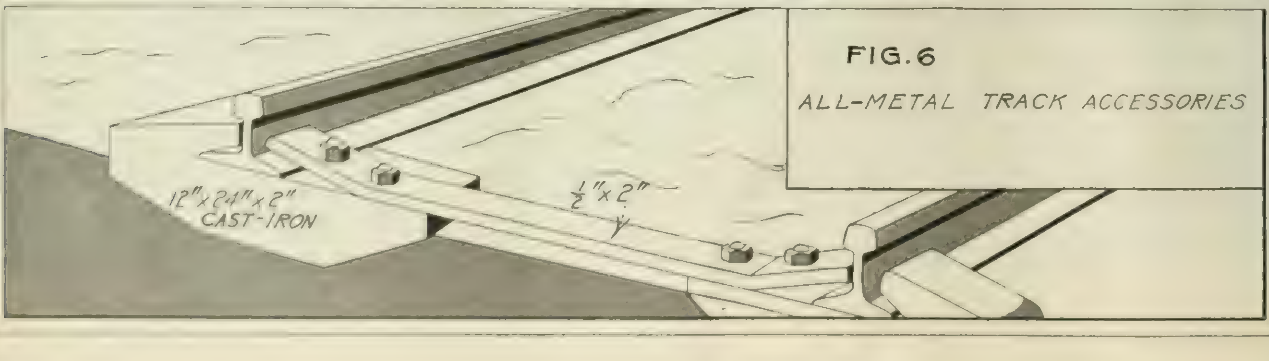


FIG. 6

ALL-METAL TRACK ACCESSORIES

Ideal Layout for Silver-Lead Smeltery

BY GUY C. RIDDELL[*]

A lead-smelting plant for 1000 to 3000 tons of charge per day calls for extreme flexibility in track system and the duplication of all vital units in mechanical handling apparatus if charge-wheeling is to be eliminated and general labor kept at a minimum. Standard-gage tracks and a complete railroad circuit of plant, as well as a loop-system for blast-furnace charging, are essential features. Large bin-storage capacity, automatic conveying and weighing, Dwight-Lloyd nodulizing and double-roasting of zinc concentrates and lead ores, high-column high-blast lead smelting, an ingenious large-scale blast-furnace feed system, Cottrell smoke treaters, and certain novel features of recent American-Australian practice are included in the following suggestions.

THE ideal lead-smelting plant is not to be found in America. Neither has it been discovered in Australia, Europe, or India. Lining up the varied iews of metallurgists here and there about the world, it ppears that the ideal layout has many forms in many ninds; and it is probable that he is wise who speaks of n ideal plant in the broadest terms only. Needless to ay, this article has been undertaken only at the instigaion of the editor of the *Journal*, who has cleared the round somewhat by specifying that the plant be "for melting 1000 tons of silver-lead charge per day, laid out n level ground, with a declivity on one side of the terain to be used as a slag dump—provision to be made in lesign for extension of plant up to triple the original apacity."

For an ideal layout a wide territory must be searched, nd the final composite equipment and method assembled rom every corner of the globe. The plant a description f which follows is in the main a combination of Ausralian and American methods, which, though possibly ar from ideal, fairly reflect the present state of the art.

In addition to the conditions laid down above, it is ecessary to state that the plant will be a customs meltery and that an ample supply of electric power is vailable. Siliceous silver and gold ores will be handled. n addition to enough crude and concentrated lead res to give from 25 to 35% Pb on charge, with zinc nywhere below 15% ZnO in slag. It is assumed hat the plant is situated in a temperate climate where xcesses of season do not upset normal precedure. The mportant factors of railroad approach, topography of ite, and local conditions in general are also assumed as ffering no particular difficulties or advantages. In act, the local peculiarities of site that have counted so ecidedly in the past in determining the lines of plants ow operating have not been considered. The flow of naterial will not be assisted by gravity, and railroad restle work, hoist, and bucket elevator are necessary. The general layout of plant is shown in the accompanyng diagram.

Railroad cars deliver either to the sampling-mill unloading conveyor, or from overhead trestles to the blast-furnace charge bins, Dwight & Lloyd mixing bins, or stock piles. The sampling mill has a capacity of 50 tons per hour, and mill ores are delivered to blast-furnace and Dwight & Lloyd charge bins by belt conveyors. From the Dwight & Lloyd mixing bins the charge is assembled by cross belts and delivered by belt conveyor and bucket-elevator systems to the *A* and *B* sections of a Dwight & Lloyd double-roasting plant. Three 42-in. *A* machines are provided and four 42-in. *B* machines. Low-sulphur ores, which do not require double roasting, by-pass the *A* section, proceeding over separate conveyor to *B* section, for single roasting with the crushed *A* sinter. The product from the *B* machines discharges into railroad cars, which are switched and dumped into the blast-furnace charge bins. These have scale hoppers, and the loaded charge cars are hauled from these bins to the hoist incline by electric locomotive, and on to a transfer car at the top of the incline, which switches them to the furnace tops. There are three blast furnaces, each 52 in. by 180 in. at tuyeres. The slag is handled by standard-gage steel pot cars, and the matte-fall is so low that a single settler box suffices. Bullion is handled hot from the blast furnace to the refinery by monorail electric hoists. The refinery has the usual equipment for the Parkes process. Gases from refinery cupels, blast furnaces and D. & L. plant are passed through two Cottrell treaters—one small unit for refinery cupels, and a large treater for combined blast-furnace and D. & L. gases. The arrangement of entire plant permits enlargement at a later date.

STORAGE FACILITIES

Unless considered at the outset, perhaps no single feature of smelting work is more perplexing to the operating superintendent than the disposition of surplus ores, fuel and fluxes; i.e., tonnages beyond those absorbed in the daily process. The storage and reclamation of materials that must be carried in reserve has seldom received deserved attention. Strikes, break-downs at mine and smeltery, and unexpected diversions of vital ore supply come about sooner or later; and there are times in the most well-ordered plant operations when reserve stocks must be called upon, or added to, and unwelcome expense encountered.

The ideal plant, then, should be equipped not only with large bin storage capacity in the direct line to the roasters and blast furnaces, but also with stock piles at which a month's supply of coke and ample reserves of iron, lime and miscellaneous ore can be discharged from a railroad trestle, and reclaimed as needed by locomotive crane. One particular feature, the lack of which is being deplored to a greater or less degree at many existing plants, should be included, namely, ample storage for roasted product between roasters and blast furnaces. A capacity up to 3000 tons should be arranged in the tier of blast-furnace charge bins for roasted product alone. Normally carried half full, these bins will keep the blast furnaces supplied for two days when the roasters are idle. When the blast furnaces are under repair or have slowed up on a cranky spell, the roasters can operate a couple of days or so without swamping the blast department.

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[*] Consulting metallurgical engineer, United States Tariff Comnission, Washington, D. C.

Ore, fuel, and fluxes of a size and grade such that no treatment at the sampling mill is necessary, are delivered to blast and roaster bins from an overhead railroad track. The material for the sampling mill is unloaded from another railroad track into receiving hoppers beneath the rails, these hoppers extending at least three car lengths and discharging to a collecting belt which delivers to the crusher. The crushed material, after sampling, is conveyed by belt again from the mill, either to storage and mixing bins for the D. & L. double roasting plant, or to the blast-furnace oxide-ore and flux bins, all of which adjoin the sampling mill. Much of the material coming into the plant is of such size and homogeneity—lead concentrates and slimes, fine oxide ores and fluxes—that sampling by fifth or tenth shovel is sufficient, in which case these materials are switched directly from the scale house to the D. & L. or blast-furnace charge bins.

Sampling Mill

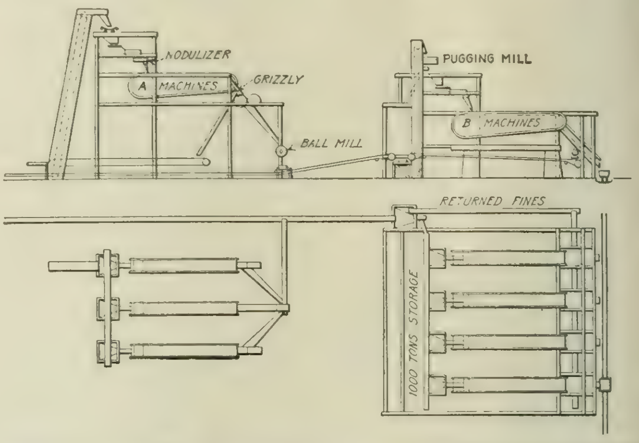
Designed for 50 tons per hour, the sampling mill has one No. 5 gyratory, two 16 x 36 in., one 14 x 30 in., and one 12 x 12 in. Traylor automatic side adjusting rolls, and samplers of Vezin type. Electro magnets safeguard the rolls and crushers from scrap iron, and above the crushers, rolls, and screens are placed monorail hoists for the repair and renewal of parts.

Dwight & Lloyd Double Roasting Plant

The various concentrates, crushed sulphides and fluxes for the D. & L. machines are delivered by cross belts below the storage bins to collecting belts which convey to either *A* or *B* section. The bulk of the D. & L. storage bins are used for high-sulphide material which is destined for two roasts, but a few bins at one end of the line are set apart for certain ores, of 5 to 15% sulphur content, which need only a single roast, and for fine material which requires only agglomerating. One conveying system runs from these latter bins direct to *B* section, the crushed sinter from *A* section coming out to this same belt for transport to *B* section. Another conveying system runs from the high sulphide bins to *A* section. At both *A* and *B* buildings, the charge is raised by a pair of bucket elevators. Either elevator has ample capacity for the total duty in an emergency. Seven D. & L. machines are provided, three in one building (*A* machines) for pre-roasting and four in another building (*B* machines) for final roasting, with room for additional machines at one end of each building as the capacity of the plant is increased.

Each D. & L. machine is provided with a super-hopper, oscillatory feed distributor and double-muffle oil burner; and each *A* machine with a nodulizer, to be described later. At the discharge end of each *A* machine are a set of toothed rolls and a $\frac{3}{8}$-in. screen for removing raw fine material. The oversize from the screens goes to a central ball mill, which delivers the crushed product to a belt conveyor running out to the conveyor system for the *B* section. The ball mill is perhaps the most effective machine for this intermediate crushing, when properly designed and adjusted. The best size of particle is $\frac{1}{16}$ to $\frac{1}{4}$ in., and the material should be classified as uniformly as possible.

This being a silver-lead smeltery, the handling of high pyrite ore is not contemplated. If such ore is encountered in considerable amount, the D. & L. process will not suffice. In the blast roasting of pyrite the "loose" atom of sulphur is distilled from the mineral by the high temperature quickly reached; and if much pyrite is carried on the charge, the free sulphur may collect in the flues, and this may, under certain conditions, result in an explosion. Consequently, a furnace of the Wedge type which heats the ore slowly and gives time for the "loose" atom of sulphur to burn to SO_2 in the furnace, is preferable for pre-roasting ores which contain a large amount of pyrite. Fortunately, the other sulphide minerals do not have this property of losing sulphur, so that they can be pre-roasted in D. & L. machines without danger, together with ores which have only a small amount of pyrite.

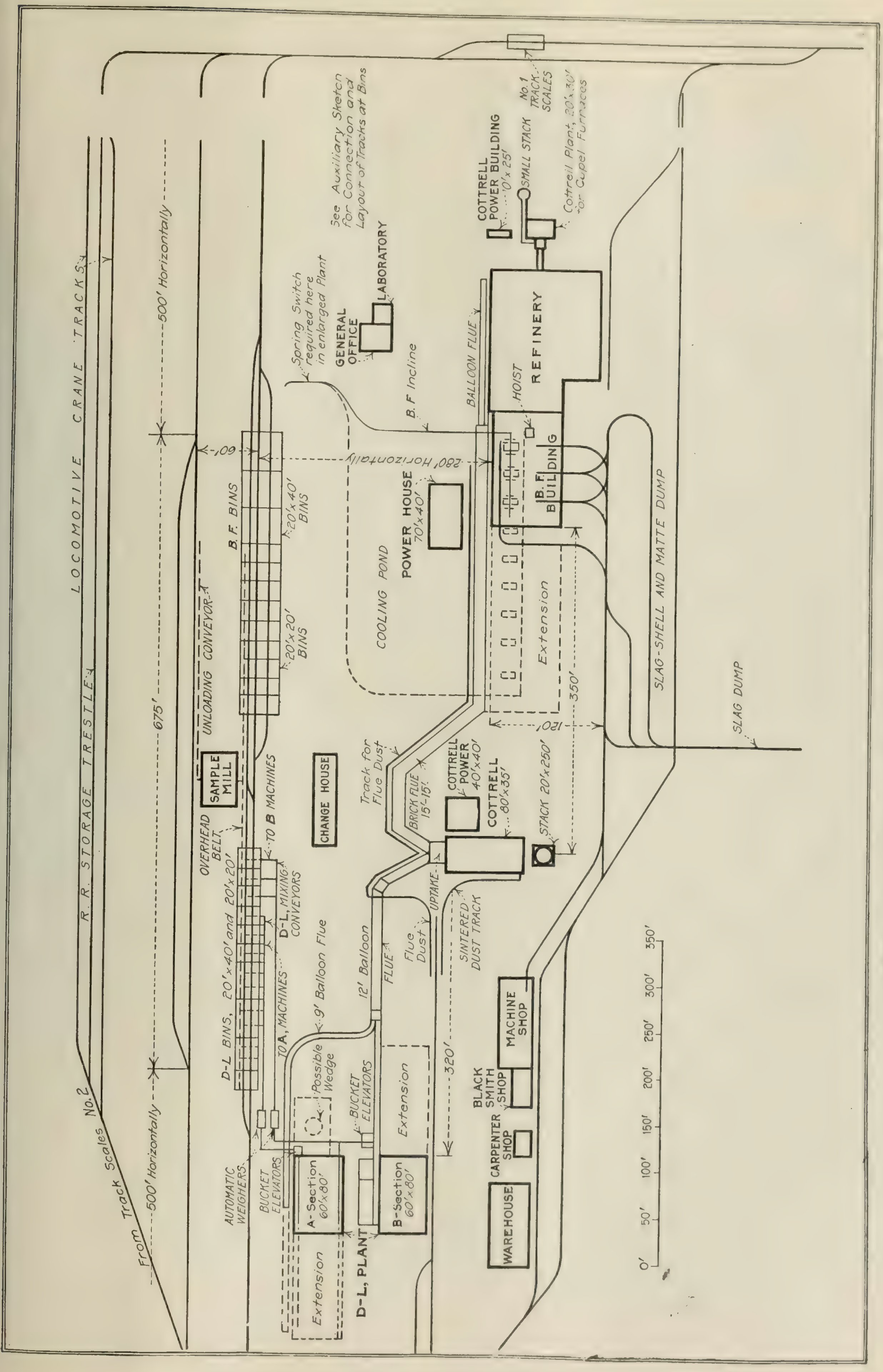


ELEVATION AND PLAN OF D. & L. DOUBLE ROASTING PLANT

Storage or take-up capacity is provided between *A* and *B* sections, in bins which will hold 1000 tons of *B* charge, or slightly more than a day's run. In regular operation, the product from *A* section goes directly to the *B* machines, via the toothed rolls and ball mill, joining the the low-sulphur material, which is delivered direct from mixing bins to *B* section by belt conveyor and bucket elevator. This intermediate storage is available, however, when shut-downs occur in either section.

Final sinter from the *B* machines discharges over the screens into railroad gondolas; and these cars are switched for dumping to the high-line track, running to the top of the blast-furnace charge bins. There are two lines of approach to the blast-furnace bins from the D. & L. plant. Fines through the screens under $\frac{1}{4}$ in. are returned to *B* charge by belt conveyor; the $+\frac{1}{4}$ in.—$\frac{1}{2}$ in. material goes to grates for protective dressing, if made necessary by hot charge.

The charging system for blast furnaces is laid out with particular regard to an expected subsequent expansion to triple capacity. The system is almost entirely mechanical, requiring no charge wheelers. Hopper bins are used for bulky material (coke, lime rock, roasted products, fluxes, slag shells); and flat-bottom bins for oxide-mixture beds. Fuel bins are roofed over for protection from the weather. Hopper-bottom bins are 15 ft. deep, 20 ft. wide and 20 ft. long, and mixture-bed bins 40 and 60 ft. long. There are about 24 bins,



GENERAL PLAN: IDEAL LEAD SMELTERY—DESIGNED BY GUY C. RIDDELL and all have scale hoppers underneath—the long bins three and the short bins two. The ingredients of the entire charge are assembled in a charge car, which is motor driven and has a hopper of a length approximately equal to that of the blast furnace. This charge car runs from beneath the bins to the furnace tops. Scalers weigh the respective ingredients into the bin hoppers, which are supplied with arc gates, through which the weighed material is allowed to flow as the charge cars travel to and fro underneath the hoppers, thus distributing the material throughout the length of the car. Bed ore is cut down by two men in the bins, and shoveled to the scale hoppers.

IDEAL TRACK SYSTEM

The track system for the charge cars beneath the bins is looped by means of spring switches. Leaving the lower end of the hoist incline, the empty cars are drawn by electric motor through one line of bins. They are stopped for charge constituents to be drawn out at designated points, and proceed ahead until the spring switch puts them over on to one of the parallel tracks on the second line of bins. As they return on this track, the remaining charge requirements are drawn out; and finally the car is again at the hoist incline. This incline (30°) begins at a point about 100 ft. from the furnace building. For any number of furnaces up to four hoisting and feeding proceeds as follows:

An electric hoist pulls the 5-ton charge car up the incline to the transfer car, which runs on a track over the furnace tops and at right angles to the incline. The latter car, having its own motor, is manned by the hoistman and driven along the building over the furnace tops to the furnace requiring the charge. The furnace tops are closed by flat steel doors, which are automatically slid along the floor by the approaching or retiring transfer car, thus uncovering and covering the furnace top. When the plant has been expanded to a larger capacity and more than four furnaces are in operation, this charging system will also have undergone certain changes which are contemplated in the original design A continuous looped system, good for any volume of traffic, would then be in operation as follows:

Dotted lines on the plan show an extension of track system from the feed floor to the bins. The electric hoist will have been replaced by an endless cable incline which will pull the charge cars up to same transfer car at the feed floor. Instead of traveling directly over the furnaces, however, the transfer track will now be placed along the ends of them, and at each furnace will be a frame carrying rails at the same height as the rails on the transfer car. The charge car is run off the transfer car on to these rails, dumped and run back on to the transfer car. In case the furnace is not ready for its charge, the transfer car is free to make another trip back for another charge car, leaving the first car standing over the furnace, to be removed at leisure.

The transfer track extends the entire length of the building, and at the far end delivers the empty charge cars to a second endless incline, down which the empties are braked to the charge bins at ground level. The endless cable at this end of the building is readily convertible into a hoist, whenever the other incline is under repair. A spare transfer car is always in readiness at one end of the top floor, but a single transfer car will handle almost any volume of material, as it never has to wai at the furnace top.

Several mechanical safety devices are incorporate in this hoisting and transfer system, which are simpl and practicable, and actually in operation in severa plants. At the moment of dumping the charges int the furnace, an electrical contact is closed by the charg car doors, and a tally of the load is registered at th plant superintendent's desk on a Bristol recorder. A continuous history of charging is thus obtained, givin the exact time, number and speed of charges. Undu filling or dropping of furnaces at the lunch hour, and a change of shift is recorded; and regularity in feedin is greatly enhanced by the use of this device.

There are three lead blast furnaces, each 52 x 180 in at the tuyere line; and units can be added at one en of the building, as required. These furnaces, althoug of standard dimensions at tapping floor, have unusua height of shaft, allowing a much higher ore column tha is found at the older smelteries in the United State The transformer and power house is situated at th rear of the blast-furnace building within the loop, an contains individual blowers for each blast furnace, supplying 6500 to 8000 cu.ft. of air per minute at a blas pressure of 60 to 70 ounces.

ARRANGEMENTS FOR MATTE AND SLAG

With matte-fall held at from 1 to 2½%, a singl large oil-fired rectangular settler at each furnace i sufficient for matte settling. The settler boxes are arranged on wheels, for transfer by slag locomotive t a breaking floor. A locomotive crane serves this breaking floor, and is also available for other departments o the plant where it may be used in connection wit numerous construction, unloading and reloading jobs

Slag is handled, on tracks of standard gage, in 5-to sectional steel pots, which are hauled and dumped electrically. Ample clearance is left between the rear en of the furnaces and the brick flue for a single trac along the entire building, frequent opening of the bac end of these 180-in. furnaces being desirable. Sla pots serving this rear end are equipped with tap hole 12 in. above the bottom, so that the top slag can b tapped out and the matte butt saved, for returning to shell dump, provided in front of the furnace buildin and alongside a railroad track leading to the blast-furnace charge bins. In the normal operation of the plant no slag shells will be returned. In case, however, th ratio of slag to bullion on charge drops to about 1½ to 1 (as it will when lead on charge runs especially high) or when furnaces become zinc bound or crusted, and slag physic is desired, it will be found wise to resmelt fro 10 to 20% of the shells for temporary periods.

REFINERY

Bullion is handled hot from the blast furnace by a monorail electric hoist and taken, without solidification directly to a drossing plant and refinery of ample spare capacity. Drossing is performed in six 60-ton steel kettles (or four during the early operation of the plant), and from these the drossed bullion is pumped to three softening furnaces. Six desilverizing kettles, three refining furnaces, six merchant kettles, and a hard-lead furnace are included in the lead refinery. The Miller casting machine is used to mold and load market lead.

'he silver refinery is equipped with about nine retorts, ee cupelling furnaces, one fine-silver furnace and a cible furnace for gold melting. Doré bars are parted the electrolytic method.

'wo Cottrell treaters are provided, one small unit for ie from the refinery cupels, and one large treater for t furnace and D. & L. smoke combined. The ac- panying diagrammatic sketch shows the arrange- it of Cottrell equipment for the refinery unit and ifies recent improved practice in the art of electrical cipitation. It is to be noted that the plant is anged with down-draft for better gas distribu- and has suspended pipes. Furthermore, gases are le to double back to an exit near the top of the elec- le chamber. For the refinery cupel gases, a treater aining 64 pipes (12 in x 16 ft.) and one 15 k.w. 000-volt electrical set—one-fourth only of the ter equipment shown in horizontal section on mpanying diagram—would provide rather ample acity. For the larger volume of blast furnace and L. smoke—approximately 150,000 cu. ft.—the Cot- plant is arranged somewhat differently, in that a ble row of treaters is provided. Ten sections of 64 pended pipes each (12 in. x 16 ft.), and five 15-kw. or-generator rectifier-transformer sets, with one iliary are required. Gas velocity is chosen at 5 ft. second. Flues—both inlet and outlet—are placed on central axis of the building. Brick chambers are lace beneath the collecting hoppers and dust can er be sintered in place, or drawn off for transfer he D. & L. charge bins. In either case the Cottrell luct is loaded on railroad cars at the D. & L. track.

necessary amount of moisture is sprayed into the streams at points far enough back from the treater nbers to insure thorough diffusion of humidity.

Cottrell Process Perfected

ifficulties, which have now disappeared, were en- itered in the early application of the Cottrell process last-furnace smoke. This is due to the fact that a e thorough understanding of the dielectric condi- of the deposit has come about, and its adverse elec- il state is now corrected by humidification, regula- of acidity, etc. The last Cottrell plant to go into ation at a lead smeltery—Northport, Wash.—is an nple of the present state of the art of electrical pre- ation. Roaster and blast-furnace smokes are com- d in the treater at this plant, and it is reported that rance is being maintained, with regularity, between nd 100%. Modern standardized electrical equipment, ble gas distribution obtained by down- instead of raft through receiving-electrodes, uniformity of perature and the correction of the adverse electrical lition of the deposit by humidification are refine- ts of Cottrell practice that are resulting in the suc- ful treatment of lead blast-furnace smoke.

he Cottrell process as a medium for dust and fume very is cheaper than a baghouse to build or operate, is as effective unless the "complete clearance" neces- in a farming community is sought. "Complete rance," however, is not metallurgy, although treaters eries will accomplish it. The Cottrell apparatus, ow set up, will catch any solid matter, dust, fume cid, and will do this under operating conditions h are easily regulated and infinitely more desirable than those of the fabric baghouse. Recent modifications of the standard baghouse have attracted some attention in Australia and the United States, but these are merely ingenious improvements in method whereby mechanical shaking is made more or less continuous and a smaller bag area can be utilized. The fundamental baghouse evils of rotting fabric and clumsy procedure still remain. Baghouses for lead work are giving way at many points to Cottrell treaters, and it is probable that eventually the replacement will be complete.

The equipment called for is largely standard. There are, however, at the D. & L. and blast-furnace departments one or two features of sufficient novelty to call for special comment. Adoption of the D. & L. double-roasting system in preference to the Wedge-H. H., or the American form of "cross over" double roasting (D. & L. to H. H.—originally devised and first tried by Curtis Pigott and myself in 1913 in Montana) is in deference to my conviction that the D. & L. form of sintered material behaves better on the blast furnace than the denser H. H. product. Australian furnace tests have confirmed these earlier Montana impressions as to the relative behavior of H. H. vs. D. & L. sinter.[1] The question resolves itself to a case of same speed or better for the D. & L., and about $\frac{3}{4}$ of 1% less coke on D. & L. for the same reduction.

Dwight & Lloyd Nodulizer

Each *A* machine has a nodulizer through which the entire charge is passed before delivery to the grates. This nodulizer is a recent but extremely important device in D. & L. practice, developed in Australia in 1917, and already of tremendous significance in both lead and zinc metallurgy. The apparatus employed is a revolving cylindrical drum of from 2 to 3 ft. in diameter and 8 ft. long, set with its long axis at a slight angle to the horizontal. Properly moistened charge is fed at the upper end, and any desired degree of balling or wet nodulizing is imparted to the material in its passage through the drum to the regular feed distributor in place beneath the discharge end. Surprising results are obtained in Australia from this nodulizer, where its employment has accomplished wonders in the matter of sintering two obdurate classes of material—flotation lead slime and zinc concentrates. No longer have these products the terrors for the smelter metallurgist that they possessed of old. They are now added to the D. & L. charge in almost unlimited amount if properly balled up or nodulized before ignition. Whatever the fineness or denseness of the charge before treatment in this nodulizer, it is found that any desired degree of balling up can be obtained, and the charge deposited on the grates in a porous, almost granular state which results in increased tonnage and better desulphurization.

The treatment of zinc concentrates by double D. & L. roasting as practiced in Australia adds a notable achievement to the record of the D. & L. sintering machine. Sulphur in the neighborhood of 1% in sintered product carrying over 50% Zn was obtained in 1917, and this sintered product on retorting gave a higher zinc recovery than the Hegeler calcines. It is not at all improbable that this D. & L. zinc-ore roasting will carry the D. & L. machine as extensively into the zinc field

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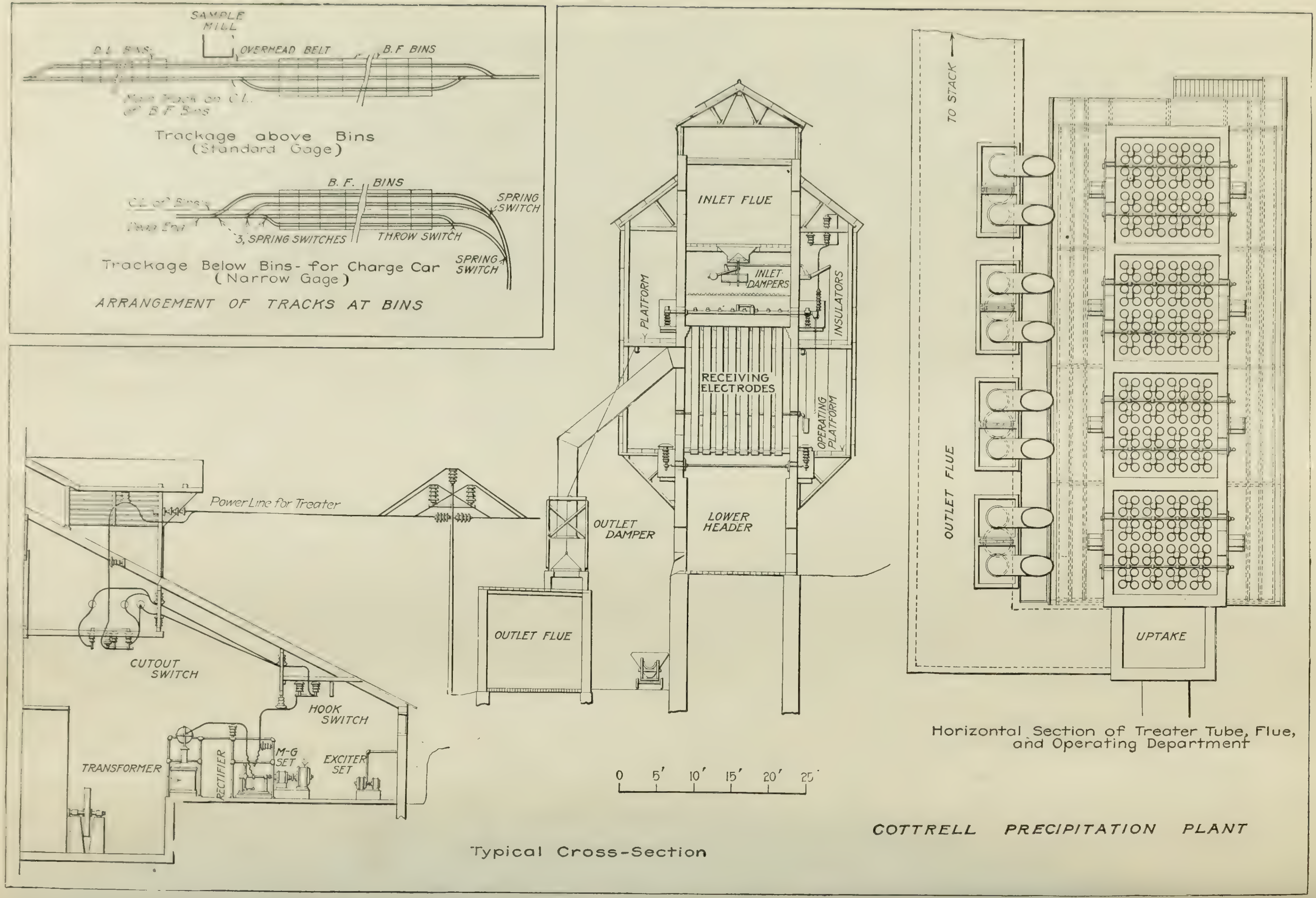
[1] Trans. A. I. M. E. Vol. 49 pp. 495-499



ARRANGEMENT OF TRACKS AT BINS

Trackage above Bins (Standard Gage)

Trackage Below Bins - for Charge Car (Narrow Gage)

COTTRELL PRECIPITATION PLANT

Typical Cross-Section

Horizontal Section of Treater Tube, Flue, and Operating Department

DETAILS OF COTTRELL PRECIPITATION PLANT AND ARRANGEMENTS OF B. F. CHARGE TRACKS AT BINS as it has already gone into lead, copper, and iron ore operations.

Other novel features in the D. & L. department—of Australian origin also—are the double-muffle burners used for oil ignition, in which the cyclonic air effect gives complete utilization of fuel; and automatically cleaned grate bars with "elevated continuous slot." This new R.-D. grate-bar has a greater actual air space than the bar formerly in standard use, and the peculiar form—i.e., depressed ribs—allows the continuous passage of a cleaning tool through the slots, which keeps the entire air space in effective commission.

INDIVIDUAL BLOWERS

Few existing plants have individual blowers, but separate equipment is provided for each furnace in the present instance. To the metallurgist, the volume of air taken by the furnace is at all times the best indicator of things internal; but when several furnaces are fed from one main, accurate volume measurement is difficult. Pitometers, volumeters and venturi tubes can be used, but bends and eddies in the blast main make satisfactory use of these gages almost impossible, and the advantage of positive delivery to each furnace of a known amount of air amply warrants the extra cost of separate blowers.

SAFETY AND WELFARE

The physical welfare of the employee is as much a factor of efficiency at any plant as a moral obligation on the part of the employer. A regular safety organization is, of course, necessary, and such organization must be able to give a certain amount of time freely and wholly to the matter of welfare and safety of the plant. Many measures and devices will be adopted, and first and foremost, a roomy, well-ventilated changehouse must be centrally located where every man has a sanitary locker. Shower baths and a swimming pool are provided, with attendants constantly on duty. In each department a local wash- and lunch-room is also arranged. The plant is protected throughout with standard guard rails and safety devices, and is constantly patrolled by a safety inspector.

This being an installation with high lead charge, special provision must be made for combating fume and smoke poison. Screens at the sampling mill are tightly housed; the discharge ends of the D. & L. machines are closed in, and the fumes are sucked back into the wind box; the blast furnace tops are closed by flat sliding doors, automatically operated by the feed car; and all smoke on the tapping floor is sucked from the slag pots and slag and lead tap holes, into the flue behind the furnaces.

The drinking of milk, citric and tartaric acid beverages and water is encouraged to the extent of allowing vendors to supply men on duty at all hours. Sanitary drinking fountains are installed in all departments. The custom of milk drinking has been in vogue for years at the world's largest smeltery, at Port Pirie, Australia, where plumbism among employees is notably scarce. Seventy-five gallons of milk is consumed daily at Port Pirie, in addition to hundreds of bottles of soft drinks.

It is in the blast department that the ideal plant makes a striking departure from the conventional layout. The standard American lead blast furnace has an ore column of 17 to 19 ft. The furnaces in this "ideal" plant considerably exceed this, having 25 to 27 ft. of ore column over the tuyeres. Although going far into the unconventional (as far as American practice is concerned) in this matter of height of ore column and blast pressure, these furnaces are distinctly conservative as regards (1) the retention of a standard top feed distribution, as worked out many years ago by Dwight & Hixon in Montana, and (2) the avoidance of excessive width at tuyere line.

The slotted *A*-spreader, properly adjusted on center line of the furnace, which every particle of falling charge must strike or penetrate, offers possibly the maximum opportunity for controlling the distribution of feed into the furnace. In this system of feeding, the proper angle of the spreader is established for any set of conditions, after which the fine and coarse materials are fed into the column in a well-adjusted distribution. It does not seem probable that devices which only approximately control this segregation can survive in the long run. Such a device is the hood in vogue at Australian and Continental plants, now being revived at one or two American smelteries, where the stack runs down into the center of the furnace, 3 to 6 ft. below the top of the charge, the charge itself forming a seal around the hood. The furnace top (except for the part covered by the hood at the center) is exposed and unprotected, but no smoke is noticed on the feed floor as long as the furnaces are kept filled to a point above the bottom of the hood. With this apparatus in use all the coarse material tends to run to the center of the furnace, and the fumes naturally come up through the channel of least resistance.

The nicety of charge distribution essential to maximum lead-smelting efficiency is not attained in this system. The reasons which caused the replacement of the old Darby tube or hood by the modified Dwight spreader years ago are even more potent at the present day. I have observed the operation of both systems, and am inclined to the belief that much of the virtue attributed to the hood type of feed in Australia, and recently revived at El Paso and Selby, is really the effect of the high charge column and high blast of Australian practice. At one Australian plant where the high column is lacking, this hood system has been in use for years, with results far from good. At another Australian smeltery, also using the hood type, smelting efficiency and metallurgical outcome are surpassingly good, but this good work has come about since the furnace shafts were raised and smelting conditions lined up for an ore column of 25 ft. and a blast pressure of 65 to 70 ounces.

On the point of charge distribution alone, a properly adjusted central spreader should give better control than any fixed hood. We do not want too much coarse material at center of furnace. On the point of feed floor ventilation, no trouble is experienced with a high-column furnace when it is properly closed by automatic top doors.

Comparative tests by the writer on smelting efficiency of wide and narrow furnaces operating on the same charge in Australia have indicated a persistent tendency of the narrower furnace to show the better behavior during periods of refractory charges, high-zinc, and bad slags. The wider furnaces have pronounced tendencies toward the formation of center crusts. The extra penetration of a blast pressure as high as 60 to 70 oz. warrants some increase over standard size, but the furnaces suggested are given a 52-in. width only.

There is in this high-column lead blast furnacing an important opportunity for metallurgical progress. The writer has found agreement with his views on this subject in several parts of the world, in correspondence and conference, and at one point the matter has been tried out to a finality. Here the evidence is clear and distinct. At the Cockle Creek, N. S. W., works of the Sulphide Corporation, a lead furnace 30 ft. 9 in. from feed floor to tapping floor, with about 25 ft. of ore above the tuyere line, runs along at about 550 tons per 100 sq.ft. of hearth area, under 60 to 70 oz. blast, with 12 to 13% ZnO in the slag, and with slag-lead about ¾ of 1%. Long experience with the difficult conditions at Cockle Creek has taught these metallurgists that they are free from furnace trouble and bad assays only as long as blast pressure is kept near 70 oz. and a relentless driving speed of smelting maintained. The smooth handling of excessive zinc burden with persistently clean assays was not attained until the furnace column was raised. At the present time the resistance of the high charge column results in a cool furnace top, and the high blast induces an intensely hot fusion zone well confined to a position near the tuyeres. The Cockle Creek furnace handles high zinc charges with a notable degree of smoothness. Coke is lower (11 to 11.5%) since this column has been carried high; and every feature of the operation remains consistently better than in the days of the old low furnace.

Analyses of throat gases show that practically all the reducing power of the furnace gases is utilized in the high column. If signs fail not, it is in the direction of this high column furnacing that lead-blast metallurgy will trend in the future.

It is not to be understood, however, that the notable success of the Australian lead smelteries, in the handling of an excessive zinc burden on the lead charge, is due solely to this high-column furnacing. There are, of course, many other points involved, and it is a fact that these able Australian metallurgists have evolved a distinct and unique system of fluxing, furnacing, and general manipulation in their long and successful treatment of lead ores high in zinc. This, however, is another story, and quite outside the scope of this article.

[The author of the foregoing article wishes to acknowledge the courtesy of C. T. Rice, who kindly agreed to the reproduction of the drawing of the Cottrell precipitation plant. This drawing was originally arranged for inclusion with one of the series of articles on the Bunker Hill & Sullivan smelting works, by Mr. Rice, which begins in this issue.—Editor.]

In South Africa a Parliament Committee appointed to inquire into the position of low-grade gold mines has presented a report, states the *Chemical Engineering and Mining Review*. Owing to the increase in the cost of production due to the war, several mines are making only a working profit of 18c. per ton, but the committee could not indorse the proposal of the Chamber of Mines to close them down, because it would be difficult—perhaps impossible—to reopen them in normal times. The committee recommends that steps be taken to control the amount of development work done in mines, and the allocation of stores and labor.

Blast-Furnace Plant for Smelting Copper Ore

By Forest Rutherford[*]

In the general plan here shown of a blast-furnace plant for the smelting of copper ores and concentrates, I have outlined only the approximate locations of the various departments, allowing in every case for enlargement. The plant is equipped to start up with a capacity of 1000 tons of charge per day, production to be increased to 3000 tons per day without interfering with the smaller operations. This, of course, would necessitate the flues, stacks, and sections of the belt delivery system being built to suit the final conditions. They are therefore shown of sufficient area and size, while all other units can be enlarged simply by adding thereto. The smelting capacity can be increased by joining up each two 20-ft. furnaces with a middle section, thus getting one furnace 55 ft. long, and then adding more units. The increase to the converting capacity can be arranged by either adding more units of the 12 ft. vertical type or by replacing them with the large-size horizontal type. The latter is preferable.

To get complete control over the metallurgical conditions at the furnaces, I would use the Messiter system of spreading and reclaiming, and would deliver the charge to bins over the feed floor by means of belt conveyors. For the feeding of the blast furnaces a side-opening scale car is suitable, so built that the charge can be dropped at any position in a furnace as well as along its length. The converter department would include a casting machine for the molten converter slag, preferably of the straight-line type; a McGregor skull-cracker for the shells; and for the casting of the copper either a circular or straight-line type of machine. Personally, I much prefer the circular or Walker type if of sufficient size. Having fewer small movable parts, it is more easily kept in working order. For the larger operations, of course, a second machine would be put in. The siliceous ores would be delivered by means of large portable bins that could be placed on stands beside the converters, and not by belts delivering to permanent bins over the converters. The former method is much cheaper, both to install and to operate. To feed the ore into the converters themselves, the Garr gun would be used.

For the air blast, both to furnaces and converters, I would seriously consider turbo blowers as against rotary or reciprocating blowers, as the former have now been brought up to a high point of operating efficiency; and would arrange to deliver the air to each blast furnace, especially when enlarged, by a separate main, on account of the excellent control over furnace operations that such a method allows. The converters would, however, be served by a general main. A site for a reverberatory furnace is shown on the plan, as a 3000-ton blast furnace plant without a furnace of this type attached would be considered complete under present conditions.

I have not, in this description, gone into details of construction, as this to a great extent depends on each individual problem and has no place here, but have simply tried to show in a general way a plan of a plant for the smelting of copper ores that would be, when complete, capable of treating about 3000 tons of charge per day.

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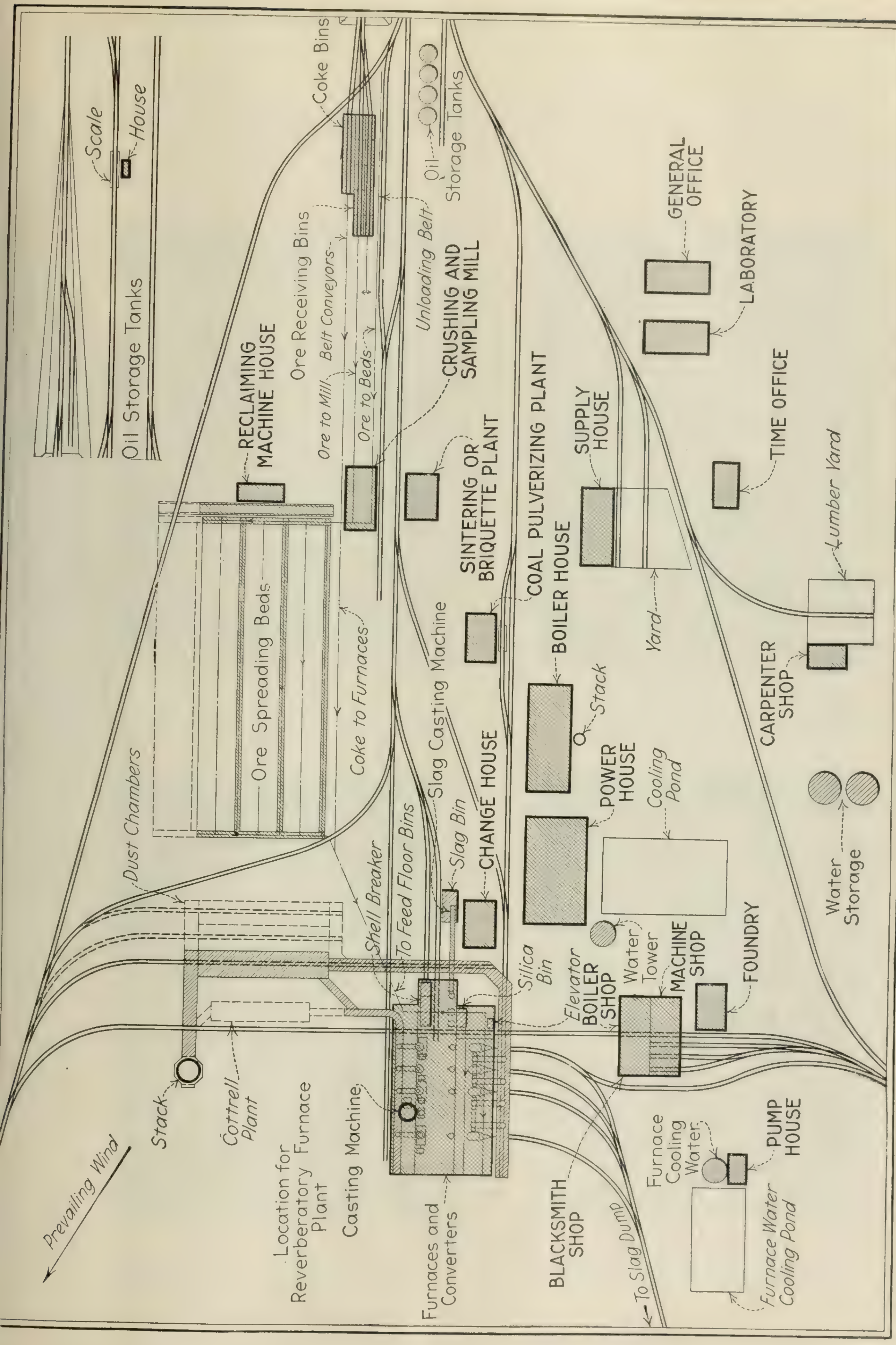


GENERAL PLAN OF BLAST FURNACE AND CONVERTING PLANT FOR COPPER ORES—CAPACITY 1000 TO 3000 TONS PER DAY—DESIGNED BY FOREST RUTHERFORD

Distinguished American Metallurgists

WILLIAM ALLEN SMITH

A metallurgist of wide and successful experience in lead, silver-lead and zinc smelting

OTTO RISSMANN

General manager, National Zinc Co. A veteran in the metallurgy of zinc who has exhibited distinguished originality in his practice

WILLIAM THUM

Superintendent of the Grasselli lead refinery of the U. S. Smelting Co., who has conducted the electrolytic process with distinguished ability

JULES LABARTHE

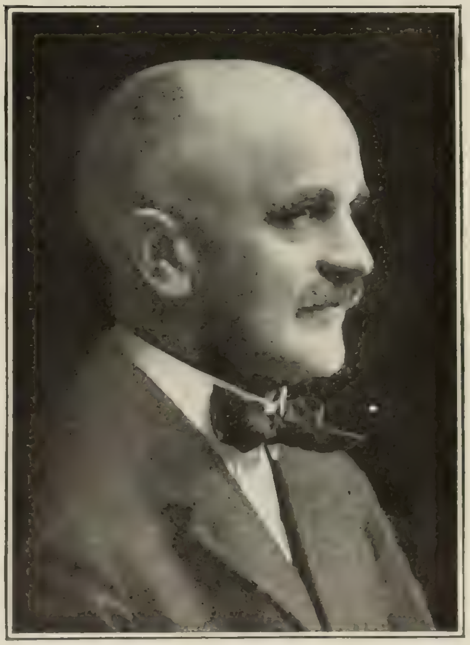
Long superintendent of the smeltery and refinery at Trail, B. C. More recently the designer and builder of the Bunker Hill and Sullivan works

Distinguished American Metallurgists

A. E. WHEELER
One of the brilliant Anaconda corps. Now the metallurgical head of the Union Miniére du Haut Katanga

C. A. H. de SAULLES
A zinc metallurgist of broad and successful experience, whose work has been characterized by distinct inventive genius

WALTER T. PAGE
Manager of the Omaha works of the American Smelting and Refining Co. Mr. Page may well be characterized as the dean of American lead refiners



F. D. WEEKS
One of the older generation of silver-lead and copper metallurgists. Until recently metallurgical director for the American Metal Co.

Baghouses for Zinc Oxide

By JOHN F. CREGAN*

EXTERIOR VIEW OF BAGHOUSE, EASTERN TYPE

The importance of the baghouse in smelting zinc oxide direct from the ores is well recognized, and the efficiency of the plant is based on the percentage of baghouse recovery. Lack of coördination of methods has been due to variations in the industry itself, and it may be considered that further standardization and improvement in design are essential to the retention of the baghouse in its present position in the zinc-oxide industry.

THE baghouse, as a fume collecting means, is so well known that a general discussion of the principles involved is unnecessary. It is when the adapation of the baghouse to a particular purpose is considered that our ideas of the general process meet at cross-urposes; and the experience gained in its use in one ndustry will more than likely produce negligible results vhen applied to some other industry under different onditions. In the several industries in which the bagouse forms an important part of the process, its funcion is to collect a fume or a fine dust. There are cerain fundamental conditions which govern the operaion, and these conditions are applicable to the particuar process. The application of the same methods of onstruction and operation in a particular process to general baghouse operation will lead to failure.

It is well known that the baghouse is an important ink in the process for the production of zinc oxide vhen the oxide is smelted directly from zinc ore. It is usually situated at a rather long distance from the furnaces. It is connected with the furnaces by means of a pipe line, which conveys the hot gases from the furnaces to the baghouse. These gases are either drawn or driven through this pipe line by means of a specially constructed fan. The general schematic arrangement is indicated in Fig. 1.

The entire process may be compared to a chain in which every link has its own function to perform and every function has an influence on the operation of every other function. The coördinating of the functions of each link into a harmonious operation of the whole system will produce a successful plant. The function of the baghouse is to collect all of the merchantable oxide which leaves the furnaces, and the efficiency of the entire plant is based on the percentage of baghouse recovery which is obtained. In most cases it is not practicable to do good furnace work unless the baghouse is functioning properly, but there are some isolated instances in which the furnaces have shown an excellent metallurgical record, though the baghouse recovery was extremely low. The net result of such an operation in every case represents a financial loss to the owners.

Diversity of Design Owing to Use in Many Industries

The fact that the operation of the baghouse varies with the particular industry in which it is used, and the failure to recognize this fact, is responsible for the present diversity of construction, methods of operation and general opinion as to baghouse operation which now exists in the zinc-oxide industry. It is also true that there are variations even in the zinc-oxide industry itself which further complicate the situation; and although attention will be drawn to the conditions that are responsible for the variation, this discussion deals with zinc-oxide baghouses in general rather than to their adaptation to any particular ore. It is impossible to lay down a set of invariable rules for operation, even in a general discussion. Though the industry is an old one, the issues have been complicated by experience derived through the use of the baghouse in other industries and the field of investigation has been but slightly covered. Great progress has been made, and although each operator has developed along lines to meet the particular conditions that confronted his operation, there has been no general coördination of methods beyond what might be called general sectional types.

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*Superintendent, Zinc Oxide Department, American Zinc and Chemical Co., Langeloth, Pennsylvania.

The different conditions under which the entire zinc-oxide industry is forced to operate have introduced lines of thought in connection with the baghouse that are characteristic of these diversified problems. These conditions are sectional and, as in the case of furnace construction, the baghouse has felt the variation. The result is that in the zinc-oxide industry we have two types of baghouse; and with the present available information and equipment, neither general type can be sectionally interchanged without considerable modification in construction and operating practice.

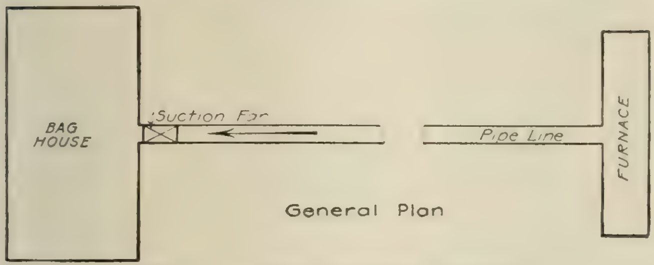


FIG. 1. LATEST WESTERN TYPE

EASTERN TYPE DEPENDENT UPON ANTHRACITE FUEL AND CLEAN ORE

The governing elements in the process are the character of the ore and fuel on which the particular operation is based. In general it may be said that the ore and fuel are responsible for the marked sectional difference in the type and general ideas that prevail in the whole zinc-oxide technology. In the Eastern part of the United States anthracite coal is available in abundance. It is fortunate for the industry that the normal operation of the preparation of anthracite coal for the market produces a size that is admirably suited to the zinc-oxide process. This coal is high in carbon, smokeless and low in volatile matter. The ore supply, in general, is a clean silicate containing neither lead nor sulphur and is of uniform zinc content. It has been available in sufficient tonnage to permit of a continuous operation for many years. The process under such conditions is definite, easy to control and permits of a certain standard type of construction and method of operation. This type of baghouse has reached a high state of development in the Eastern territory, and may well be named the Eastern type of baghouse. The general arrangement of this system is shown in Figs. 2 and 3.

In the Eastern system the zinc fume is drawn from the furnaces by a suction fan, which is generally about one-third of the pipe line distance between the furnace and the baghouse. The fume is then driven from the fan through the pipe line to the baghouse, where it enters the bag distributing system just under the roof. The entire pipe line is made of galvanized sheet steel and is designed to eliminate right-angle turns and bends as much as possible. It is 3 ft. in diameter and will average 600 ft. in length. Inside the baghouse and just under the roof, this pipe line discharges into a header pipe, which is placed at a right angle to it. From this header pipe, in the form of a gridiron, are led eight rows of distributing pipes, and each distributing pipe has 19 openings in the bottom, to which thimbles are attached from which the bags are hung. Each distributing pipe is equipped with a closely fitting damper, so that the entire row of bags in any pipe may be shut off at any time. The 10 bag openings in each distributing pipe nearest the header have funnel attachments of sheet steel, which serve to discharge the hot fume downward and thus protect the end of the muslin bag that is attached to the distributing-pipe thimble.

The bags in use are muslin of about 2400 meshes to the square inch. Each bag is 44 ft. long, divided into two sections of 16 and 28 ft., respectively. The object of the division is the ability to renew the first 16 ft. of bag, which is exposed to the greatest heat, without disturbing the lower section of the bag. Platforms or walkways are provided, so that each section of the bag may be shaken throughout its entire length. The bottom end of the bag is attached to a hopper which is arranged to receive four of the bags. On the discharge end of the hopper is attached a 3 ft. 9 in. x 5 ft. 6 in. canvas bag, which serves as a final collector for the finished pigment. As the bags are shaken the oxide falls vertically into the collecting hopper, which serves as a chute, and passes thence into the canvas bag. These latter bags are removed once every 24 hours and replaced by a new set.

EASTERN BAGHOUSES HIGHLY EFFICIENT

This arrangement is clean-cut and represents the highest development that the baghouse has reached in the zinc-oxide industry. The total absence of horizontal flat surfaces on the discharge side of the distributing pipes prevents any collection of pigment in the system which would tend to interfere with the operation. The perfect damper control and the arrangement of the walkways permit of an operation which assures the operator that all of the pigment that enters the baghouse on any particular day will be collected on that day. Baghouse shut-downs for cleaning purposes are practically unknown, and labor is reduced to a minimum requirement.

PLANTS FREE FROM SULPHUROUS FUMES

This system is purely a product of the working conditions that are permitted by the use of anthracite coal and silicate ore through an unbroken period of years. The lightness of zinc oxide in its practically pure state permits an ease of transportation by means of air currents through the pipe line which is not so readily noted in the case of zinc-lead pigments. The total absence of sulphur in the ore under treatment creates a baghouse atmosphere in which liberties may be taken as to freedom of arrangement without fear of a justified protest from the workmen.

The baghouse buildings are well ventilated structures and are designed so as to eliminate hot sections. They are long and narrow, and are so ventilated that every section is practically at a uniform temperature, and no section is dangerously hot. Roof and wall openings are provided with the greatest liberality, and the general working conditions are so free from the disagreeable features that usually accompany baghouse operation that in normal times the labor turnover is insignificant.

The conditions which govern the production of zinc oxide in practically every other section of the United States are totally different from those of the East, which have just been described. Neither the ore nor fuel supply is constant. The producing plants have to depend on the open market for their ore supply, which consists of an assorted lot of silicates, carbonates and sulphides, with none in sufficient tonnage to permit of a continuous operation on the same ore for a period of several months. Practically all the ores contain lead. The fuel supply is usually as varied as the ore supply. The coal is generally high in both sulphur and volatile matter. Where coke is obtainable, it is used to offset these conditions.

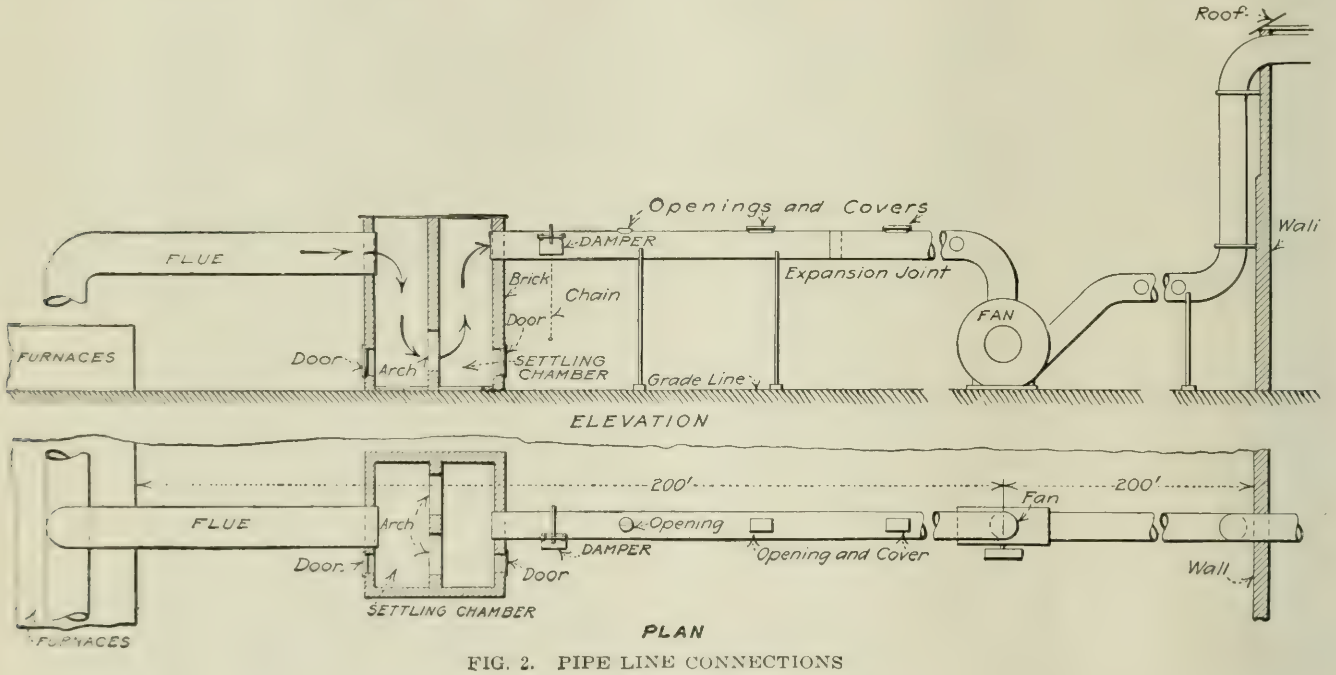


FIG. 2. PIPE LINE CONNECTIONS

These varying conditions result in confusion in the baghouse unless their existence and effects have been recognized and anticipated. The experience of many producers has been both troublesome and expensive before they came to a realization that their troubles were inherent to the process—that the conditions had to be faced, and their baghouse construction so designed as to permit the use of the variable raw materials that were the basis of their industry. The development of the baghouse in the Western section of the United States has produced a standard which may be called the Western type. The general arrangement of this system is illustrated in Figs. 4 to 7.

The details of the Western installation vary considerably from the type as developed in the East. The pipe line is never less than 4 ft. in diameter and rarely is less than 800 ft. in length. This pipe line, in older installations, is curved, in order to get resistance to the gas flow and also to confine the length of pipe to a limited space. The fan is always placed at the end of the pipe line immediately adjacent to the baghouse. The header and distributing system are placed on what might be called the ground floor of the baghouse, with the bags hanging suspended from a grillage, which is carried on the roof trusses. The bags are attached to the distributing pipes, and the upper ends are fastened to a rope, which is then drawn up over pulleys and thus hung vertically without requiring the operator to leave his original position on the distributing-pipe platform. There is only one walkway between each double row of bags, and this walkway is placed so that the attaching of the bags to the distributing pipes and the shaking are both done from the same working level. When the bags have been shaken, the oxide falls into the collecting hoppers, and is then drawn off, once every 24 hours, by means of small two-wheeled buggies. The bags will average 30 ft. in length and are 22 in. in diameter. Their average period of use is shorter than those in the Eastern baghouse, for reasons that will be given later.

As previously stated, the Eastern baghouse has been developed around a set of conditions which have been constant and have reasserted themselves over a period of years. The constant use of a zinc ore, whose variations in metallic content rarely exceeded 5%, on a particular block of furnaces, whose size and number of grates were identical with a number of others on the same or at different plants, resulted in a certain definite pigment capacity as the normal expectation from that particular type of furnace block. The problem which then presented itself was to design a baghouse to collect the pigment from either one block or any number of blocks in combination. How well this was done is reflected in the excellent baghouse system that has been described as the Eastern standard.

It was found that every square foot of grate surface in the furnace block required approximately 100 sq.ft. of screening surface in the baghouse. The comparative absence of sulphur gases and the constancy of pigment production permitted a freedom of action in the baghouse where the operator could remain in any part of it for comparatively long periods without undue discomfort. This resulted in the introduction of the top distributing system and the intermediate walkways, so that the bags could be given a thorough shaking and thus utilize all the screening surface to capacity. The top discharge doubles the work of hanging of bags, but it permits the use of devices to conserve the muslin consumption, with the result that fewer bags have to be hung. The division of the bag into two sections, where the section which is exposed to the greatest heat is short and easily removed without disturbing the long section of the bag, is a means of conservation which reflects itself monthly in the baghouse operating costs.

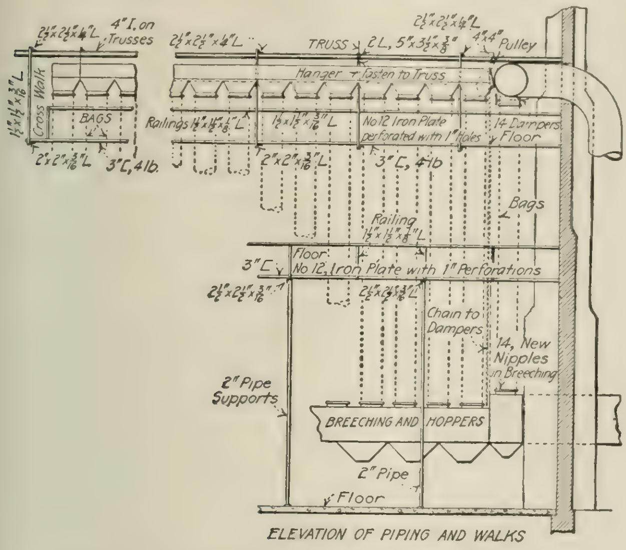


FIG. 3. PIPING BREECHING AND HOPPERS

WESTERN PIGMENTS WERE AT FIRST INFERIOR, BUT ARE NOW GOOD

It proved to be a costly experience for the Western producers to reach the final conclusion that all known signs failed when they attempted to adapt known methods of baghouse construction and operation to their conditions. It was early made plain to them that something was wrong, but the actual determination of the trouble, in the light of previous experience, was a difficult matter. All sorts of experiments were tried. Some of them were not from the point of view of how best to use the baghouse, but how to use it at all. In fact, the Western zinc-oxide industry is suffering today from the prejudice in the minds of some consumers, which was caused by the introduction of Western pigment on the market before the problems that are inherent to the process in that territory had been satisfactorily solved. It is only fair to say that, in view of the many new and difficult problems which confronted the pioneers in the Western zinc-oxide industry, their present high quality of pigment is a record of achievement and a just compensation for their years of disappointment. The pigment production in the West is now on a substantial basis, and the elements which in the past caused so much trouble are under perfect control. Many baghouses in the West now permit of the same freedom of activity as those in the East, where operating conditions are infinitely more favorable.

The complexity of the Western ores and the quality of the fuel supply were responsible for all the trouble. The element sulphur had to be reckoned with, because, when it is not present in the ore, it is present in the fuel, and in most cases the plants had to contend with a combination in both. It is a peculiar characteristic of the zinc-oxide process that all harmful, volatile elements in the furnace charge will pass on to the baghouse and remain to make trouble. The recognition of this fact and the successful baghouse developments, which is responsible for the elimination of these harmful elements, have placed the Western zinc-oxide industry on a substantial basis.

AREA OF SCREENING SURFACE DEPENDENT UPON TONNAGE OF PIGMENT PRODUCED

Western zinc oxide is sold both on color test for whiteness and on chemical analyses. These analyses are now guaranteed by the producers. Sulphur in all its forms, chloride and the various chlorides are under control. Though the elimination of these elements from the pigment takes place largely in the baghouse, their presence in the baghouse atmosphere is no longer attended by the troubles which formerly existed. Emphasis has been laid on the radical difference between the conditions that governed the process in the Eastern and Western operations to bring out the necessity which determined the difference in construction and operation. In the first place, the Eastern baghouse was developed for use in connection with an operation whose ore supply rarely carried zinc with a higher metallic content than 20%. It never contained sulphur. The Western ore supply rarely carries less than 30% metallic zinc and frequently has in combination with it as much as 15% metallic lead Sulphide ores also are largely used in the process.

It should be perfectly obvious that the amount of screening surface required for the pigment which will be driven off from 1000 lb. of ore containing 20% zinc will be much less than the amount required to collect pigment from a charge of 1000 lb. of ore containing 45% combined metals. To add intensity to this contention, the Western ore charge, under Western operating conditions, will give up its metals in the form of pigment in an appreciably shorter time than the Eastern ore under Eastern conditions. The individual charge tonnage per square foot of furnace grate will be smaller, but the total weight of charge per square foot of grate surface per day will be the same. The only conclusion which can be reached—and practice has verified its logic—is that the required screening surface in the baghouse is not dependent upon the abstract area of furnace grate surface, but upon the tonnage of pigment which the furnace

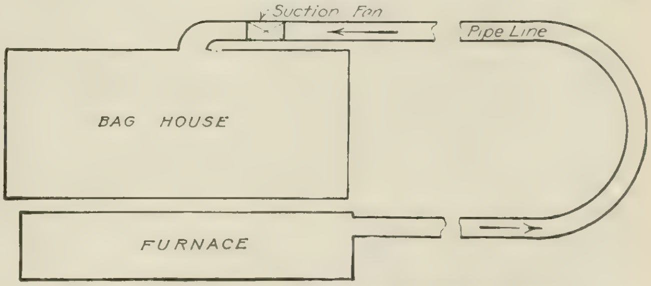


FIG. 4. GENERAL PLAN, WESTERN TYPE

grate surface is capable of producing with a charge of ore which varies from 10% metallic content to 50% metallic content. Any attempt at the specification of a definite figure for this ratio at this time would be pure speculation, because baghouse development has not yet reached its final stage. The Western baghouses reflect the conditions named, and contain approximately twice the bag screening area of their Eastern prototypes. The bags are hung with a full length of 30 ft. In the older installations, the single walkway, which was placed at the collecting hopper level, afforded the only means of shaking.

It was found to be impossible thoroughly to clean from the platform a bag which was 30 ft. in length. Another objection was that the workmen were forced to shake the bags at the point where they were weakest, because the end of the bag which is attached to the distributing pipes soon rots, owing to its exposure to heat and sulphurous gases. This condition has led to the installation of a second walkway, which permits of the bag being shaken at its center, with the result that it is thoroughly cleaned and with a minimum of risk of tearing the bag at its weak point.

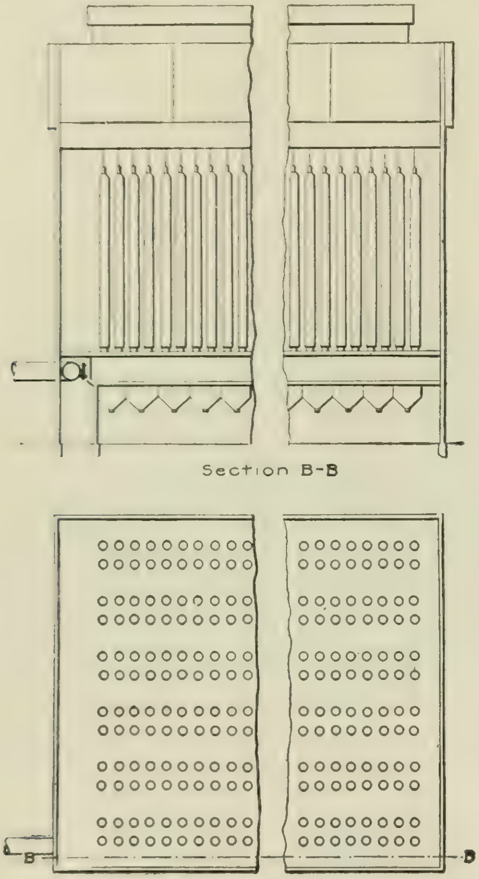


FIG. 5. OLD STYLE BAGHOUSE

The presence of lead, chlorine, sulphur and moisture in the pigment gases determined the policy of the Western operators in their adoption of the bottom baghouse discharge and distributing system. It is a prerequisite to success that the bags must be shaken at intervals which are more or less regular. To do this work satisfactorily requires the presence of the workmen among the bags for a period of about one hour during the shaking period. The renewals of bags also requires that the workmen get right into the building and remain until their work is finished. The sulphur-laden atmosphere of the baghouse precluded the possibility of any of this work being done unless working conditions were so arranged that the men could reasonably be expected to perform their duties. The result was the present Western system, in which the workmen were least exposed to the fumes and in which they rarely had occasion to go to the top section of the baghouse which carried the bag-suspension grillage.

Though the general design of this type of baghouse was governed by conditions which had to do with labor, an unexpected but, nevertheless, essential element of success was correspondingly introduced. Described in simple terms, the baghouse bags are purely screens in which the pigment is retained and collected and the deleterious fumes are permitted to pass off through the pores of the muslin. This process must be continuous for the reason that the fume delivery is continuous and any failure to keep the pores of the muslin open will prevent the gases from escaping. Sulphur fumes, zinc-oxide fumes and moisture under certain conditions have a strong tendency to enter into chemical combination; and, unless precautions are taken, the baghouse reflects this condition through the formation of zinc sulphate on the inside of the bags. This deposition is in the form of a hard scale which completely closes the pores of the bags. The resulting pigment will assay high in impurities, and after this condition has existed for a comparatively short period the bags so affected cease altogether to perform their function as a screening medium.

Though there are a number of methods which can be adopted to prevent this reaction from taking place, many of them would require the introduction of new equipment and new methods of operation which some plants would be slow to adopt. The simplest method is to keep the entire baghouse at a temperature which will prevent the condensation of moisture in the building. This practice does not take care of the moisture in the fume nor of dampness on wet days, but removes a source of trouble which otherwise would be serious. By placing the distributing system on the bottom of the baghouse, so that the greatest heat is given off at the coolest point in the building, this heat, rising uniformly, serves to prevent the formation of the zinc-sulphate coating.

Both Types Possess Inherent Weaknesses

Neither of the foregoing systems is without elements that are recognized as fundamental weaknesses. The top discharge of the Eastern baghouse permits of an arrangement which is admirably suited to economy in muslin and facility of operation. The bags hang straight and true, and a fold under that system is due to pure carelessness. The fire hazard is greatly reduced, because the hottest zone is near the top of the building, and though each system is particularly susceptible to fire, the location of the hot zone will limit the probable extent of the damage. The objection to the use of this class of baghouse as a universal type is real and is based on conditions that govern the operation when we get away from Eastern conditions. In the first place, the screening surface is based on a direct relation to the furnace grate surface area, and no consideration is given to the fact as to whether the ore to be burned on those grates contains 10% metallics or 50%. The plan of having a few long bags to provide this screening surface, with the inlet at the top, results, in the winter months, in a hot zone on the upper half of the building; and the lower half is at a temperature which is favorable for a reaction between sulphur and water. It is possible to overcome this condition through the introduction of methods which have a detrimental effect on some other step in the process, and the condition in general is unsatisfactory.

WESTERN PRACTICE WEAK IN ARRANGEMENT OF BAGS

The Western type suffers primarily from inability to hang the bags in perfect alignment and without folds or creases. A fold results in a charring of the bag at the folding point, and under certain conditions this charred spot will either tear or burst into flame. If the latter happens, the results are serious, for the point of ignition and the hot zone are at the bottom of the bag and directly in a position for the sparks to sweep through the entire baghouse with the rising current of hot gases. It may be that this failure to eliminate folds is due entirely to the mechanical equipment, but the fact remains that the bags are now hung with ropes, and the elimination of the stretch in these ropes calls for perseverance to an unusual degree. As an offset to this disadvantage the principle of having one end of the bag fixed and the other end suspended results in a saving of muslin which is appreciable. Since it is not necessary to have every bag the same length, provided the screenng surface is ample, any bag or a number of bags may have their charred or torn ends removed and the whole bag lowered until the period of usefulness of any particular bag has been exhausted. This latter point only emphasizes a fact which is not noticeable in Western practice. In general it may be said that in that territory the baghouses are designed to provide the necessary screening surface with bags which are 30 ft. in length. The usual procedure is to have but one walkway from which to do the shaking, and this walkway is placed on the level with the distributing-pipe system. As previously stated, it is impossible adequately to shake a 30-ft. bag from this walkway; and the efforts that are put forth by the operators to do the best they can from uch a position place a strain on the weakest part of the bag, and result in the tearing of many bags and a loss n muslin which would be unnecessary under different conditions. It is a matter of record that the last 10 ft. at the top of a 30-ft. bag becomes useless as a screening medium within 24 hours after the bag has been hung. This is owing to lack of shaling, and is sufficient and conclusive evidence to an experienced operator that the bag is too long.

Though each type of baghouse has certain fundamental conditions which must be observed, there are features in the behavior of the bags that are common o both types, and the methods which are employed to meet these characteristics are practically universal. The entire operation is a screening process; but, owing to ack of persistent scientific study, there are still adverse elements in the process, the elimination of which would simplify the operation and reduce the cost. It is well known that the greatest source of loss in the baghouse is due to renewals of bags whose period of service has been terminated through the destructive action of heat and sulphur fumes. During the summer months this action is particularly in evidence and is more detrimental to new bags than to the older ones which received a protective coating of pigment during the cooler season.

It is the general policy to permit the bags to absorb a certain amount of pigment. This provides a coating, which acts as an insulator and protects the bags from the destructive influence of the heat. After this has been done, the periods of shaking are so regulated that the pores of the muslin are kept open; and the uniformity of the pigment deposition is such that the muslin remains protected. In other words, the shaking is arranged with a view to keeping a uniform flow of gases through the system. The bags must be kept sufficiently open to permit the gases to escape, but at the same time they must not be shaken so clean or so frequently that the fire risk becomes dangerous. Good practice provides for shaking the bags at four-hour intervals. Though this is no hard and fast rule, it may be accepted as meeting the general situation as nearly as general conditions will permit.

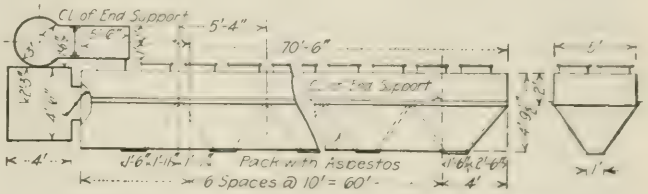


FIG. 6. BAGHOUSE HOPPER ARRANGEMENT

The muslin has been standardized to be not less than 2200 meshes to the square inch, and the temperature inside the bags at the point of their connection with the distributing pipes is approximately 200° C. The problem that now presents itself is to screen out the hot gases and leave behind the zinc pigment, which is itself in the state of a fume, and still maintain the muslin bags in a serviceable condition under such a high temperature. In the absence of any assistance in the way of a protective chemical coating, the operators have used their own good sense and have met the situation with the only means at their disposal, and so regulated the details of operation that the baghouse is really commercially practicable, even though it is expensive. This is accomplished through the system of shaking the bags at certain intervals.

It is of the greatest importance that the shaking of the bags at the regular intervals be carried out with as nearly perfect efficiency as possible. The baghouse is merely one link in a process where the functioning of each link depends upon the efficiency of every other link; and as the baghouse is at the discharge end of the process, a failure there brings on a series of disturbances which reflect themselves through the entire system. Failure to shake the bags will throw a resistance against the discharge of the fan. This resistance gradually increases, until the volume and velocity of gases through the pipe line decreases, and results in a deposition of pigment in the pipe line. Finally, this condition works back to the furnace, where, through the cutting off of the draught, the furnace slows down and the furnace clinker will carry a high metal content. In many cases this accounts for the low baghouse pigment production and the inability to bring the furnaces up to capacity.

As an indicator of the condition of the baghouse, many operators consider that the best results can be obtained if the pressure on the inside of the bags can be held at one-eighth of an inch, as shown by the reading on a U-tube water gage. There are various local elements in individual plants which would preclude the possibility of making this rule absolute, but an approximation of this condition will give satisfactory results. The bags will be sufficiently open to permit of a uniform screening of the pigment gases, and at the same time the pigment coating on the inside of the bags will be ample as a protection against fire.

Aside from the operating difficulties, the one great source of operating worry is the fire hazard. This danger is so familiar to experienced operators that in well-regulated plants the liability has been materially reduced. The risk is always present, however, and the price of immunity is eternal vigilance. A fire may start in a baghouse from two sources. If the shaking intervals are too close together and the operator does his work so thoroughly that the protective coating of pigment is almost entirely removed from the bags at their point of junction with the distributing pipes, the muslin will be so exposed to the heat that a fire may be expected. This condition establishes the fact that the shaking may be done too well. The greatest danger, however, is from too little shaking or entirely neglecting one of the scheduled shakes. In the latter case the pigment coating on the inside of the bag becomes so heavy that the muslin ceases to function as a screening medium. The hot gases cannot escape, and the pigment coating stands between the baghouse and destruction. The danger point is brought about when the operator finally begins the shaking. After he has shaken the bags on one set of distributing pipes and reopened the damper, the pent-up hot gases rush to this set of bags; and this set of pipes, with its bags, for the time being has to serve as the means of escape for the heat which has been held back during the period of neglect.

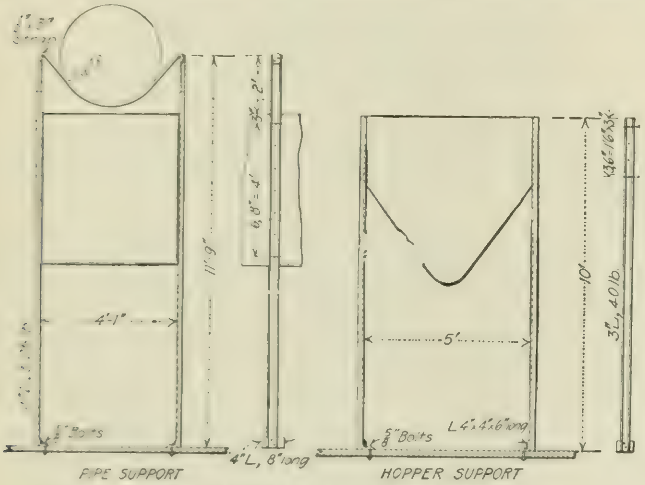


FIG. 7. PIPE LINE LAYOUT

It is a fortunate circumstance that the system in itself provides a safety valve that operates against a frequent recurrence of the latter condition. The bags comprise an assorted lot of new, medium and old bags. Many have been exposed to the heat for long periods, and their ability to resist pressure has been reduced to almost zero. When an operator fails to shake at the appointed time, the pressure in the bag system rises, and if there are a number of weak bags in the system these will begin to burst, and continue to do so until the pressure has been relieved. After this has occurred a few times, the operator generally finds it to his advantage to be honest in his work.

If the baghouse operators are sufficiently alert and watchful, a fire, having started, may be confined to a small area. It is a peculiar characteristic that when a fire starts there is rarely a blaze. There usually is a period of smoldering, accompanied by a strong odor of burning cloth. The gas pressure from the fan blows these smoldering sparks to the next bag, and in this manner the fire is communicated to the entire system. The first thing to be done when fire is discovered is to shut down the fan. Then tear down the bags that are smoldering, using care that sparks are scattered as little as possible. Roll up all smoldering bags and remove them from the building.

FURTHER STANDARDIZATION AND IMPROVEMENT IN DESIGN IS IMPERATIVE

It is a safe assertion that more thought will have to be expended on baghouse design and operation if the baghouse is to retain its present position in the zinc-oxide industry. The types which represent the process cannot be regarded as distinctly representative of the ultimate baghouse of the future. The experience that has been gained establishes the basic fact that the baghouse should be a building of fire-proof structure. It should be as well ventilated as possible, and to this end the design of the building should be worked out in collaboration with an expert on scientific ventilation. This is not only necessary because of the advantages to be derived from a positive control of the product as well as economy in muslin consumption, but particularly because of the impelling necessity for the provision of healthful working conditions, so that labor may be employed at a wage that will not include a premium as an incentive to offset the disagreeable features of the present operating system.

The distributing system will gradually tend toward a combination of the principles which justify the existence of the present diverging types. The top discharge with bags 24 ft. in length, and their number greatly increased, would be a cure for many of the troubles that are now incidental to baghouse operation. The screening surface should be based on the maximum pigment capacity of the furnace block, with due excess capacity to take care of operating irregularities. The entire baghouse system should be such that it could proceed independently with its work at all times. It should never be necessary to regulate the furnace production to the capacity of the baghouse. The extension of the zinc-oxide industry to new territory has revealed the shortcomings, and brought out new lines of thought which will assert themselves when sufficient confidence has been gained to break away from what appear to be established conditions.

Hoisting Cost Data are given in the 1917 report of the Bunker Hill & Sullivan mine, at Kellogg, Idaho. From the shaft 448,843 tons of ore was hoisted, at a cost of $25,253.81, at the following average costs per ton: Hoistmen and skipmen, .029; lubricants, .001; miscellaneous, .012; machine shop repairs, .004; electrical repairs, .002; electrical power, .008; total, $.056 per ton.

Ulco Hard Metal—a Substitute For Babbitt

Of the many inventions that may be directly attributed to the stress of necessity caused by the war, the discovery of a new alloy which appears to be performing the office of a number of other metals is of the greatest importance to industrial America, and incidentally of vital assistance to the Government in its efforts to conserve the rapidly diminishing tin supply of the world.

In the summer of 1915, when the foreign demand for shrapnel balls was at its height, causing famine conditions in the antimony supply, antimony was selling at 45c. per lb. in New York. Even at this unheard-of price, there was no antimony to be had. Conditions had become so serious that the United Lead Co., one of the large American manufacturing companies, issued orders to its technical force to find a substitute for antimony. It was not long before this condition was brought to the attention of Professors Frary and Temple, then of the University of Minnesota, who spent their vacation in developing a metal that could be used for shrapnel balls. Their results were successful in the fall of the year, when their product was offered to the manufacturing company originating the suggestion, and steps were at once taken to manufacture the metal experimentally at Keokuk, Iowa.

The metal has been designated "Ulco Hard Metal." It is hard and tough and has a distinctly metallic ring, despite the fact that in chemical composition it is 98 to 99% lead, plus barium and calcium. The latter elements are introduced by an electrolytic process, and hence the plant for the production of the metal was erected at Keokuk, where the electrical energy developed by the Mississippi River at the Keokuk dam was available.

Shrapnel balls manufactured from the new alloy were pronounced superior to the lead and antimony ball by reason of their higher specific gravity, greater toughness and the complete absence of brittleness—all these qualities combining to produce a ball with superior ballistic effects. Yet about the time the metal was fully developed for this purpose, antimony had receded in price to such an extent as to make the use of the new metal for the special purpose unnecessary.

The research laboratories of the manufacturing company responsible for the introduction of the metal devoted themselves diligently to the study of its peculiar nature, and have since discovered its real worth in bearing metals. Here the metal is found to possess hardness, compressive strength, low friction, heat resistance—all the qualities of a high-grade babbitt.

Tin lends an element of hardness and toughness to babbitt; antimony hardness alone; and it has been generally supposed that where lead was used in a babbitt it added greatly to its anti-frictional qualities. The new metal having all these characteristics, being principally lead, with its high anti-frictional qualities, appears to be supplanting babbitt of the higher grades. Moreover, of special importance is the fact that the new metal is conserving the supply of tin, so urgently demanded by all the nations at war.

Unco Hard Metal may be cast, rolled, drawn and extruded; its melting point is the same as lead, and its specific gravity about the same. The metal has been undergoing a test conducted by the U. S. Bureau of Standards, and we are permitted to report the results of the test as follows:

A 10-lb. ingot of Ulco Hard Metal, the original Brinell hardness numeral of which was 25.2 at a load of 500 kg., was melted down, and chilled castings were poured at various temperatures with the following results:

Temp. °F.	Temp °C	Brinell Hardness Numeral
650	343	23.5
700	371	25.1
750	399	25.0
800	427	25.7
900	482	22.8
1,000	538	22.0

The metal was fluid at 650° F., and though the maximum hardness was produced by pouring at a temperature of about 800° F., the hardness was not greatly reduced by pouring higher temperatures.

Test bearings were then poured and service tests made in an Olsen testing machine, tests on genuine babbitt being made at the same time to serve as a basis for comparison. The table below gives the results of these service tests:

GENUINE BABBITT

Load Lb. per Sq.In.	R.P.M.	Total No of Revolutions	Final, °C	Temp., °F.	Rise in Temp. °C.	°F.	Friction Lb.	Loss in Weight Gram
100	694	12,230	89	192	53	95	22	0.023
200	706	16,510	102	216	58	104	29	0.021
300	682	15,150	125	257	100	180	38	0.013 (*a*)
400	603	6,600	139	282	94	169	79	0.054 (*b*)

(*a*) Belt slipping. (*b*) Bearing seized and smoking

ULCO HARD METAL

Load Lb. per Sq.In.	R.P.M.	Total No of Revolutions	Final, °C	Temp., °F.	Rise in Temp. °C.	°F.	Friction Lb.	Loss in Weight Gram
100	710	13,160	56	133	23	41	13	0.013
200	715	18,870	69	156	33	59	18	0.021
300	719	18,830	80	176	42	76	27	0.013
400	711	17,310	81	178	43	77	23	0.022
500	723	17,660	79	174	43	77	25	0.014
600	692	14,960	84	183	45	81	24	0.021
700	648	24,520	62	144	38	68	24	0.020
800	365	12,870	53	127	20	36	23	0.010
900	408	22,300	59	138	22	40	24	0.015
1,000	405	23,200	66	151	36	65	22	0.014 (*a*)

(*a*) Bearing still in good condition.

The Ulco Hard Metal bearing was still running excellently at 1000 lb. per sq. in. load, but as the capacity of the testing machine was reached the bearing could not run to failure, as in the case of the genuine babbitt bearing.

It will be noticed that the Ulco Hard Metal ran considerably cooler than the genuine babbitt, the friction was less and the wear also a smaller amount. It should be borne in mind that the specific gravity of Ulco Hard Metal is much greater than that of genuine babbitt, and for equal loss in weight the volume loss would be less in the case of Ulco Hard Metal.

These tests were repeated on new samples with substantially the same results as above. A test was also made in which no lubricant of any kind was used in the bearing. The bearing was run at a speed of 700 r.p.m. and 50 lbs. per sq.in. pressure, and after about 10 min., the metal began to flow and adhere to the steel shaft, scraping out more of the metal from the bearing. The shaft was not injured in the least by this test, and the metal that had adhered to it could be readily removed with a knife.

Tensile tests on Ulco Hard Metal and genuine babbitt cast under similar conditions gave the following results:

	Tensile Strength Lb. Sq.In.	Elongation % in 1 Inch	Reduction of Area %
Genuine babbitt	10,600	15	8
Ulco Hard Metal............	13,000	5	1

The fracture of the babbitt showed blowholes, reducing section approximately one-fourth, though the Ulco specimens were sound throughout. The average elastic limit in compression of Ulco Hard Metal was found to be 11,525 lb. per square inch.

Further uses for the metal are gradually being developed. It is finding its way into lines where it displaces brass; bathroom supply and waste pipes, nickel plated, are at present being manufactured from it, and the demand from this source must eventually be of considerable volume. At the moment, however, its patriotic duty is to conserve the tin supply, and this it is accomplishing effectually.

Production of Chilean Nitrate in 1914 was 53,500,000 quintals (quintal = 101.4 lb.); in 1915, 38,200,000 quintals; in 1916, 63,300,000 quintals; and in 1917, 65,100,000 quintals. Shipments in 1914 were 40,100,000 quintals; in 1915, 44,000,000; in 1916, 65,000,000; and in 1917, 60,800,000 quintals.

Practical Notes from the

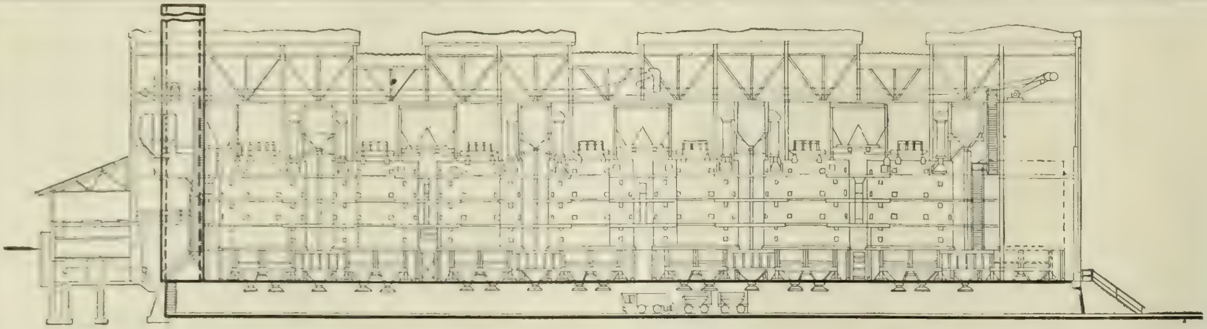


Fig. 1 Method of Ventilating Calcine Loading Tunnels Under No. 2 Roaster Plant

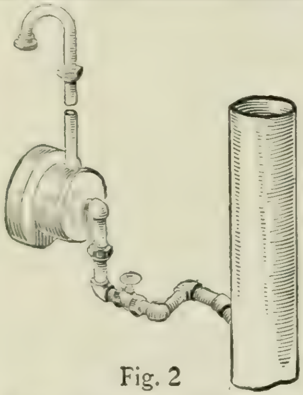


Fig. 2
Cooler Water For Furnace Arms is Arranged For By a Combination of Pipes and Elbows Which Permits Movement of Furnace Arms Without Leakage in Water Line

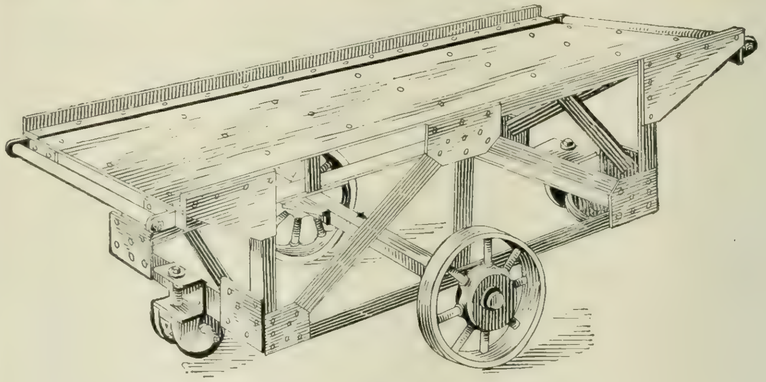
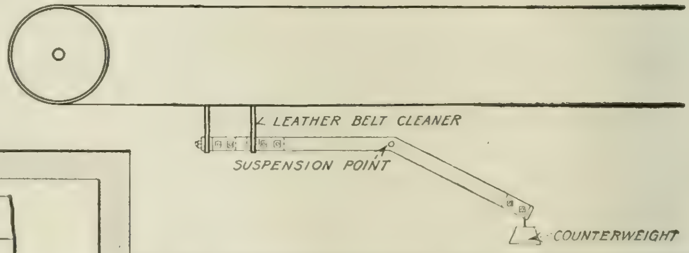


Fig. 3
Carriage to Which Arms are Lowered in the Furnace and Which is Then Drawn Out on to a Truck Standing Outside

Fig. 4



Balanced Scrapers For Cleaning Concentrate Belt Conveyors are Hung Under Conveyors as Shown

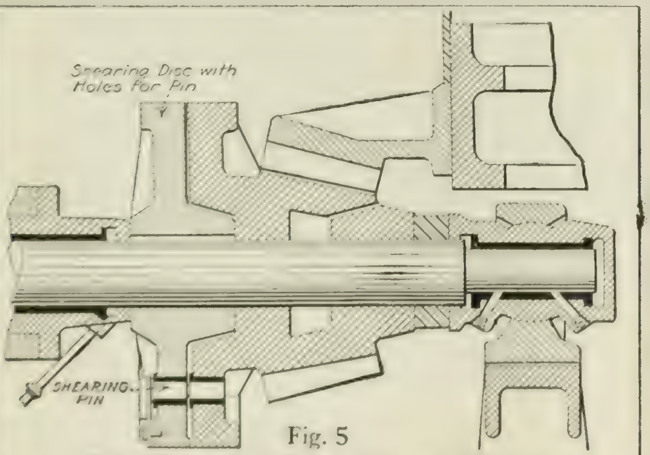


Fig. 5
Bevel Pinion with Safety Shearing Disc For Furnace Drive

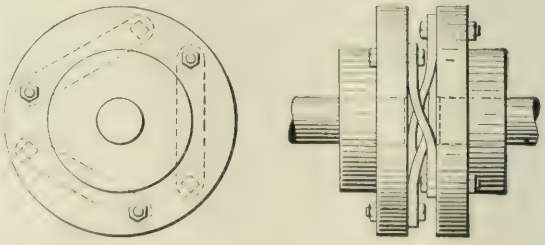


Fig. 6
Flexible Safety Coupling of Flat Leather Straps

Anaconda Reduction Works

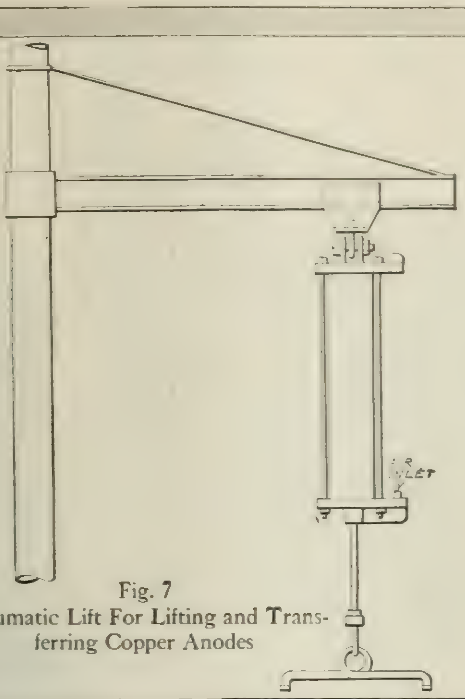


Fig. 7
Pneumatic Lift For Lifting and Transferring Copper Anodes

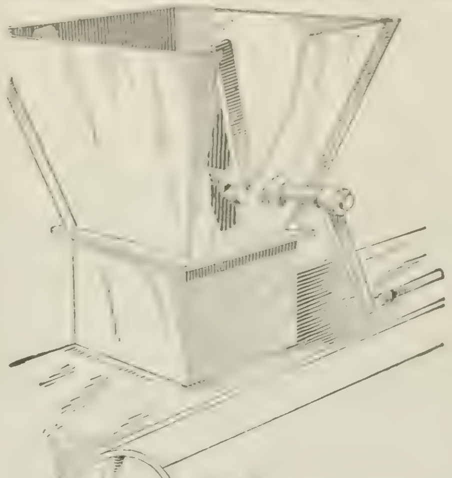


Fig. 8
Agitator in Furnace Feed Hopper Has Oscillating Blades Which Prevent Any Accumulation of Sands on the Sides

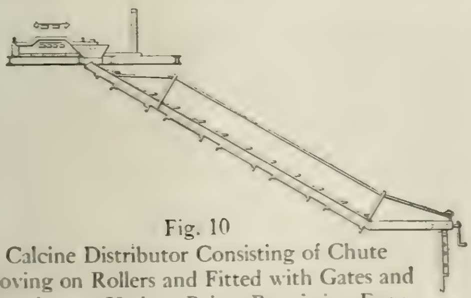


Fig. 10
Calcine Distributor Consisting of Chute Moving on Rollers and Fitted with Gates and Openings at Various Points Permitting Even Distribution

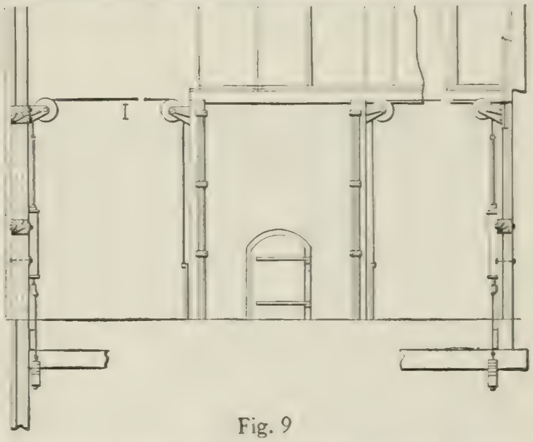


Fig. 9
Pneumatic Lifts Used For Opening Charge Chutes at Blast Furnaces

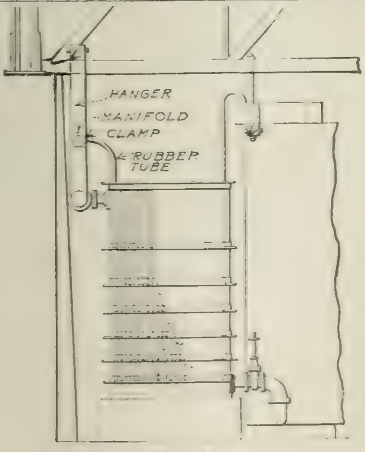


Fig. 11
Lead Solution Heater Coils are Connected By Rubber Tube with Clamped Connections Thus Permitting Individual Removal

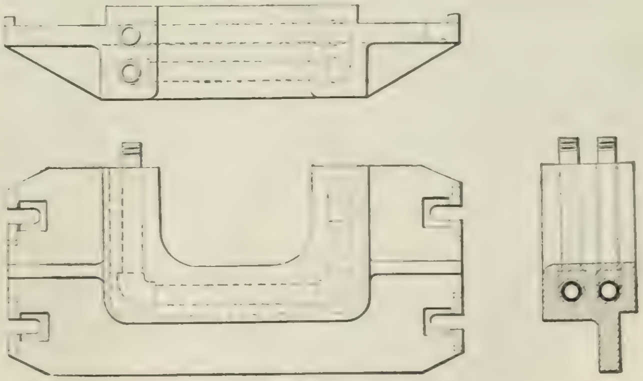
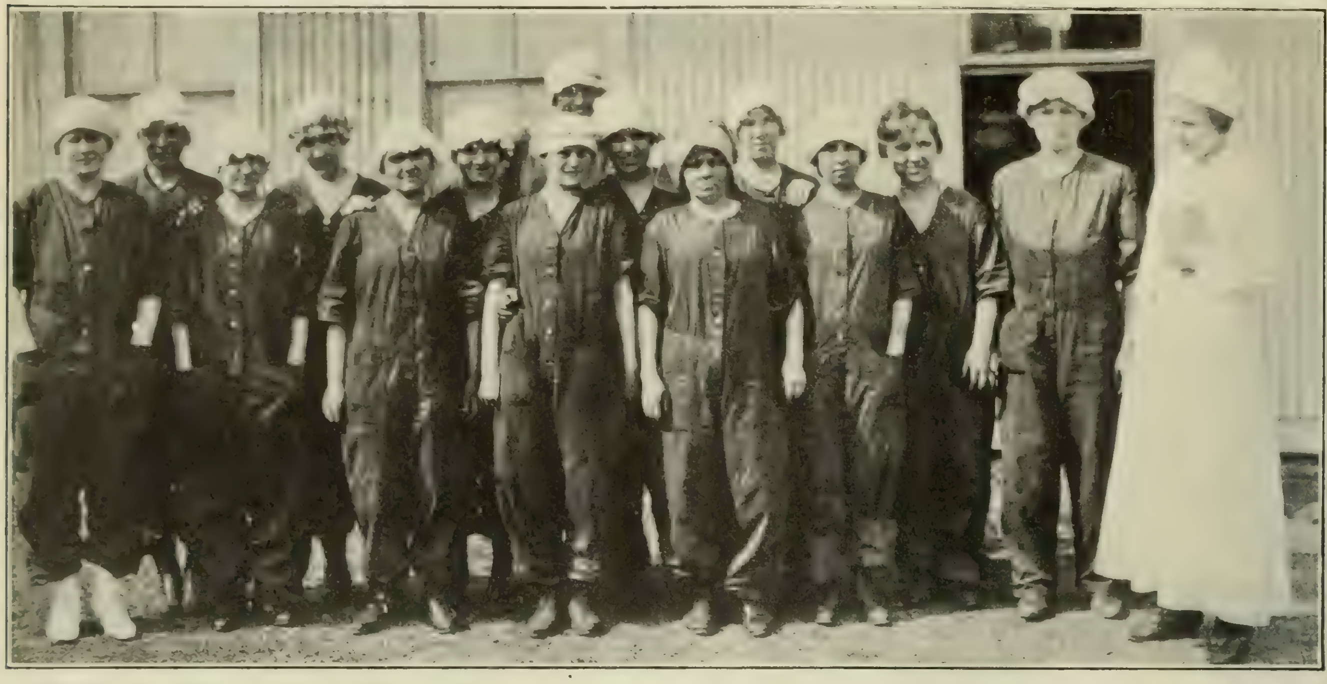
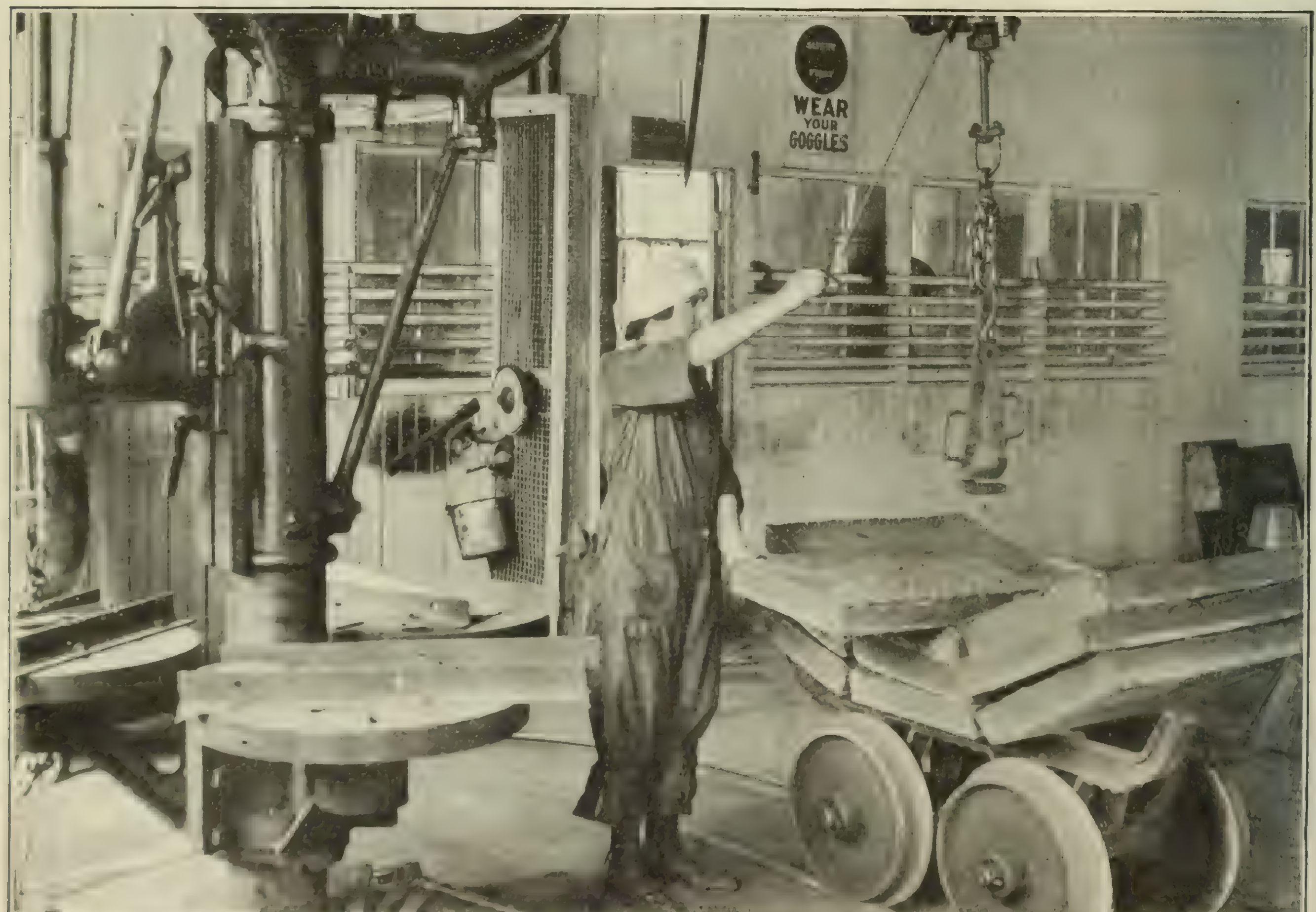


Fig. 12
Water Cooled Slag Launder and Tip with Cast-in Circulating Pipes

Women in the Smelting Industry



WOMEN WORKERS AT THE PERTH AMBOY, N. J. PLANT OF THE AMERICAN SMELTING AND REFINING COMPANY



WOMAN OPERATING HOIST TO CARRY COPPER CAKES TO MACHINE TO BE SAMPLE DRILLED

Improvements at the Consolidated Arizona Smelting Co.'s Plant

By Frank R. Corwin*

During 1917 the furnace and converting equipment at Humboldt, Ariz., of the Consolidated Arizona Smelting Co., consisted of one copper blast furnace 52 in. x 156 in. at the tuyeres, one seven-hearth Wedge roaster 22.5 ft. in diameter, one reverberatory furnace 19 ft. x 100 ft.. and three horizontal converters 7 ft. 6 in. x 9 ft. The furnaces were in good condition mechanically, but the crushing, grinding, and handling facilities were poor. With only one roasting furnace, it was necessary to make up 50% of the reverberatory charge with crude ore crushed to 2 in., which made a hard smelting charge, the furnace handling only small tonnages, with high oil ratios, and resultant high costs. The concentrator was producing a larger tonnage of concentrates than it was possible to handle through the roaster; and, in order to get as high an elimination of sulphur as possible, about 20% of the blast-furnace charge was made up of fine concentrates. This fine charge, together with poor charging conditions, gave a low tonnage on the furnaces. Both furnaces were handling charges that were high in sulphur and low in copper, which produced low-grade mattes and made it necessary to operate the three converters continuously, with resultant high converting costs. These conditions having been foreseen, a new roasting plant was erected in 1917 and "blown in" in January, 1918.

The new plant was equipped with three Wedge roasters of the same size and type as the roaster in use; and provision was made in the design of the building to accommodate the old roaster as soon as it could be shut down and moved. Each roaster was equipped with separate Cottrell treaters and a new storage and conveying system was built to do away with the expensive hand shoveling of charges which had been the practice.

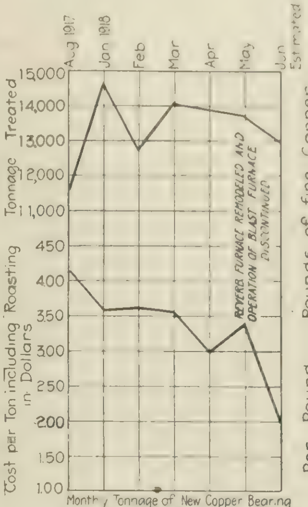
As soon as the new plant was operating, and a 100% calcine charge was available for the reverberatory, the tonnage increased to such an extent that all of the concentrates, together with a portion of the crude ore, which had been going to the blast furnace, were handled by the reverberatory. It proved to be more economical to treat as large a tonnage as possible in the reverberatory rather than run both furnaces on light tonnages, a condition which made it necessary to shut down the blast furnace for a few days each month on account of a shortage of ore.

About this time H. H. Stout, superintendent of the Copper Queen Reduction Works, Douglas, Ariz., was obtaining wonderful capacity results with his reverberatory furnaces; and through his courtesy the information necessary to remodel the Arizona Consolidated Company's furnace along the lines which he had developed was obtained. After the changes had been made in the construction of the furnace, and it had recovered from the temporary shut-down, the tonnage increased to over 500 tons per day, which was sufficient to take care of all the ores coming into the plant. This made it possible to discontinue the use of the blast furnace, and to roast all the high-sulphur ores prior to smelting. It is now possible to grade the mattes to any percentage most desirable for the economic operation of the plant.

The changes that have taken place during the last six months have greatly improved operating conditions and reduced smelting and converting costs. Under the old arrangement it was impossible to keep an intelligent class of labor, but since changes have been made there has been a great improvement in this respect, which has helped in placing the plant on an efficient operating basis. While the blast furnace was still operating, the lime rock was removed from the charge and the amount of specular hematite ore from the Swansea Lease, Inc., mines was increased. This assayed Cu 3.5%, Fe 48.8%, S 4.5%, insol. 11.8%, and the change resulted in a saving in blast-furnace operation of approximately $3500 per month. The average matte and slag made by the furnace during 1917, while lime rock was being used for flux, and during the month of May, 1918, when this practice was discontinued, was as follows:

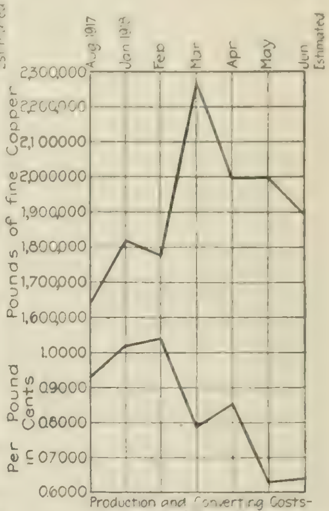
	Matte	Slag
Average, 1917	37.4% Cu	0.35% Cu, 32.7% Fe, 8.2% CaO, 37.6% Insol.
May, 1918	37.7% Cu	0.37% Cu, 35.3% Fe, 2.[illegible]% CaO, 45.2% Insol.

Fig. 1 shows the monthly tonnage of new copper-bearing material treated in the smeltery, together with the smelting cost per ton; Fig. 2 the monthly production of fine copper, together with the converting cost per pound. Fig. 3 shows the monthly copper extraction in the plant, and Fig. 4 the monthly tonnage of new copper-bearing material treated in the reverberatory, and the cost per ton.



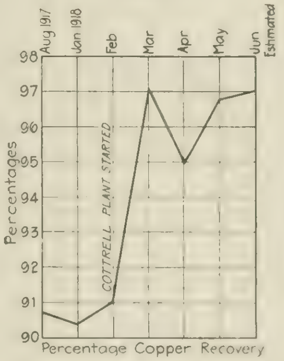
Monthly Tonnage of New Copper Bearing Material and Smelting Cost per Ton

FIG. 1



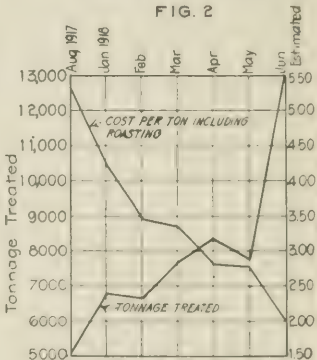
Production and Converting Costs- Pounds of Fine Copper

FIG. 2



Percentage Copper Recovery

FIG. 3



Monthly Tonnage of New Copper Bearing Material smelted in the Reverberatory and Cost per Ton

FIG. 4

PROGRESS CHARTS

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*Smelting superintendent, Consolidated Arizona Smelting Co., Humboldt, Arizona.

Notes on Recent Metallurgical Progress

BY E. P. MATHEWSON*

Impressions gleaned by a distinguished metallurgist during a journey of observation among the great smelteries of the United States and some smaller plants, with practical comments on design and operation, supplemented by details from inquiries and metallurgists in charge. Explanation of the motives responsible for the substitution of improvements and modifications in the conduct of the work is followed by condensed data dealing with practical operations. Interesting accounts of byproduct plants are also included, with drawings of typical installations.

A GREAT many interesting things are being done in non-ferrous metallurgical plants in the United States and Canada at present. It was my privilege recently to inspect a great many of these plants and to see what was being accomplished, and these notes resulted. In some cases they have been amplified by personal communications from the superintendents or managers in charge of the plants, and credit has been given wherever possible. In case due acknowledgment has been inadvertently omitted, it is hoped that those interested will make allowances, as it was necessary to prepare the article on rather short notice.

The first plant visited was that of the Tennessee Copper Co., at Copperhill, Tenn., and here is to be found the largest sulphuric-acid plant in the world. Sulphuric acid, first considered as a byproduct, is now the main product of the company, smelting being an incidental operation. The following description of the acid plant has been furnished by the staff.

ACID PLANT OF THE TENNESSEE COPPER CO.

The Tennessee Copper Co., besides being one of the two copper-smelting companies in existence making sulphuric acid by the chamber process from the waste fumes of copper blast furnaces, enjoys the distinction of being the original pioneer in that industry. The size of the plant can be best realized by the following comparison: The State of Georgia has 29 sulphuric-acid plants, with a combined capacity of 418,000 tons of acid per year, or an average of 40 tons per day for each plant. The plant of the Tennessee Copper Co. has a capacity of 325,000 tons annually, or 900 tons per day (60° basis), and is equivalent, as regards output, to 22 average Georgia plants combined.

The plant of the Tennessee Copper Co. is divided into three sets of chambers, each set having its Glover and Gay-Lussac towers, and each connected to one common flue leading from the blast furnaces. Four of the chambers—the largest ever built—have a capacity of over 500,000 cu.ft. of space each. The total chamber space for the entire plant is more than 6,000,000 cubic feet.

On account of the varying sulphur content of the ores fed into the blast furnaces, and also because of the practice of charging the furnaces intermittently, the grade of gas delivered to the acid plant is necessarily fluctuating in SO_2 percentage. With gas varying within brief periods of time from 6% SO_2 to 3.5%, or even less, the control of the process was formerly extremely difficult, and the old-style method of regulating the chambers by means of temperature differences and by observing the color of the chamber gases through windows or "sights" proved to be altogether inadequate. A novel method of chamber control, based on scientific principles, was invented and established about eight years ago by Andrew M. Fairlie, chemical engineer for the company, and has since that time been in daily use. This method was fully described by Mr Fairlie in the Transactions[1] of the American Institute of Chemical Engineers, and for a complete understanding of the method reference should be made to Fairlie's publication.

Briefly, the method consists in establishing a series of "desirable ratios" between the SO_2 in the gas entering the Glover tower and the SO_2 in the gas at a fixed point in the front chamber. The accurate determination of SO_2 in chamber gas and in chamber exit gas was formerly a difficult matter; but by means of a modification of the Reich test, developed by Mr. Fairlie, it has become possible to train an ordinary workman to make SO_2 determinations on chamber gas and chamber exit gas agreeing within 0.01%. When the "desirable ratios" are once established, they are typewritten in tabular form, and the table is framed and posted before the eye of the chamberman, whose duty it is frequently to test the per cent. of SO_2 at the aforesaid fixed point in the front chamber, and so to regulate the introduction of nitrate of soda or nitrous vitriol as to maintain the desirable ratio corresponding to the percentage of SO_2 in the gas entering the Glover tower. Any error in judgment in the amount of niter introduced is detected in the beginning at the front chamber, and is corrected before any great harm can be done, or loss can result. The advantage of this method over the old-style methods of chamber control, in which knowledge of any irregularity in the process was not obtained until the trouble had reached the intermediate or the last chamber, is in the greatly reduced cost of the nitrate of soda used in the process.

This method of chamber control has also proved of particular value in starting a new plant, or an old one after a shut-down. By the old methods of chamber control, and in starting up a new plant, it often takes weeks, and even months, before it is possible to obtain a satisfactory output at reasonable costs. With the analytical method of control, in starting for the first time the new chambers of the Tennessee Copper Co. in July, 1916, the process had been "caught," as the saying is, within 48 hr. after first admitting gas to the Glover tower; and the older plant has been frequently started up, after a shut-down, and worked up to full capacity, within 20 hr. or, if the shut-down was of short duration, within 12 hr. The method of chamber control is covered by U. S. Patent No. 1,205,723, and the method for the determination of SO_2 in chamber gas, by U. S. Patent No. 1,205,724.

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*Consulting metallurgist, A. S. & R. Co., 120 Broadway, N. Y.

[1] Vol. IX, pp. 319-332.

The copper-smelting plant of this company is a suc-
essor to the plants built before the Civil War. Inter-
sting experiments have been going on at the plant,
sing pulverized coal[2] instead of coke in the blast fur-
aces; and the indications are that successful results
ill probably be obtained. Arthur L. Tuttle is the gen-
ral manager in charge of the plant, and a most agree-
ble host he proved himself to be. M. A. Caine is assist-
nt manager; T. W. Cavers, smeltery superintendent;
nd Andrew M. Fairlie is in charge of the acid plant.

The amount of ore treated daily averages 1200 tons;
pproximate analysis is as follows: Cu 1.6%, S 25%,
e 35%, SiO_2 18 to 20%. There is no roasting, and the
nelting is classed as semi-pyritic, 6% of coke being
sed on the charge. The furnaces have tight tops of
ist iron, with swinging doors for the admission of
e charge, and are run with a slight pressure at the
harge floor to avoid the admixture of too much air to
e acid fumes. There is an ordinary dust chamber
remove the dust, and the Glover towers also act as
ist catchers. The blast-furnace charge is kept as
arse as possible, the opening of the crusher for ore
d quartz being 8 in. On account of the acid plant,
nall blast furnaces are preferred, the idea being that
henever blow holes occur it is better to blow out the
rnace to keep the gases free from the excess air that
ould enter through the blow holes. Years ago there
as much trouble in this plant with spouts, but this was
ercome by increasing the water space to 1¾ in. The
st matte from the furnaces runs from 8 to 12% copper,
d this, concentrated with siliceous ore, produces a
cond matte running 22½% copper.

The Ducktown Sulphur, Copper and Iron Co.'s installa-
on, of which W. S. Lamoreaux is general manager,
e the Tennessee Copper Co.'s plant, produces sulphuric
id from all the blast-furnace gases, but on a smaller
ale. Instead of the tight box-top and side feeding,
e furnaces are covered on a level with the charge
or, and the feeding is done by the Freeland charging
vice, which is an endless belt discharging from the
d and gradually advancing over the furnaces, push-
g the cover forward as it goes. On the return trip
drags the cover back into place. This plant produces
pper matte and sulphuric acid.

Mr. Lamoreaux has been experimenting for a num-
r of years in the manufacture of sulphur directly
om the gases. The process used is to pass the fumes
rough incandescent coke, then cool them, using a
reen fuel economizer for heat interchange; then pass
em to Feld washers and thence to a filter. The product
pure and can be marketed as flowers of sulphur, or
melted into brimstone. The consumption of coke is
out 1½ times the sulphur produced; and only a mod-
ate amount of labor is involved.

The plant treats about 500 tons of ore daily in winter
d 400 tons in summer. The ore averages 25c. in Au
r ton, 2.5% Cu, 30% Fe, 26% SiO_2 20% S, 2.5%
$_2O_3$, 3% Zn, 7% CaO, traces of As, Te, and Se. The
st matte produced runs 13% Cu and the second matte
per cent.

At El Paso, at the plant of the American Smelting
d Refining Co., under the management of Kuno Doerr,
mes Heggie, general superintendent, and R. S. Moore,
gineer, there is an interesting development of Peirce-Smith converters, the design being of the largest diameter so far installed. The size of the furnaces is 13 ft. diameter by 30 ft. long. The principal features are: (1) The diameter, which is 13 ft., *i.e.*, 3 ft. larger than the original Peirce-Smith; (2) two riding rings instead of three; (3) ability to turn the riding rings completely around; (4) equipment for the introduction of the siliceous ore with Garr guns.

The last, I believe, is probably the most important improvement. It permits of introducing the siliceous ore in a moist condition without danger of explosion, and spreads evenly over the bath, thus producing a uniform temperature throughout the converter. The El Paso 13-ft. diameter P. S. converters have averaged 15,726 tons of blister copper per run. By "run" is meant the time between two consecutive repairs to the brick lining. The only repairs to the brickwork have been at and about 3 to 4 ft. above the tuyere line, and around the mouth of the converter. Time lost because of repairs has been only 5 per cent.

In the opinion of those who have used these converters, particularly Superintendent Heggie, this particular type and size, where there is a sufficient supply of matte to justify such a large unit, is considered the best in use today.

REVERBERATORY IMPROVEMENTS

Capt. H. H. Stout, superintendent of the Copper Queen reduction works, at Douglas, Ariz., started a series of interesting experiments, to be described later, and these proved an incentive to the other plant superintendents in the southwest, in the matter of increasing the tonnage of reverberatory furnaces. Engineers from El Paso were sent to Douglas to confer with Captain Stout, and they found that he had increased the area at both the verb and uptake of the furnace. The uptake was increased to 70 sq.ft., whereas formerly it was less than half that size. Also, the openings in the burners had been increased to 1⅜ in. and the air pressure from 8 to 12 lb. These changes allowed a much greater quantity of oil to be burned with a shorter and hotter flame, and resulted in higher tonnages and a betterment in the fuel ratio.

On their return to El Paso, the openings of the burners on No. 3 reverberatory were increased from ¾ to 1⅛ in. in order to obtain a greater volume of air. The construction of the furnace was not altered. As the area of the uptake was already 60 sq.ft., it was deemed best to allow this to stay as it was, and to confine the change to the burner openings. The tonnage on this furnace rose at once; and though it averaged only 351 tons per furnace day for the first 15 days of February, with a fuel ratio of 1.15 bbl. oil, the next nine days after changing the burner openings it averaged 651 tons on 0.78 bbl. of oil per ton. The furnace was then down for repairs to the arch for three days, and then ran for 21 days at an average of 645 tons on 0.87 bbl. of oil per ton. It then went down 18 days for considerable repair work. A great deal of this lost time, however, was due to lack of labor.

No. 4 reverberatory, the latest and biggest furnace, 28 ft. x 130 ft., was started up on the 6th of April. It was designed and built before the high tonnages were made at the Copper Queen plant; and, as the area of the uptake was 70 sq.ft., this was considered to be ample, although the furnace is wider and longer than the Douglas furnace. The holes in the burners, however, were made the same dimensions as on the No. 3 furnace. All the charge is dropped along the sides for a distance of 70 ft. from the bridge, and the flame is carried for a length of 80 ft., which is considerably longer than at the Douglas smelteries.

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[2] U. S. patent, 1,259,467, issued to T. W. Cavers, Mar. 12, 1918.

A good tonnage was obtained on this furnace from the start; and on the 18th of April, 12 days after charging began, 964 tons of solid charge was smelted. From the 15th of April to the 10th of May the average daily tonnage was 851 tons on 0.61 bbl. of oil per ton. The reverberatory has not been smelting as high a tonnage for some time, nor has the fuel ratio been as good, owing to a shortage of ore and also to the fact that about 35% of the charge is siliceous, aluminous ore that is coarse (due to lack of crushing facilities). Up to and including June 23, this furnace has put through 61,282 tons of solid charge. It is difficult to estimate how much more it will smelt before going down for repairs to the arch, and just how extensive these repairs will be.

COPPER QUEEN SMELTERY

On another visit, in June of this year, additional data were obtained at the Copper Queen plant, where considerable study is being devoted to the temperatures of the calcines. Results of recent determinations showed:

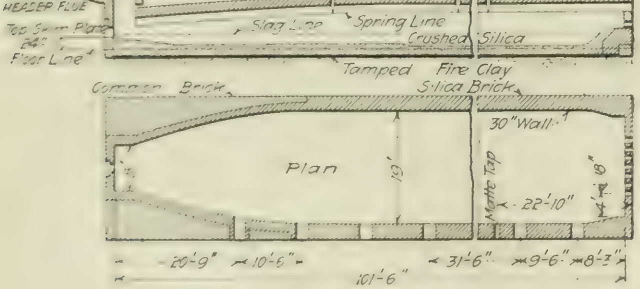
A loss of 70° in dropping from the last hearth to calcine hopper; 180° loss from calcine hopper to charge car; practically no loss in transit; 150° loss dropping from charge car to reverberatory charge hoppers; 110° loss in charge hoppers at reverberatory; making a total loss of 510° from the roasters to the reverberatories. In order to save some of this heat, the operators expect to insulate their hoppers and probably put in a charge car similar to the one at the International plant at Miami.

The charge going into the roasters averaged 26% S, and required no fuel. It consisted of the two following mixtures:

	No. 1	No. 2
Concentrates	75%	90%
Sasco flue dust	23%	....
Siliceous ore	2%	10%

No. 1 mixture was being used in the proportion of 70% to 30% of the No. 2 mixture, thus making a charge of the following composition:

Concentrates	79.5%
Sasco flue dust	16.1%
Siliceous ore	4.4%

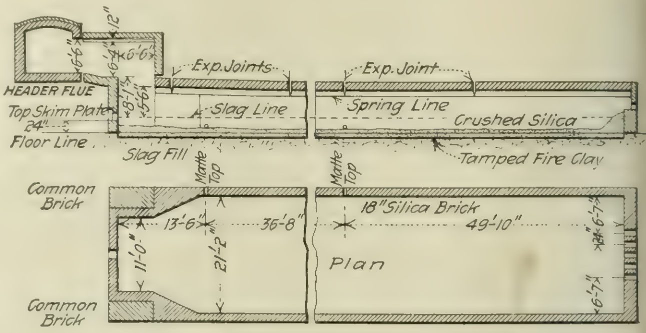


Original Reverberatory Furnace

FIG. 1

This mixture was being roasted from about 26% S to 10.5%, making a 60% elimination. Each roaster was handling 70 to 75 tons per day, and the temperature of the calcines was about 1300°. Captain Stout is considering making 11-hearth roasters out of the 6-hearth roasters now at the smeltery, and bringing the tonnage up to about 130 tons per day.

The latest reverberatory was put into service about the middle of May and has two banks of burners, seven in one row and six in the other, using air at 35 oz. pressure, and heating the oil up as high as 250° at 80 lb. pressure. The furnace has a straight-line roof from a point 20 ft. from the bridge way to the uptake. From this 20-ft. point back to the bridge there is a gradual rise in the roof, so that at the bridge the roof is 1 ft. higher. The average tonnage to date on this furnace was about 680, with a fuel ratio of 0.55 bbl. of oil. It is claimed that tonnages of 730 and 740 with 0.45 and 0.47 bbl. of oil were recently recorded for a two-day run. Calcines entering furnace were about 900°. With calcines entering the furnace at 1200°, Captain Stout figured that it would be possible to obtain a fuel ratio of 0.30 bbl. The wall above the skimming bay, although the furnace had been operating only a little over five weeks, was nearly burned through. Considerable trouble was also being experienced through boiler tubes burning out.



Rebuilt Reverberatory Furnace

FIG. 2

A continuous skim was being used on this furnace, and it was said that the slags were considerably cleaner than with the intermittent skims formerly used. With 30% Cu in the matte, it was possible to get 0.30 to 0.35% Cu in the slag. The other furnace that was operating was using all the flue dust and making up the rest of the charge with hot calcines. It was averaging only [illegible] tons per day.

THE LEAD SMELTING DEPARTMENT AT EL PASO

In the lead department at El Paso the Australian practice of putting the "thimble tops" on the furnaces had been adopted. During 1917 all the lead blast furnaces of the El Paso plant were equipped with these tops. For a number of months furnaces thus equipped were run alongside furnaces with the old-style tops, and comparison was made of their operations. The comparison favored the furnaces with the closed or thimble tops, and, as opportunity offered, the other furnaces were changed to that style. The advantages to be noted were: (1) A better distribution of the charge in feeding the furnace, resulting in a decrease in the formation of accretions in the shaft and a lengthening of furnace campaigns; (2) decrease in lead losses through the stack and decrease in loss of lead per ton of charge smelted; (3) decrease in the quantity of gases passing through downtakes of furnaces; (4) better working conditions on the feed floor and perfect visibility of charge as it is dumped into the furnaces; (5) lower coke percentage.

These advantages have been largely realized, and the same type of top is being generally used by the lead-smelting plants in the West.

EXPERIMENTATION AT THE COPPER QUEEN PLANT

At the Copper Queen reduction works, at Douglas, Ariz., where the reverberatory changes were initiated, evidences of careful experimentation were numerous. In order that no mistakes be made in recording these experiments, I persuaded Captain Stout briefly to describe them, as follows:

We have practically solved the various factors which enter into and control the amount of fuel capable of being

mpletely consumed within the working limits of the fur-
ces.

First—A multiplicity of oil burners which permits the
porized fuel to mingle with the oxygen in the combustion
r more quickly and more thoroughly, because of the
eater number of burners.

Second—Heating the oil to approximately 250° F.; and,
consequence, maintaining its pressure up to about 80 lb.,
as to condense (at this pressure) the hydrocarbons vola-
ized. This more rapidly volatilizes the hydrocarbons as
ey exit from the burner, which, combining within the
omizing air, creates an explosion, with a rapid elevation
temperature, thus rapidly volatilizing the remainder of
e fuel.

Third—The use of air at about 30 to 40 oz. pressure for
omizing, and approximately 10% of the total air required
r theoretical combustion.

Having obtained these factors, we are able to burn 1 lb.
oil for each 26 cu.ft. of available combustion-chamber
ace within the confines of the furnace for a distance of
ft. of flame length. This is arrived at by taking out
e space occupied by the charge and slag. We burn in a
x 20 ft. furnace from 500 to 600 bbl. of oil per day.

The limiting factor on this fuel consumption, with the
me length of only 35 ft., is the quantity of air which our
boilers and old flues will permit us to draw through the
rnaces. In other words, we are limited. At the Calumet
Arizona smeltery they have been able, with their boilers,
draw sufficient air through the furnaces to burn about
e same quantity of oil in a day. In other words, we re-
rd a reverberatory furnace as a combustion chamber for
rning fuel; and the melting process and the metallurgy
ll take care of itself.

THE FUEL RATIO ON THE CHARGE

The daily variations in the same plant in the fuel ratio,
as between different plants with approximately the
ne slag, caused Mr. Samuels, of our investigation de-
rtment, to take up this phase of the question; and the
ult of his experiments is that we are content with the
sumption that it is inversely as the temperature of the
cines entering the furnaces. For all practical purposes,
s is the only factor involved with the fuel ratio question,
uming that the oil is burned to ½% CO in the uptake,
that there is a multiplicity of burners to insure a high
nperature focus at the burner end. Mr. Samuels has
o worked out that the only function which the fuel of
reverberatory furnace performs is raising the tempera-
e of the calcines up to fusion point, which is approxi-
tely 2000° F. The heat of the combination of silicates ex-
ds the latent heat of fusion, so that the resulting slag
matte would be superheated approximately 456° Fahr-
neit.

With this end in view, Mr. Samuels plotted the fuel ratio
temperature of the calcines actually entering the fur-
e through the 6-in. feed pipes in the roof; and his
umption has been practically verified. Relatively speak-
, our results so far give for 500° F. temperature of
rge, a fuel ratio of 0.77 bbl. of oil per ton of charge;
with 860° F. temperature of calcines, a fuel ratio of
ut 0.59 bbl. of oil. The 860° was the maximum tem-
ature we could obtain. This was because of the loss of
t in transit from our roasters. We know, also, that at
Paso, with a temperature of charge of approximately
°, 0.95 bbl. of oil is required as a fuel ratio. A rough
tting of these points demonstrates that a fuel ratio of
0 bbl. of oil, or possibly 0.45, is not an excessive predic-
n if we can insulate against the loss of heat in calcines
that they will enter the reverberatory furnace at about
0° F. The lower hearths of our roasters average about
0°. Our investigation along this line has not yet been
npleted.

CLEANING OF REVERBERATORY SLAGS

The subject of cleaning reverberatory slags is old. It was
ved at Anaconda that the variation of content of copper
gs from skim to skim was due to a blanket or scum on top
the reverberatory slag in the skimming end, the scum be-
composed partly of unfused material. At Anaconda the
tinuous skim was put on the reverberatory furnaces, al-
ing the blanket to remain on top of the slag, which holds
k the unfused ore floating in the center of the furnace,
at a point where the temperature was high enough to
nplete the fusion. A limpid slag flowed under the blanket,
ch reduced in copper content.

From our experiments in furnace capacities and short-
ng of flame, it was practically proved that the skim-
ng end of the furnace was absolutely useless, and per-
med the miserable function of radiating heat and chilling the slag to a point where fusion was not completed. Mr. Butler then conceived the idea of melting the charge in one end, taking the flue out of the center of the furnace, and changing the other end of the furnace by narrowing it up to a reverberatory settler in which a small quantity of oil will be burned. The effect will be to elevate the temperature at the top of the slag and complete the fusion. We will soon begin to alter one of our furnaces for this experiment.

THE WASHING OF REVERBERATORY SLAGS

In 1903 I erected a reverberatory settler, through which I ran reverberatory slag, and in this settler, which was fired by oil, low-grade pyrite was thrown over the surface of the slag during its quiescent period, forming about a 10% matte. The copper in the reverberatory slag entering the settler was 0.42% for the year, and at leaving was 0.22% for the year. In the double-end fired furnace, proposed by Mr. Butler, it is our intention to endeavor to wash the slag in the settling end by the addition of a small amount of low-grade pyrite, blown over the surface; and to maintain the temperature of the slag in the skimming end by the burner at a temperature where this washing material is completely fused. Efforts to produce these results in the ordinary reverberatory furnace have failed, because the temperature at the skimming end on the surface of the slag was so low that fusion could not be completed.

THE CLEANING OF CONVERTER SLAG

All attempts to clean converter slag by pouring it molten into the reverberatory furnace have failed. We are of the opinion that this is due to the fact that converter slag of about 22% silica content is heavier than reverberatory slag, and a stratification takes place in the reverberatory furnace.

Since all attempts at a solution of this problem have failed when attacked in this manner, we purpose to go back to the converter and run as high a silica slag in the converters as possible, to see if that will reduce the amount of magnetite in the converter slag, and thus eliminate the tendency to stratification.

With a 12-ft. upright Great Falls converter, we have been able successfully to get a 40% silica slag by blowing in the silica, crushed to pass through a ½-in. mesh, continuously during the entire blow from matte to white metal. The addition of this silica, which was not put in by a boat and in large quantities at a time, but was blown in continuously, kept the converter cool, and the whole operation was entirely successful. Our next step will be to put the converter slag in the reverberatory furnace, for which we are arranging launders, and we expect to have that experiment in operation within a month.

It will be noted, therefore, that, considering the five subdivisions in our problem, we have actually accomplished: (1) The increase in furnace capacity (we have been able to obtain with hot calcines as high as 900 tons from a 90-ft. furnace); (2) the decreased fuel ratio, in so far as our temperature of calcines will permit; (3) the double-end-fired furnace is yet to be demonstrated; (4) the washing of the slag, which had been demonstrated some years ago; (5) the cleaning of the converter slag by running it highly siliceous from the converter—we have progressed in this to only the point of making a highly siliceous slag.

Captain Stout will, no doubt, publish a full account of the experiments and results as soon as they are completed. It has always been the policy of the Phelps Dodge Corporation, under the leadership of the late lamented Dr. James Douglas, to give to the profession any facts pertaining to the technical operation of the plant that might be of value elsewhere.

THE CALUMET & ARIZONA SMELTING PLANT

At the Calumet & Arizona Co.'s plant at Douglas, Ariz., H. A. Clark, smeltery superintendent, after showing me everything of interest about the plant, kindly furnished the following data regarding his experience with the reverberatories:

Prior to January, 1918, the best tonnages, to my knowledge, on reverberatory furnaces of 19 ft. x 100 ft. inside measurements, was an average of 400.1 tons per day, dry solid charge, on 0.75 bbl. of oil per ton. This was accomplished at the Calumet & Arizona smeltery, at Douglas. The Copper Queen plant here has never approached these figures in tonnage with the same sized furnaces. Consequently, H. H. Stout, now superintendent of the Copper Queen plant, working with the object of increasing tonnage, decided to enlarge the size of the reverberatory uptake at the Copper Queen plant from 33 sq.ft. to 80 sq.ft. outlet, on account of the low draft in the uptake of his furnaces. The result was that there was an increase in furnace tons per day from approximately 350 to 600. The increased area of outlet reduced the gas velocity from 75 ft. per sec. to 40 ft. per sec. After the furnaces had been in operation about three weeks, the front and uptake burned down, on account of not having control of the fire zone.

At this time I increased the uptakes on the furnaces at the Calumet & Arizona plant from 30 sq.ft. to 70 sq.ft. outlet, which augmented the furnace capacities from 400 to 650 tons per day. With the benefit of Mr. Stout's experience with his front and uptake, we started experiments with the control of the smelting zone by the admission or non-admission of air through dampers at the burner holes, with the result that our output was increased to over 900 tons per furnace day. This enormous gain over the old operation was accomplished by being able to burn 200 additional bbl. of oil, or a total of 500 per day in the same furnace, when previously it was possible to burn only 300 bbl. per day. The combustion and control of the fire zone by dampers was perfect, confining combustion to the first 30 ft. of furnace and preventing the flames from carrying through to the front or uptake end, as had happened before, with disastrous results to the brick. Of the total charge, 92% is delivered in the first 30 ft. of furnace; the remainder is for protection of side walls only. All material is side charged. The temperature at the fronts is from 2300° F. to 2400° F., or the same as when the fire zone was not under control. Another point not to be overlooked is the conservation of heat in the calcines between the roasters and reverberatories. We have always watched this point carefully, and it is a vital consideration when dealing with large furnace tonnages and aiming at fuel economy. Data of reverberatory operations are given in the accompanying table, No. 1.

With regard to giving credit to whom it really belongs, I will say that all smelteries in the West are now copying our furnace model and operation. Credit for the opening up of the uptakes to provide sufficient outlet to reduce the gas velocity from 75 to 40 ft. per sec. is due to H. H. Stout, superintendent of the Copper Queen plant. The credit for the complete control of the smelting or fire zone by manipulation of the air inlet, and not by adjusting the oil flow through the burners, is rightfully claimed by Mr. Cole and Mr. Jacks, of the Calumet & Arizona metallurgical staff. The oil regulation has nothing to do with the control of the fire zone, for the reason that one is compelled to burn approximately 500 bbl. of oil to smelt 800 or 900 tons of ore; if the oil supply is reduced slightly the tonnage will be reduced three to one; and consequently the oil ratio will go up, as nearly all the smelting is done within a range of 100° temperature. There is thus no way of controlling the smelting zone except by the air manipulation at the burner end, and the conservation of heat between the roaster discharge and reverberatory charge-hole.

TABLE I. REVERBERATORY DATA, CALUMET & ARIZONA MINING COMPANY

	Furnace No. 2	Furnace No. 4
Date started	Feb. 7, 1918	Jan. 9, 1918
Total elapsed time to June 21, days	134.000	163.000
Total furnace days (24 hr. days in operation)	130.567	157.616
Per cent. operating time to total elapsed time	97.44	96.70
Dry tons solid charge per furnace day	707.0	675.2
(a) Bbl. oil per dry ton solid charge (gross oil consumed)	0.697	0.707
Tons liquid converter slag per furnace day	104.0	88.5
Draft in uptake (inches of water)	0.18	0.22

(a) Includes all oil for firing up furnace.

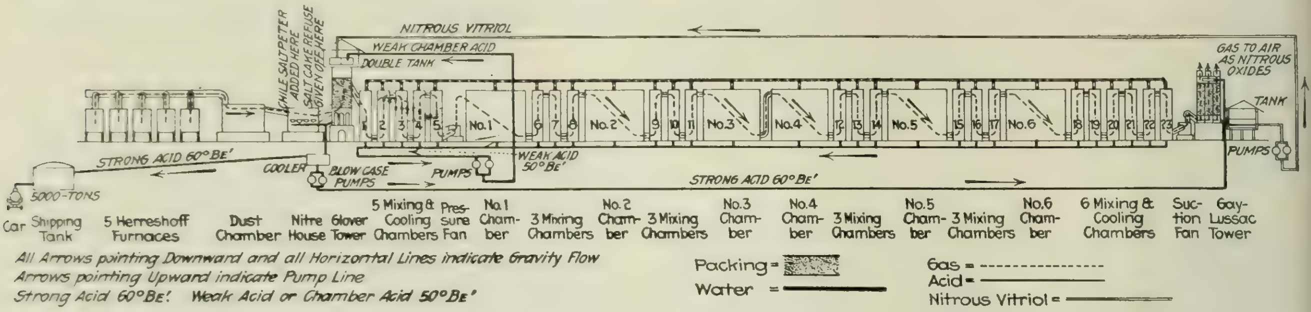


FIG. 3. STRAIGHT LINE DIAGRAM OF SULPHURIC ACID PLANT

Results of best thirty days' continuous operation:

	Furnace No. 2	Furnace No. 4
Average dry tons solid charge per furnace day	794.6	779.6
Bbl. oil per dry ton solid charge	0.622	0.617
Record day's run during 30-day period:		
Dry tons solid charge per furnace day	921.2	869.4
Bbl. oil per dry ton solid charge	0.550	0.571

GENERAL DATA

	Per Cent. SiO_2	Per Cent. Al_2O_3	Per Cent. FeO	Per Cent. CaO	Per Cent. Cu
Average slag analysis (includes converter slag)	35.2	7.2	46.0	5.6	0.45
Average matte	....	....	....	.....	25.9

Screen analysis of charge:

	Per Cent.
Reject from ¾ inch	3.8
Reject from ½ inch	13.0
Reject from ¼ inch	21.5
Through ¼ inch	61.7

Average temperature charge estimated a 830° F.

The sulphuric-acid department of the Calumet & Arizona Mining Co. is a new adjunct, the acid being used for the leaching of the ores at Ajo, Ariz. A description of the plant, compiled by the superintendent of the acid department and furnished by Mr. Clark, follows:

Sulphuric-acid manufacture by the chamber process consists of the following essentials: (1) Formation of sulphur dioxide; (2) oxidation of sulphur dioxide to sulphur trioxide; (3) union of sulphur trioxide with water to form weak sulphuric acid; (4) concentration of all acid formed to a gravity of 60° Baumé, or approximately 78% monohydrate sulphuric acid; (5) recovery and utilization of oxides of nitrogen used as catalytic agent in the oxidation of sulphur dioxide to sulphur trioxide.

The methods by which these mentioned reactions are brought about are shown in Fig. 3. Sulphide ores are roasted in Herreshoff furnaces, giving a gas containing from 5.5% to 7.5% sulphur dioxide at a temperature of from 850° to 900° F. The oxidation of this to sulphur trioxide is brought about by the catalytic action of oxides of nitrogen, formed by the action of sulphuric acid on nitrate of soda in the presence of the hot furnace gases in the niter house. From here the gases pass into and up through the Glover tower, where from 20% to 25% of the total conversion into sulphur trioxide takes place. From the Glover tower the gasses pass into chambers, and during passage through these the moisture is added either in the form of steam or as finely atomized water; this combination forms weak sulphuric acid, which is concentrated by circulating through the Glover tower.

TABLE II. DATA ON OPERATION, CALUMET & ARIZONA MINING CO.

Furnaces in acid plant	4
Per cent. sulphur in ore	28–38
Per cent. sulphur in calcines	6–12
Tons of calcines per furnace day	62–70
Tons of flue dust recovered daily	3–5
Per cent. SO_2 in gas	5.5 to 7.5
Temperature of gas, deg. F	850–900
Daily acid production, as tons 60° Baumé	220
Niter consumption daily, lb	3,200
Niter consumption per cent. on sulphur in acid produced	3.00
Strength of acid produced, deg. Baumé	60–62
Chamber exit gases, SO_2, per cent	0.12
Chamber exit gases, O, per cent	4
Chamber space per lb. of sulphur in acid produced, cu.ft	20.0
Gay-Lussac space equivalent of chamber space, per cent	3.97

From the last chamber the gases (containing only a trace of sulphur dioxide and from 3% to 5% of oxygen, the inert nitrogen which was present in entrance gas, and the oxide of nitrogen used catalytically) pass into the Gayssac towers, where the oxides of nitrogen are absorbed cold sulphuric acid and returned to the acid-making cycle circulating the Gay-Lussac acid on the Glover tower, ere the reacting hot gases cause the liberation of the des of nitrogen from the acid. Thus the nitrate of soda rged in the niter house represents the loss in the process, e to faulty absorption in the Gay-Lussac towers, and the mation of nitrogen and oxides of nitrogen which are not sorbed by sulphuric acid. The plant has been in conuous operation since Mar. 24, 1917.

The dimensions and description of the main units are as lows:

The Glover tower is an acid-proof brick tower with lead drip tain and exterior steel framework, octagonal in shape, height ft. and diameter 22 ft. The packing of the Glover tower conts of acid-proof tile 12 x 6 x 1½ in. The cooling chambers are 23 number and each consists of a circular steel cage, lead lined. ft. in height and 17 ft. in diameter.

The main chambers are six in number, rectangular in shape, h steel framework. The lead curtain is supported by horizontal aps bolted to angles of the framework. The chamber dimensions 143 ft. 6 in. long, 59 ft. wide and 41 ft. high. The total cham- space, including cooling chambers, is 2,300,000 cu.ft., which es a ratio of 20 cu.ft. chamber space per lb. of sulphur in acid en the plant is producing 220 tons of 60° acid per day.

The pressure fans are steel framework, lead lined, with 8 x 4 ft. t regulus metal impellers.

The Gay-Lussac tower is of unit type construction, with 12 s each 13 x 13 x 45 ft. high. The towers are built entirely of d-proof brick and packed with acid-proof tile the same size as the Glover tower. The complete tower unit is inclosed in a d drip curtain, supported by steel framework. The total capac- of 12 tower cells is 91,300 cu.ft., or an equivalent to 3.97% of mber space.

The storage tank for shipping acid is of steel and is of 5000 tons acity.

The pumping equipment for all 60° acid consists of 10 standard ought-iron blowcases, operated by compressed air, with a capac- of 20 tons each; and for handling chamber or weak acid a fivege lead air-lift pump is provided.

Small shipments of acid are made in standard wrought-iron acid ms, but most of the acid is shipped in 50-ton capacity unlined el tank cars similar to those used in oil service.

The chamber and Gay-Lussac capacity is ample for a plant in ady operation, and economical in the use of niter under all ather conditions.

Table II gives data on operations.

The plant has worked successfully since the day it s started, using nothing but the sulphur in ores from Bisbee mines with a sulphur content of about 30%, d no special ore or pyrites have been used.

THE INTERNATIONAL SMELTING PLANT

At the International Smelting Co.'s plant at Miami, which L. O. Howard is superintendent, it was obved with great interest that the method for handling ation concentrates after roasting was working exlently, no dust being noted in the vicinity of the disrge hoppers. The cars which are used to transfer dust from the roasters to the reverberatories have special pipe connection for the return of the gases d light dust to the Cottrell apparatus. At the reveratory furnaces, the charge slides have packed rod ndles, preventing dust escaping on top of the arch, is preserving the brick work.

A post-hole digger is used for sampling flotation conntrates; it is about 4 in. in diameter and is said to ve good results. The peculiarity about this plant is at practically all the charge is flotation concentrates, 0 mesh or finer. The average charge to the reverberaries is Cu 26.47%, Ag 0.71 oz., Au 0.008 oz., SiO_2 .73%, Al_2O_3 6.42%, Fe 17.15%, CaO 3.83%, S 19.73%, O 13.56%. The average slag produced is Cu 0.82%, 0.26 oz., SiO_2 41.08%, Al_2O_3 13.35%, FeO 32.80%, O 6.99%, S 0.42%. The furnaces are 120 ft. long 21 ft. wide, and the ratio of oil to solid charge is 7 bbl. The average bullion produced from the conrters is 99.32% Cu, 2.82 oz. Ag, and 0.039 oz. gold.

The Cottrell plant is one of the most efficient to be und anywhere. It is placed above the roasting, or ther drying, furnaces, and there is absolutely no visle discharge from the pipes above the building.

The New Cornelia Copper Co.'s plant at Ajo, Ariz., is a novelty in many ways. In the first place, the ore has turned out slightly higher in grade than the estimates made before the mine was developed—something unique in the history of porphyry coppers. The leaching plant is running smoothly. There was some trouble at first, owing to the presence of ferric iron in the electrolyte. This was overcome by the introduction of sulphur dioxide gas, obtained by roasting some of the Bisbee ores. The fine-crushing plant at Ajo, designed by David Cole, of El Paso, is an efficient installation.

The capacity of the leaching plant is 5000 tons in 24 hrs., and the output of electrolytic copper is 100,000 lb. per day. The ore is ground to pass ¼-mesh screen. An interesting sampling device for the crushed ore, as designed by Mr. Cole, has been installed. The ore average heads for 1917 were Cu 1.68%, tailings 0.37%; this includes all the tailings for the year of starting the plant. The ore averages 66 to 68% SiO_2, 14 to 16% Al_2O_3, 4.5 to 5% Fe, 0.2 to 0.3% CaO, 1.5% MgO; the tailings are 97% of the original ore. The electrolyte has 2.5% total Fe, 0.02% SiO_2, 2.96% Al_2O_3, 1.49% MgO, 0.041% CaO, 0.012% Cl, 2.09% H_2SO_4, 0.18% P_2O_5, 0.35% MnO, 2.71% Cu; total in the form of sulphates, 22.553 per cent.

In addition to the electrolytic copper output, there is produced daily 20 tons of cement copper (70% Cu), precipitated by scrap iron from the spent electrolyte. The plant employs 850 men and uses 8000 kw. electrical power. Pumping is one of the big items of expense. The plant is equipped with the Hulett unloader, with a 12-ton bucket, and has a capacity of 500 tons per hour, for unloading tailings from the leaching tanks. The tanks are of concrete, lined with 6 lb. lead on the sides and 8 lb. on the bottoms; the lead in the bottoms contains 4% antimony.

The town of Ajo has been carefully laid out, with a view to the comfort and convenience of all its inhabitants. The welfare of the employees has been particularly looked after, and the coöperative store is so efficient that prices are lower in Ajo than in any of the other camps visited, and supplies of all kinds, including food, are as good as can be obtained anywhere. For the amusement of the employees when not at work a plaza has been provided, where on special occasions music is rendered by a band; and provision has also been made for usual recreations, such as baseball, and other outdoor sports. The town also possesses schools and hospitals of the most approved type. The principal buildings are of concrete.

The New Cornelia company's officials in charge are: M. Curley, general superintendent; W. M. Griffith, chief engineer; J. A. Potter, superintendent of plant, and H. A. Tobelmann, metallurgist. A. G. McGregor, Warren, Ariz., late of the firm of Repath & McGregor, is responsible for the design of the New Cornelia and many other Arizona plants.

TACOMA SMELTING PLANT

At the Tacoma Smelting Co.'s plant, of which H. Y. Walker is general manager, and G. M. Kerr, general superintendent, there was shown another of the 13 x 30-ft. Peirce-Smith type converters, but with the modified hood of Van Amberg's patent. Experiments, under the direction of W. H. Howard, consulting engineer, are there being carried out for the recovery of the sulphur in various forms from the gases. The results so far obtained are encouraging.

By increasing the supply of air to the burners on the reverberatory furnace, over 600 tons daily of charge has been smelted at a fuel ratio of 0.63 bbl. of oil per ton. The electrolytic copper refinery at this plant has several novel features, particularly the Van Amberg greasing machine for starting sheets.

MISCELLANEOUS CANADIAN PLANTS

At the Victoria Chemical Co.'s plant in Victoria, B. C., some interesting substitutions were made on account of the scarcity of Doulton stoneware and other materials, caused by the war. Perhaps the most notable was the substitution of steel cylinders lined with lead and acid-proof brick for the condenser wall for nitric acid, and the use of cast iron containing 15% of silicon, cast locally, for the connecting pipes for nitric acid.

To show the rapid progress in the manufacture of explosives, it is sufficient to state that Canadian Explosives, Ltd., had just installed the latest apparatus for the manufacture of TNT and had used it only a few days when an improved French process was called to their attention; and, as it was so much better than the older process, it was substituted at once and the former plant "scrapped." The process was materially cheapened by the introduction of this invention.

At Trail, B. C., the Consolidated Mining and Smelting Co. of Canada's plant has branched out materially, and is now turning out as much as 50 tons of electrolytic zinc daily, about 30 tons of electrolytic copper, besides electrolytic lead, refined silver and gold.

THE GREAT FALLS SMELTERY

At the Great Falls plant of the Anaconda Mining Co. a wonderful change is seen. A few years ago this plant was one of the largest copper concentrating and smelting plants in the country. Today copper smelting is not carried on except in one furnace to handle byproducts, the main business of the plant being the electrolytic refining of copper and the leaching and electrolytic refining of zinc. In addition to these activities the plant has a newly installed wire mill and electric furnaces for the production of ferromanganese for the United States Government; also a fire- and building-brick plant.

The capacity of the old electrolytic copper refinery was 5,000,000 lb. per month, but the new refinery has a capacity of 15,000,000 lb. The zinc refinery is turning out on an average of 100 tons daily of electrolytic zinc. A. E. Wiggin has recently been appointed general superintendent and J. O. Elton, assistant superintendent.

THE WASHOE REDUCTION WORKS

At the Washoe Reduction Works, Anaconda—Frederick Laist, manager, L. V. Bender, superintendent—pulverized coal is used entirely at the reverberatory furnaces and with great success.

In the converter plant at the Washoe an enormous reverberatory has been put in operation to treat the converter slag hot, by mixing it with concentrates carrying sufficient sulphur to clean the slags.

This furnace is treating approximately 1000 tons of material daily, of which a little over 50% is molten slag, the remainder being a mixture of calcined concentrates and raw concentrates, together with siliceous fettling material. About 8% of fuel is used to melt this charge, and naturally this percentage will vary with the proportion of solid material in the charge.

In order to make this type of furnace work successfully it is necessary to get a reasonably good mixture between the sulphur-bearing material and the molten converter slag in order that the magnetite in the latter may be reduced to the FeO condition and thus be removed in the slag.

The side walls of the furnace are protected by the siliceous fettling material which is fed along the sides of the furnace. It is an interesting fact that the furnace is able to run on a very low SiO_2 and high Fe slag.

At the brick plant, which is a department, there are being manufactured in an Oregon kiln 50,000 brick daily from flotation tailings; and at this plant the company is making the brick for the new stack being constructed near the old main stack of the plant. Incidentally, this new stack will be enormous in size, its dimensions being 525 ft. in height and 60 ft. inside diameter at the top. There will be a large Cottrell installation at the base; and the material caught by means of this apparatus will be smelted in a special reverberatory. The new research laboratory at this plant is a feature well worthy of the consideration of all large operating companies.

TOOELE PLANT OF THE INTERNATIONAL SMELTING CO.

At the Tooele Plant of the International Smelting Co., the slag reverberatory for the lead furnaces was abandoned because the zinc in the slag built up accretions in the bottom. The blast-furnace men in the lead department have a lunch room set apart for their special benefit, and no one is allowed to touch his lunch before washing thoroughly. This prevents lead poisoning.

It has been proved at the Tooele plant that it does not pay to resmelt slag shells. The average slag in the lead blast furnaces is 30% SiO_2, 38% FeO + MnO, 15% CaO, 9% ZnO, 0.32 oz. Ag, 1.1% Pb and 0.25% Cu. The first matte runs 23 to 25% Cu, 14% Pb and 20 to 25 oz. Ag. The bullion runs 98.5% Pb and 80 to 120 oz. of silver.

The Dwight & Lloyd sintering machines have been speeded up so that each one now has a capacity of 250 tons per 24 hours. In the Tooele plant, as in nearly all installations using these machines, and to avoid explosions in the dust chambers, a preliminary roast is given to all sulphides to remove the loose atoms of sulphur. Interesting experiments are being conducted on a special form of Cottrell apparatus, which is much cheaper in cost of installation than the standard apparatus, and at the same time just as efficient. At this plant the matte from the lead furnaces is blown first without silica in converters and the fumes are caught in a baghouse. When all the lead is removed the matte is blown in a copper converter. William Wraith is general manager, O. M. Kuchs, assistant manager, and A. B. Young, acting superintendent.

MISCELLANEOUS SMELTING PLANTS

At the Garfield Smelting Co.'s plant, R. F. McElvenny, plant manager, and A. H. Richards, assistant superintendent, there have been installed 13 x 30-ft. converters using the Tacoma hood; and here, as at the ther plants of this company, the Garr silica gun is used nstead of boats for distributing the silica necessary to orm slag in the converter. As an example of the enefit of this method, in one campaign there were roduced 15,300 tons of copper, an average of 103 tons er converter day. The only repairs necessary at the nd of this campaign were in the vicinity of the tuyere. he reverberatories at this plant use flat burners for ulverized coal and they have been found to be better han the round burners in protecting the arch. An verage of 600 tons per furnace day on 15% fuel has sually been maintained.

At the Midvale plant of the United States Smelting o., E. H. Hamilton, superintendent, Robert Wallace, ssistant superintendent, the special things to be noted ere the charging apparatus for the lead blast furnaces, nd the concrete shaft to a lead blast furnace with a rick lining and loose reinforcing; also the recovery f metallic arsenic as a byproduct from blast-furnace ue dust and the recovery of electrolytic cadmium.

At the Murray plant of the American Smelting and efining Co., W. W. Norton, superintendent, a careful tudy of the Australian type of "thimble top" for lead urnaces has been made. A most ingenious set of entilators has been devised for the lead furnaces—he lead-well, tap spout and settlers—so that the workmen are absolutely protected from lead fumes. The recautions as to employees washing before eating are nsisted upon here.

At the United States Metals Refining Co., Grasselli, nd., W. Thum, superintendent, where the Betts electrolytic process has been developed largely, Mr. Thum as designed a special electrolytic tank with independent upports for the electrodes. He finds that redwood is he best lumber for such tanks and he prefers stave onstruction.

At the International Lead Refining Co.'s plant at ast Chicago, Ind., George P. Hulst, assistant general anager, has designed a special furnace for treating tharge or softener skims. He claims that this furnace ives a clean hard-lead slag and clean bullion and does way with the necessity for using residue furnaces.

In connection with the reference to the 13 x 30-ft. eirce-Smith converters, used in several of the larger lants in the West, it is interesting to note that at the erth Amboy plant of the American Smelting and efining Co., a large converter of this type, but only 0 ft. in diameter, was installed some years ago. It as found soon afterward that the supply of matte was ot sufficient to warrant a furnace of this size, so the urnace was cut in two, with satisfactory results. One ust cut the coat according to the cloth or, in other ords, choose his unit according to the quantities he as to handle.

Zinc-Dust Analysis

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Auction of Nitrate Lands At Santiago, Chile

The following lands will be auctioned on Aug. 10 at Santiago, Chile, and contain an estimated amount of mixed nitrates as indicated. The reserve price in gold at 18d. per peso is also given.

TERRENOS DE LEALTAD DEL TOCO

Lot N—	5,132,722 quintals at	P0.25
Lot S—	1,536,231 quintals at	0.25

TERRENOS AL NORTE DE LA OFICINA COYA

Lot No. 1—	7,677,897 quintals at	P0.25
Lot No. 2—	8,325,642 quintals at	0.25
Lot No. 3—	7,744,408 quintals at	0.25
Lot No. 4—	8,009,327 quintals at	0.25
Extra—	206,106 quintals at	0.10

TERRENOS ALREDEDOR DE LA OFICINA PAN DE AZUCAR

Lot B— 1,582,354 quintals at P0.20

TERRENOS SAN JUAN DE SOLEDAD

Lot C—2,546,826 quintals at P0.25

TERRENOS AL PONIENTE DE ROSARIO DE HUARA

892,712 quintals at P0.20

TERRENOS AL PONIENTE DE SANTA ROSA DE HUARA

1,188,308 quintals at P0.20

TERRENOS AL PONIENTE Y SUR DE CONSTANCIA

1,093,756 quintals at P0.25

TERRENOS AL PONIENTE DE LA OFICINA MOROUSSIA

1,325,731 quintals at P0.20

TERRENOS AL SUR DE LA OFICINA VALPARAISO

2,602,957 quintals at P0.20

A Spanish quintal is approximately 100 lb. Further information can be obtained at the Seccion Salitre of the Ministerio Hacienda, in either Valparaiso or Tarapaca. Chile.

Events and Economics of the War

Renewing their offensive on July 15, in an attack extending from near Chateau-Thierry to Massiges, the Germans made little headway, though crossing the Marne from Jaulgonne to Beuilly; the French and Americans immediately counter attacked. Previously the Allies had begun an offensive against the Austrians in southern Albania, driving the latter back 25 miles, taking Berat, thus completing a single front of 200 miles extending from the Adriatic to Saloniki, on the Aegean. Small gains were made against the Germans opposite Soissons and at various other points on the Western front. Kem, on the White Sea, was occupied by the British. In Germany, Von Hintze, a Pan-German, was appointed foreign minister in place of Kühlmann, resigned. Haiti declared war on Germany on July 15.

Government control of telegraph, telephone, cable and radio lines in the United States, during the war, was approved by the Senate, and the measure signed by the President on July 16. The Agricultural bill was vetoed, because of the clause contained fixing the price of wheat at $2.40 per bu. Higher taxes on excess profits were recommended by Food Administrator Hoover. Exportation of certain foodstuffs to Mexico is to be allowed conditionally, it was announced. Dr. E. A. Rumely, controller of the New York *Evening Mail*, was charged with having purchased that paper with funds obtained in Berlin and with directing its policy accordingly.

Crisis in Gold Mining

To the end that some relief may come to the gold-mining industry, Delegate Sulzer, of Alaska, recently called a conference of Western Congressmen and prominent mining men, who met at the office of Congressman Taylor, of Colorado, according to a bulletin of the American Mining Congress. A committee was appointed composed of Messrs. Taylor, of Colorado; Raker, of California; Welling, of Utah; Smith, of Idaho, and Miller, of Washington.

At a meeting of this committee it was suggested that several prominent men representing the mining industry, the Government and monetary interests of the country be selected to act in an advisory capacity to the committee. The advisory committee is anxious to have suggestions from mining men as to how the situation can be met. It is hoped through the activity of this committee that some plan may be worked out to assist the gold-mining industry. Those that have suggestions to make have been requested to send them to the Washington office of the Mining Congress.

The gold supply of the world has been falling off rapidly. The increase in demand for money, created by the increase in business transactions, has been met with currency, promises to pay, notes of credit—good notes so long as the gold foundation upon which they rest is kept at a proper ratio.

The cost of gold-mining has been and is rapidly increasing, though the value of the output remains stationary. Gold production has reached a crisis. Though production has been gradually growing less, present conditions will shut it off altogether, except in mines where gold is a byproduct. Gold production is on the verge of a precipice and, unless help is given, cannot continue. Low-grade gold mines are now operated at a loss, and there appears to be no hope for the future. Liberty Bonds are a promise to pay in gold. If production is stopped, the gold cannot be available for their redemption. A world effort to liquidate would produce a money panic which would put gold in its proper relation to general prices. A better method must be found.

Many things may properly be done for gold mining. First, gold production may be relieved from the requirements of the war excess-profits tax law. Second, gold mining may be classed as a war industry, through which preference may be given in obtaining its supplies. Third, freight-rate advances as relating to gold mining may be remitted. Fourth, its employees may be made immune from draft.

The American Mining Congress advocates that the embargo be lifted upon the exportation of all newly produced gold, and the present and future gold production allowed to take advantage of the premiums which now or hereafter may obtain. The present foreign 4% is not consequential except that it brings hope to the gold miner that he has an even chance in the world's market. It appears that, unless substantial help is given, gold will be at a premium of 50% within five years.

The appeal of the gold industry to the nation has been unheeded; the appeal of the nation to the gold industry will be heeded, but the unwatering of abandoned mines, the rebuilding of abandoned treatment plants, the assembling of working organizations, will be as tedious as the assembling, training and equipment of an army from raw material.

Exempt Canadian Coal Miners Conditionally

Coal mining is classified in Canada as a work of national necessity, and coal miners are dealt with as a special class in the enforcement of the Military Service Act of Canada. The course to be pursued in regard to application of conscription to miners has been a matter of serious consideration to the tribunals charged with power to grant exemptions, temporary and permanent, in British Columbia and other Western mining provinces. The attitude assumed recently by Judge Thompson, of British Columbia, may be taken as indicative of the generally accepted policy in this respect.

In the Crow's Nest Pass coal district he was confronted with a blanket appeal for exemption for 36 men having the backing of the United Mine Workers of America and based on the contention that the appellants were engaged in a work of national importance.

After hearing all the evidence as to the actual time being worked by each man, the amount of coal produced and the individual earnings, he allowed 31 applications for a limited period, renewal being conditional on their maintaining their average production of coal.

In making the decision, Judge Thompson established the following rules:

> In cases where I grant exemption it shall be conditional upon the appellant being continuously employed in his occupation, either that in which he is now engaged or some other occupation in the mine. Any person ceasing to work for more than 24 hours will be deemed to be not continuously employed, unless he can show some just cause or reason for his non-employment. This prohibition does not apply to recognized holidays and the holding of funerals.
>
> A lay-off of 24 hours without just cause or reason being shown shall not occur more than once a month. In case of illness, a certificate signed by some medical practitioner must be produced within 48 hours, and if demanded by the military or civil authorities produced and filed in the office of the chief provincial police at Fernie, British Columbia.
>
> In the event of a strike or cessation of work by workmen other than exempted men, whereby the latter are prevented from working, exemption shall cease; subject, however, to the provisions in rules 9 and 10. (These are certain rules laid down in the agreement subsisting between employer and employee in this district.) This may seem a harsh ruling, but it must be remembered that this appeal has been made by the United Mine Workers of America, and it will be the duty of the officials of the brotherhood to see that no such strikes or cessations of work occur.
>
> No exempted man shall occupy an official position or carry on work which will necessitate his absence from work at his usual occupation in the mines. In the event of any person to whom exemption is granted desiring to change his employment from one employer to another, he may do so upon application being made in writing to me and a certificate allowed by me.
>
> In the event of any dispute arising between the military authorities and any person to whom exemption is granted, or in the event of the military authorities drafting, detaining or arresting an exempted man for alleged non-compliance with these rules, or from any cause, the matter shall be brought before me as speedily as possible for determination.

Controlling the Labor Reserve

The Department of Labor announced on July 8 that only manufacturers engaged on war contracts and employing over 100 workers will be required to obtain their unskilled labor through the U. S. Employment Service of the Department of Labor by the ruling which goes into effect on Aug. 1. In like manner, four other classes of labor need not be recruited through the Employment Service, namely: Unsolicited labor; labor for railroads, with some exceptions; farm labor; and labor for non-war work.

Community labor boards, consisting of one representative of employers, one of employees and a third representing the Employment Service, are now being established wherever the industrial situation justifies it. They will have jurisdiction over the recruiting and distribution of labor, in coöperation with the service. The members will be appointed by the state directors of the U. S. Public Service Reserve.

Steel Orders Reclassified

Steel orders are now divided into Classes AA, A, B, C and D. Certificates of priority are issued for the first three classes. Class C comprises orders embraced within the War Industries Board's "schedule of purposes" as being entitled to preferential treatment, but which are not covered by priority certificates. All orders covered neither by priority certificates nor included in the schedule mentioned fall into Class D. Orders in this last class may be filled from surplus stocks, if any remain, after orders in the first four classes have been provided for or filled, "subject to the approval in writing of the Director of Steel Supply first had and obtained."

To avoid delay in filling small orders urgently needed for essential civilian uses, any such order falling in Class D may be filled provided that in the aggregate it does not exceed five tons in quantity. If reasonably satisfactory delivery can be secured on Class C orders, no application for higher priority rating should be made.

New Revenue Bill May Help Mining

The lead and zinc districts of Missouri and Oklahoma were represented by A. Scott Thompson, of Miami, Okla., at the hearings on the Revenue Bill before the House Ways and Means Committee. Judge J. J. Shea, of Tulsa, appeared for the oil industry. At these hearings, which closed on July 2, much testimony of interest was presented in behalf of the various industries concerned, though but little of it pertained to mining.

The committee is said to be desirous of devising a way of taxing the mining industry by separate classification, and is anxious to do something to assist it, especially those branches having a short life and therefore needing a quick return of capital. It is expected that the bill will be drafted soon. It is urged by the American Mining Congress that the mining interests of the country get together upon some constructive plan to present to the Senate committee when it comes to consider the bill drawn by the House.

Garfield To Ration Coal If Necessary

The Fuel Administration is ready to place in effect a plan of putting householders on coal rations, as is done in France and England, if found necessary. The coal allowed to each consumer will not be the amount used last year, but only so much as is scientifically found sufficient to heat each house to 68°, providing every conservation rule has been obeyed.

The plan, which has been referred to the Federal Fuel Administration in all states, involves a department of coal allotments in connection with each local fuel administrator's office. The features of the plan are as follows: A comparison of every order received by a dealer with simple formulas showing the rating of the house where the coal is to be used; actual inspection of doubtful cases and a checking up of statements made as to coal on hand, space to be heated and heating system employed; an effective refusal to furnish more coal than an analysis shows to be necessary if requisite care be taken.

It has been made plain to the War Industries Board that a proper use of magnesia and asbestos in heating plants and in pipe coverings enormously conserves fuel; and because the demands for fuel far exceed the supply now available, or that can be made available, it was determined that the production of magnesia and asbestos coverings should be stimulated in so far as they are used in connection with heating plants, and other uses measurably curtailed.

Association of the 27th Engineers

REPORT OF THE SECRETARY AND TREASURER

Up to July 1, 1918, this association had received subscriptions and funds from other sources as follows:

Subscriptions as reported in "Eng. & Min. Journ."	$15,192.50
Interest on bank deposits	92.61
Exchange	.75
Total	$15,285.86

Its disbursements have been as follows:

Athletic goods	$ 643.64
Musical instruments and music	294.16
Cigarettes and tobacco	1328.04
Games	53.63
Typewriters	277.50
Miscellaneous cash to company funds	700.00
Wool (350 lb.), cloth and knitting machines (2)	1264.82
Miscellaneous goods	13.65
Exchange	3.01
Total	$4,578.45

There was cash on hand and on deposit with the Guaranty Trust Co. on July 1 to the amount of $10,707.41.

There were some expenses incurred in June by Colonel Perry for which bills had not been rendered up to July 1.

All expenses in administering the fund and the affairs of the association generally were assumed by the *Engineering and Mining Journal.*

In addition to the cash contribution, the association has received the following donations of goods: From Mrs. J. F. Kemp, 2 knit sweaters; from Miss Kemp, 1 sweater; from Mrs. W. R. Ingalls, 3 pairs of knit socks; from Mrs. T. B. Stearns, 24 comfort kits; and 290 books from H. H. Knox, A. R. Ledoux, F. F. Sharpless, Mrs. W. Y. Westervelt, Mrs. W. H. Aldridge, J. Parke Channing, J. F. A. Clark, A. C. Ludlum, C. E. Hubbell, Mrs. Ledoux, C. V. Drew, W. R. Ingalls and H. W. Turner.

The books that have been sent to the men are mostly stories of adventure, detective stories and accounts of war experiences, but included among them have been some suitable technical books. The McGraw-Hill Book Co. courteously gave a collection of its mining publications to the value of $25.50.

The Woman's Auxiliary of the American Institute of Mining Engineers generously volunteered to knit for the regiment. The association provided the auxiliary with two knitting machines, 350 lb. of wool and material for 72 wool-cloth sweaters, costing $1264.82. The ladies of the auxiliary have coöperated enthusiastically and up to date have delivered 155 sweaters, 421 pairs of socks, 89 pairs of wristlets, 85 helmets and 3 mufflers. The association has shipped to the regiment 121 sweaters, 249 pairs of socks, 68 pairs of wristlets and 72 helmets. On hand, awaiting requisition, are 34 sweaters, 172 pairs of socks, 21 pairs of wristlets, 13 helmets and 3 mufflers.

In the main, the disbursements have been to fill the requests of the commanding officer for what he deemed to be desirable for the comfort of his men. The knit goods have thus been sent to the regiment upon such requisitions, but a considerable number of the several articles have been prepared in advance, so as to be available for prompt supply. Other furnishings to the regiment have comprised athletic equipment, games for the barracks, musical instruments, music, typewriters and cash for company funds. Among the musical instruments have been some that will be the nucleus for the regimental band. Upon embarking, each man was presented with a supply of cigarettes and smoking tobacco. Rather than to ship such goods overseas, it has been found preferable to transmit cash and let the officers make the purchases "over there."

The expenditures up to July 1, 1918, were chiefly in behalf of companies A, B and C, and the men attached to Headquarters of the regiment. The men of the three companies of the second battalion, which has been forming in the meanwhile, must be cared for in a similar way. Although a good deal of money remains in the treasury, it will all be needed, and more too. We expect not only to promote the immediate comfort of the men in the field, but also we must keep an eye open for their dependents, left behind, who may be in need and require aid and assistance. We have already acted in one such case. Moreover, we must think of lending a hand to disabled men who come home. The mining industry has already been generous in looking out for its own, but the generosity must not cease, nor will it, we are sure.

W. R. INGALLS,
New York, July 9, 1918. Secretary and Treasurer.

The list of contributors to the Comfort Fund to date now stands as follows:

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	5.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grepher	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Francis Thomson	10.00
New Idria Quicksilver Mining Co	100.00
F. P. Burral	25.00
Livingston Wernecke	5.00
Oscar Lachmund (monthly contribution)	10.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Charles Le Vasseur (third contribution)	5.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
Total	$15,714.11

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Contributions are acknowledged only by publication in the *Journal.*

Monthly Copper Production for 1918

This table is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo and Katanga companies, whose copper does not come to the United States.

MONTHLY CRUDE COPPER PRODUCTION, 1918

	March	April	May	June
Alaska shipments	8,014,059	3,579,920	6,069,642	3,980,197
Arizona:				
Arizona Copper	4,000,000	4,200,000	4,130,000	3,700,000
Cons. Ariz. Smelting	2,270,000	2,000,000	2,000,000	1,750,000
Inspiration	8,750,000	9,350,000	10,250,000	10,300.000
Magma	900,000	1,050,000	1,169,083	..
Miami	5,174,365	4,913,590	5,100,408	4,692,554
New Cornelia (*a*)	3,218,000	2,806,000	2,880,000	2,822,000
Old Dominion	2,872,000	2,814,000	3,239,000	3,368,000
Ray	7,585,000	7,350,000	8,120,000	7,736,559
Shannon	962,000	827,000	802,000	672,000
Shattuck Arizona	1,013,593	842,790	840,999	805,310
Other Arizona	29,575,371	25,007,820	27,491,118	25,823,920
California:				
Mammoth	1,620,000	1,530,000	1,328,000	1,196,000
Michigan:				
Calumet & Hecla	13,784,569	11,734,820	12,944,732	...
Other Lake Superior (*b*)	7,000,000	7,000,000	7,000,000	....
Montana:				
Anaconda	28,000,000	26,500,000	28,400,000	25,800,000
East Butte	2,395,940	1,811,360	2,208,300	1,999,760
Nevada:				
Mason Valley	1,455,200	1,058,400	1,759,728	1,224,485
Nevada Cons	6,060,000	6,900,000	7,000,000	7,250,000
New Mexico:				
Chino	7,833,046	6,290,513	5,987,340	6,706.474
Utah:				
Utah Copper	16,380,000	16,690,883	18,200,000	18,500,000
Eastern smelters (*b*)	1,750,000	1,750,000	1,750,000	....
Total reported	160,613,143	146,007,096	158,670,350	.
Others, estimated	24,912,025	17,200,000	22,400,000	.. ..
Total United States	185,525,168	163,207,096	181,070,350	....
Imports, ore and concentrates, etc	18,392,301	12,047,453	10,886,293	....
Imports in blister, etc	36,514,548	31,294,232	27,892,478	. ....
Grand total	240,432,017	206,548,781	219,849,121	....
British Columbia:				
Canada Copper Corpn	....	.	.	....
Granby Cons	3,807,600	3,689,982	3,808,125	....
Mexico:				
Boleo	1,631,500	1,818,880	1,873,760	....
Cananea	4,480,000	4,100,000	4,100,000	4,100,000
Other Foreign:				
Braden	5,248,000	4,722,000	6,758,000	8,292,000
Cerro de Pasco	6,966,000	5,952,000	6,166,000	5,874,000
Chile	10,192,000	7,770,000		
Katanga	3,086,440	4,695,798	5,180,810	3,505,315

(*a*) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery, which is included under "Other Arizona." (*b*) Estimated.

The production of the United States by months since the beginning of the year was as follows:

	1918
January	165,431,568
February	160,011,364
March	185,525,168
April	163,207,096
May	181,070,350

The item "Alaska shipments" gives the official figure of the U. S. Department of Commerce. Kennecott production for March, April, May and June was 5,772,000, 4,794,000, 3,404,000 and 4,044,000 lb., respectively.

Copper Imports Into India cost that country about $10,000,000 a year. Brass is also imported in fairly large quantities. The copper mining and smelting industry is to be developed; and a commission has been appointed to consider opening up the Chota Nagpur deposits.

American Zinc Institute to Meet in St. Louis

The committee at Joplin, Mo., having in charge the arrangements of the meeting of the American Zinc Institute has announced that the date and place of this meeting will be in St. Louis, Mo., at the Hotel Statler, on July 29 and 30. The committee reports that judging from the number of acceptances of the invitations sent out, it will be the largest meeting of zinc interests ever convened. An unusually strong program is being prepared, and speakers of prominence in the industry throughout the United States are being assigned live topics that should interest and benefit every one interested in zinc. As soon as the program is completed, it will be given to the press and a copy sent to every large interest concerned.

Dividing De Wendel Steel Works

Greater difficulty than had been expected has been encountered by the Germans in dividing the spoil gained by confiscating the De Wendel steel works in Lorraine, it is said. It was originally proposed to form a syndicate of German steel works to take over the Lorraine concern. The syndicate was to be a limited company, 51% of the capital of which would be held by the imperial government, the kingdom of Prussia and Alsace-Lorraine, the balance going to the steel works. This plan met with opposition, however, as did also the proposal of the Alsace-Lorraine government that half the surplus ore, after meeting the needs of the De Wendel plant, should be smelted in Lorraine.

New proposals have recently been made, it is stated, to divide the De Wendel property into a metallurgical company, capitalized at 200,000,000 marks, and a mining company, capitalized at 50,000,000 marks, the imperial government subscribing 51% in each case. This scheme is backed by the Allgemeine Electricitäts company, of Berlin, the Angsburg-Nuremburg steel interests, the Esslingen works and the Lindenberg steel works. The mining company, it is stipulated, is to supply 3,000,000 tons of ore per year to the metallurgical company. The scheme is said to have been approved as far as the mining company was concerned, but strong competitive interests are opposing the creation of the metallurgical company. The Stahlwerks Verband is composed of two groups, the Southwestern and Rhenish Westphalian. The Lorraine, Thyssen, Stumin, Roechling and Dillingen interests belong to the former; the other includes practically all the remaining members. It has been suggested that the former group take 25% of the shares, and the Allgemeine Electricitäts and the so-called "Raumer" groups, 24%, the remainder, 51%, being taken by the German government.

The government of Alsace-Lorraine has been requested, on the other hand, by several Lorraine municipalities to form a new company to take over the entire property, in which Alsace-Lorraine should take the majority of the capital, and to smelt in Lorraine the entire output of the De Wendel mines.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Editorials

The Smelting Number

THIS special smelting number is the third of a series that we have presented annually. As we look back over its predecessors, we cannot help being impressed by the comprehensiveness of the treatment of the several subjects and the enduring value of the contributions, in which distinguished metallurgists have collaborated. We do not think that the present issue is inferior to those that have gone before.

There is one feature in the present issue to which we desire especially to draw attention. We invited a number of experienced metallurgists, each distinguished in his special field, to prepare a general plan of the ideal smelting works, i. e., the plant that he himself would lay out and design if he had an entirely free hand, each plan to be for a large plant, but with allowance for doubling or tripling the capacity. We were disappointed by not receiving some of the contributions of this sort that we expected, but every one will appreciate that an unusual amount of thought and labor is required in the preparation of such a contribution, and these being busy times, when every one is subject to urgent calls, failure to keep an agreement of this kind is easily to be forgiven. We hope to present more of these articles later.

Nevertheless, we are able to make rather a goodly showing in the carrying out of this plan. Mr. Rutherford has contributed on the design of a copper smeltery, Mr. Riddell on a silver-lead smeltery, and Mr. Newnam on a plan for smelting galena ore in mechanically operated plants. Each one of these contributors is a distinguished expert in his special field, and the ideas that they present will receive very respectful attention.

One of these contributors has written us: "I hope some discussion may come out on these plans. If it should, I for one will be glad to get into it, for long experience in operating has shown me how few plants have been laid out with an eye to the convenient handling of material." We hope that there will be such discussion. The subject is one of great possibilities.

Free Trade in Metallurgical Ideas

IN STUDYING the operations of the major producers of copper in the United States, it is evident that the metallurgical treatment of the ore is claiming more and more attention. The vital necessity for efficiency and economy in method was never more urgent than at the present time, especially in view of the magnitude of the operations at several plants where equipment has been duplicated and added to, where new processes have been tried out and adopted, and output has been increased to meet the ever-increasing demands for the metal. This expansion has led to a realization of the enormous losses in copper being incurred, when considered in the aggregate, even after modern metallurgical treatment; and in the annual report of one of the leading producers it is stated that the question of increasing the percentage recovery is important on account of the large tonnage involved. The phenomenal growth of such operations as we are witnessing at the present time must inevitably bring a realization of the total metal losses involved, which in the particular case referred to totaled over 20,000,000 lb. of copper in 1917. Such a figure suggests an immediate consideration of the money value of this amount of metal, which naturally leads to a pertinent suggestion with regard to improved recovery in the metallurgical plant.

Incentives for straining every effort in the direction of better results are justified, but it must not be forgotten that an extension of operations and the adoption of improved methods on a large scale are usually accompanied by a higher percentage recovery; or the same recovery may be achieved with a lower grade of ore—thus bringing in mine reserves that were previously considered unprofitable, and so adding to the life of the property. These favorable results are likely to be obscured when the increased amount of ore being handled in the plant leads to a realization of the cumulative losses of metal in the residues. As a concrete instance of the progress made in this connection, we may cite the case of the Anaconda Copper Mining Co., where the value and life of the mines were vastly enhanced by improvements made in metallurgical practice. But a few years ago—in 1913—an extraction of 75.578% of the copper content of the ore being treated at the Anaconda concentrator was made. This was followed by a recovery of copper at the smeltery amounting to 78.182% (of the amount of metal in the ore) from the extracted concentrates and ore. Within three years the concentration extraction had been raised, by metallurgical innovations and improvements, to 95.895% of the copper contents of the ore—a gain of 81% of what was previously lost in the residues; and the smeltery recovered 90.521% of the copper contained in the ore.

To improve metallurgical results it is necessary to take advantage of previous research and to utilize to the full the achievements of the extensive technical organizations connected with the large copper companies. The time is past, we are glad to say, when a veil of secrecy was drawn over the operations of a new plant. lest others should reap the benefit of painstaking research and persistent endeavor. The amazing progress that is taking place in this, the most fructuous period in the world's history, forces many to abandon preconceived notions of perfection or finality with regard to methods or mechanism. One result is that the advantage of reciprocity in knowledge, gained from theoretical ideas and practical accomplishments, is being realized; and so the individual feels that there is nothing to be gained, and, possibly, a great deal to be lost by secrecy. Another aspect of the matter deserves consideration and refers to the need for conservation of effort, which can be achieved in part by acknowledging and then borrowing the ideas of others that are so freely given to the profession through the medium of the technical journals and the transactions of engineering societies. Every facility exists to learn the details of new methods and practice as soon as the results are available. To take full advantage of such facilities is a duty which involves only the obligation to add to the stock of common knowledge and so to assist in the progress of the industry and the nation when opportunity occurs.

Modern developments in the metallurgy of copper make it interesting to trace the sequence of events which lead to the erection of enormous plants, and the adoption of standard practice with certain classes of ore. The small-scale laboratory experiments with a few pounds of material are followed by the installation of a pilot mill to handle 50 tons, or so, a day. The results lead to the design and erection of a large plant to treat one or two million tons a year, where operations are perfected as far as present knowledge and facilities permit, and which then serves as the pilot mill for the industry.

The immense coöperative benefit resulting from the investment made by one company in a new installation, when detailed results of the work are published and disseminated with frankness, is seen in connection with many large and important metallurgical plants. We note that the Inspiration Copper Co., in its annual report, has come to the conclusion that it can do no better than follow the successful practice initiated at the New Cornelia Copper Co.'s leaching plant, for the treatment of its own oxide ore; and at the same time duplicate the roasting and leaching practice of the Anaconda Copper Mining Co., for the treatment of concentrated material from the sand product.

This is as it should be, and indicates that unnecessary overlapping of research and experimentation will be avoided at a time when brains and hands are needed as never before. The announcement is a frank recognition of merit in the work of the technical organizations of other companies; and the practice of free trade in ideas will conserve effort for additional avenues of research, which will result in a reciprocity of ideas which cannot fail to benefit all concerned.

There are further encouraging signs that labor is coming more and more to a realization of its responsibilities as well as its power. At first a man was thought none the less of by his fellow workmen if he did not subscribe to Liberty Bonds, but now, if he has become such an exception, he is looked at very much askance if he refuses to subscribe, or if he does not give to the Red Cross, or if he does not buy Thrift Stamps. This is being carried a step further. The great complaint of employers has been that labor will not work steadily, that if a laborer gets a 10% increase he works 10% less, and so on. This means loss of production and is a distinct hindrance to winning the war, to which we all are committed. But now we hear from some quarters that the man who works four and five days a week, or only whenever he feels like it, is being termed a "slacker" in no uncertain manner by his fellow workmen, as well as by his employer and the authorities. This is what counts, especially among the foreign born and foreign speaking, for though some care little about what Uncle Sam thinks or their employer thinks, they have the greatest respect for what their priest, their society, or their neighbors think of them. If such a spirit becomes prevalent among employees throughout the land, and if their thoughts and words are crystallized into action against such "slackers," it will be a wonderful aid to our industrial efforts, and hence toward winning the war.

Before Mr. Burleson assumes the administration of the nation's telegraph service, we wish he would give his friendly consideration to the mail service and raise it from its disgustingly bad condition. The mail service is poor. So is the express service (of course Mr. Burleson is not responsible for it). The telegraph companies have been doing mighty well. The excellence of the wire service has been the most satisfactory thing in these chaotic days. We dread to think of how the Government may demoralize and spoil it.

In our issue of July 13th, Current Prices were omitted. The department is published in this issue. Demand for space in the current number has been so great that the page of New Publications will be published in the *Journal* of July 27.

BY THE WAY

The Crane Man

I'm the "man way up" at the very top
  Where a wise guy ought to be;
I'm the boy that's over the bloomin' shop,
  An' you gotta look up to me;
For I rides in my carriage to an' fro
  Like a millionaire's private train,
An' we sure looks down on the gang below,
  —Me an' my trav'lin' crane!

There ain't no burden too large for us,
  Me an' this crane of mine;
We lifts the biggest without no fuss
  For that is the way we shine.
We take 'em any old shape or size
  An' juggles 'em through the air,
An' lowers 'em careful, easywise
—When it comes to the job—we're *there!*

Old Hercules is an also ran
  An' Samson's a piker, too;
They was pretty good on a smallsize plan,
  But today they'd never do.
We've got 'em faded, we've got 'em stung,
  They never could stand the strain
Of the stunts we do an' the loads we've swung—
  —Me an' my trav'lin' crane!

—*American Machinist.*

Camouflage is a good word, says the *Colorado School of Mines Magazine.* It covers a multitude of truths, lies, sorrows, joys, scandals, serenities and vast reserves of ignorance as well as artillery. It is useful in war and peace. Its application has become widespread in a few short months as no other word in the war lexicon. It is more American than it is French, because we practice it more. It is all-embracing. It hides things we want hidden. It discloses when too late to seek cover. It is a screen for action, words, and thought.

Personals

Have You Contributed to the Association of the 27th Engineers?

Albert G. Wolf is examining mining properties in Nevada.

Harry J. Wolf examined mining property near Bonanza, Colo., recently.

Capt. W. H. Wright has been assigned to duty in Washington, D. C.

W. Tovote was recently in the Ray district of Arizona making geological investigations.

George A. Laird, who is with Henry L. Doherty & Co., 60 Wall St., New York, is in the city.

Raphael Pumpelly is the author of a book recently published under the title of "My Reminiscences."

Dr. G. H. Clevenger is conducting metallurgical investigations near Colorado Springs, Colorado.

A. E. Flynn, mining engineer of Haileybury, Ont., is investigating ilmenite deposits in eastern Quebec.

C. E. Van Barneveld is in Denver, where he will remain for a time in connection with war-metal work.

Heath Steele has returned to New York after visiting the Mexican properties of the American Metal Company.

C. M. Weld has closed his office in New York and will be connected with the Bureau of Mines for the duration of the war.

Morril B. Spaulding has been appointed assistant plant engineer of the Chester Shipbuilding Co., Chester, Pennsylvania.

A. O. Ihlseng, of New York, has opened a laboratory at Batesville, Ark., and will purchase manganese ore for Eastern furnaces.

C. E. Addams, general manager of the Ray Hercules Copper Co., has been appoint chairman of the Arizona Council of Defence.

W. R. Doell, formerly assistant chief engineer for the Oliver Iron Mining Co. at Eveleth, Minn., is now chief engineer for the Wisconsin Steel Co. at Benham, Kentucky.

Arthur Houle, superintendent engineer of the Shattuck Arizona Mining Co., recently visited the Rice Lake mining district of Manitoba, where the company has acquired extensive interests.

J. W. Hutchinson, former manager of Goldfield Consolidated Mines Co., has resigned to join the Army. He is succeeded by **E. A. Julian,** former chief engineer of the Wingfield interests.

John C. Devine, for many years with the Ray Consolidated Copper Co., has been made general manager of the Troy Arizona Copper Co., of Arizona, succeeding **Roy G. Mead,** who has entered military service.

Prof. Robert C. Wallace, head of the department of geology and mineralogy in Manitoba University, has been appointed commissioner for northern Manitoba. He assumes the office on Dec. 1, when he will remove to The Pas.

Major R. W. Brock, dean of the faculty of applied science of the University of British Columbia, and formerly director of the Geological Survey of Canada, has been appointed by the British government as geological expert in Palestine.

Dr. J. W. Spencer, of Washington, is in Winnipeg in connection with his presentation to the University of Manitoba of his large geological collection and library acquired during many years of investigation in Canada and the United States.

B. H. Dunshee, assistant general manager of the mining department of the Anaconda Copper Mining Co., who recently resigned on account of ill health, expects to go to California about Aug. 1, where he will make his future home

Charles W. Walters, formerly on the staff of the consulting mining engineer of Guggenheim Bros., is an ensign in the Naval Aviation Service and is now in active service in France. His address is c/o U. S. Naval Air Station, St. Trojan, Cherante Inferieure, France.

J. Parke Channing is on the [illegible] committee of the "[illegible] Industrial Conference" that is to be held at Silver Bay on Lake George, N. Y., Aug. 8 to 11. The theme of the conference will be "Human Relations and Betterment in Industry and Transportation During the War."

W. L. Cole, mine superintendent of Mountain Copper Co., Ltd., at Keswick, Calif., has retired from his position after 23 years of service with the company. **M. J. Murphy** will succeed him as superintendent. **E. L. Stenger,** formerly with the company, will return as assistant superintendent.

Col. Joseph W. Boyle, a pioneer of the Yukon, who was manager of the Canadian Klondike Mining Co. and went overseas early in the war, has been decorated by the King of Roumania for saving a number of Roumanians from exile and probably death at the hands of the Russian Bolsheviki.

H. W. Bell has been appointed State deputy oil and gas supervisor in the third district of California, which includes Santa Barbara and nearby counties. **R. E. Collom** has been promoted from this position to chief deputy at San Francisco, where he will relieve **R. P. McLaughlin,** supervisor, of much of the office work, giving him greater opportunity to look after important field work.

F. J. Brule, assistant general manager of the British-America Nickel Corp., has moved his office from Sudbury to Deschenes,, Que., where the company's new plant is being built. With him have gone **D. Van Doren,** chief engineer; **Louis Whitman,** office engineer; **C. D. Norton,** field engineer, and **R. Guy,** draftsman. **W. A. Carlyle,** general manager, is at present accupying offices in the Citizen Bldg., Ottawa.

Obituary

Guy H. Baltzell died at Frederick, Md., on July 1, aged 40 years.

John Eltringham, a California pioneer miner, died at Douglas Flat, in Calaveras County, on May 29, aged 88 years. He was at one time a partner of James G. Fair.

Randolph Adams, mining engineer, died at his residence in New York on July 9. He was graduated from Columbia School of Mines in the class of '83 and soon afterward joined the staff of the late Arthur Macey at the Silver King mine, in Arizona. When that property closed down, he went to Australia, where he became manager of the Central mine, in the Broken Hill district. He returned to the United States in 1898 and took the position of manager of the Tennessee Copper Co., which he held for 10 years. In 1908 he retired from the active pursuit of mining and made his home in New York, where he resided until his death. He is survived by a widow and two daughters.

Societies

American Institute of Mining Engineers will receive a bequest under the will of the late James Douglas of $100,000 for a scientific library.

Institute of Metals (British) will hold its annual autumn meeting in London on Sept. 11, at which several important papers will be presented.

Faraday Society. At the meeting on May 7 in London, presided over by Sir Robert Hadfield, the subject discussed was the "Coördination of Scientific Publication."

American Institute of Mining Engineers, New York section. The Woman's Auxiliary will meet on July 21 at 4 p. m. at the Engineers' County Club, at Roslyn, N. Y., Mrs. Pauline Sands Lee will recount her recent experiences in the war zone in France.

Industrial News

"Metallurgical & Chemical Engineering," the semi-monthly technical journal published by the McGraw-Hill Co., Inc., is now issued under the name of "Chemical & Metallurgical Engineering."

Trade Catalogs

W-S-M Coke Oven Machinery. Wellman-Seaver-Morgan Co., Cleveland, Ohio. Bulletin No. 10; pp. 8; 8½ x 11; illustrated.

Rego Welding and Cutting Apparatus. Bastian-Blessing Co., Chicago. Pp. 30; 8 x 10½; illustrated. Descriptive of oxy-acetylene and oxy-hydrogen apparatus.

Flexible Conductors. Sprague Electric Works, New York. Form No. B-3466; pp. 4; 3¼ x 5⅞. A leaflet descriptive of steel armored conductors of the Sprague S. S. type.

"The Thrift Book." Machinery Utilities Co., Inc., 501 5th Ave., New York. Pamphlet; pp. 16; 6 x 9 in. A price list of miscellaneous second-hand machinery and other plant equipment.

Drawing Materials. F. Weber & Co., 1125 Chestnut St., Philadelphia. Catalog; pp. 558; 4½ x 6½. An illustrated price list of draftsmen's supplies and surveying instruments as well as of artists' materials.

Wheeler Balcke Cooling Towers. Wheeler Condenser and Engineering Co., Carteret, N. J. Bulletin 109-B; pp. 28; 8 x 10½; illustrated. Shows Wheeler Balcke cooling towers of numerous designs varying from a few thousand to nearly a million gallons capacity per hour.

"Little" Janney Flotation Machine. Stimpson Equipment Co., Felt Bldg., Salt Lake City, Utah. Pamphlet; pp. 8; 5⅞ x 8½; illustrated. The "Little" Janney is a mechanical air belt-driven flotation machine, especially adapted for plants treating a small tonnage per day.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum—Process of Making Aluminous Abrasives. Thomas B. Allen, Toronto, Can., assignor to the Carborundum Co., Niagara Falls, N. Y. (U. S. No 1,268,532; June 4, 1918.)

Aluminum—Process of Making Aluminum Chloride. George H. King and Gerald I. Roberts, Port Arthur, Tex., assignors to Gulf Refining Co., Pittsburgh, Penn. (U. S. No. 1,268,015; May 28, 1918.)

Anode Connector—Julius H. Gillis, Toronto, Ont., Canada, assignor to British America Nickel Corp., Ltd., Toronto, Ont., Canada. (U. S. No. 1,267,653; May 28, 1918.)

Crusher—William K. Liggett, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co., Columbus, Ohio. (U. S. No. 1,268,479; June 4, 1918.)

Electrode for use in Electric Furnaces and for Other Purposes. Hans Nathusius, Friedenschütte, Kreis Beuthen, Germany. (U. S. No. 1,268,483; June 4, 1918.)

Fume-Arrester for Smelting Plants. Antonio Ferrari, Collinsville, Ill. (U. S. No. 1,268,447; June 4, 1918.)

Furnace, Electric Resistance. William D. Coolidge, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,268,685; June 4, 1918.)

Mine Cage, Safety Device for. Joseph Matthews, Plymouth, Penn. (U. S. No 1,268,260; June 4, 1918.)

Nickel Tungsten Composition with Carbon. Henry K. Sandell, Chicago, Ill., assignor to Herbert S. Mills, Chicago, Ill (U. S. No. 1,268,495; June 4, 1918.)

Ore Treatment Process. Harold Edwin Cleaves and Frederick W. Horton, Washington, D. C. (U. S. No. 1,268,323; June 4, 1918.)

Potash—Method of Recovering Potassium Sulphate and Alumina from Alunite. Howard F. Chappell, New York, N. Y., assignor to Mineral Products Corp., New York, N. Y. (U. S. No. 1,268,433; June 4, 1918.)

Potash—Process of Treating Potassium-Bearing Silicates to Obtain Potassium Sulphate. Guy Sterling, Salt Lake City, Utah. (U. S. No. 1,268,508; June 4, 1918.)

Rock Drill. William A. Smith, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver Colo. (U. S. No. 1,267,705; May 28, 1918.)

Smelting—Method and Apparatus for the Electrical Reduction of Ores. Bayard G. Cobb, Dawson City, Yukon, Canada, assignor to John F. Skerrett, Howard Giffin, Henry M. Kidder, Robert I. Barr, and Elaine Inescort, New York, N. Y., and to Andes Exploration and Smelting Corp., of Delaware. (U. S. No. 1,267,976; May 28, 1918.)

Steel, Process of Cleaning. James H. Gravell, New York, N. Y. (U. S. No. 1,268,237; June 4, 1918.)

Tungsten—Process for Welding Tungsten Ingots. Carl A. Pfanstiehl, Waukegan, Ill., assignor to Pfanstiehl Co., Inc., North Chicago, Ill. (U. S. No. 1,267,801; May 28, 1918.)

Editorial Correspondence

SAN FRANCISCO—July 10

Petroleum Producers and their managers, superintendents and engineers meet at San Francisco on July 15 to discuss the present shortage of labor and material. This is the second of a series of meetings arranged by the gas and oil department of the state mining bureau. The subject covers many features. Distance between wells has a marked effect upon the amount of oil produced and the cost of production. Needless or excessive drilling is sometimes indulged in, and this feature will be thoroughly discussed. The bureau has prepared data in the form of a blueprint diagram illustrating an instance of this feature. This print will be furnished to any one making an application to the bureau. Considerable loss has resulted from failure to formulate and follow regular plans or campaigns when several wells are to be drilled. Wildcat wells are sometimes drilled in territory where it may be definitely predicted that no oil could be found. However, drilling of wildcat wells is absolutely necessary to keep up productive areas and enlarge regions of possible productive territory But at the present time it is held advisable for wildcatters to consider all possible factors which may avoid needless use of labor and materials. It is believed by the supervisor that scarcity of labor and material may at some time during the war make it necessary to curtail the drilling of wells in regions of relatively low productivity.

The Rise in Freight Rates recently announced by the Government management of railroads, making an increase of 25% on ores and other commodities, is a hardship to the mining industry in California. The Afterthought mine was obliged to close its flotation plant because of the advance in freight rates on concentrates and will be obliged to install an electrolytic plant for the treatment of the copper and zinc ores. This is only one, but the most important, probably, of the various instances of the effect of this seemingly unnecessary increase. Another instance is found in Placer County, where large amounts of copper ore containing an excess of sulphur could be mined at a profit if the freight rates would permit shipment of the ores to New Jersey. The excessive sulphur content renders the ore unprofitable to copper smelters. The conditions of transportation and the placing of gold on the non-essential list, whether permanent or merely temporary, have given California mining a setback, particularly the gold, copper and zinc interests, which will be hard to recover from during the maintenance of these rates. The closing of large mines and metallurgical plants is not the only evil result; there is to be added the discouragement of investment. And there is no doubt the Government not only will need the gold in the future but needs it now. The demand for copper, zinc and sulphur being also immediate and constantly increasing, it would seem advisable that the Government management of the railroads encourage the continued production of these important minerals.

DENVER—JULY 10

Increasing Cost of Gold Mining continues to hold the serious attention of Western mining men, who believe that the gold-mining industry is speedily approaching a crisis. Though the cost of producing gold is rapidly increasing, the value of the product remains stationary. Production has been gradually growing less, and present conditions of taxation, scarcity of labor and high cost of supplies will shut off production altogether, except at mines where gold is a byproduct, unless some relief can be found. A conference of Western Congressmen and prominent mining men was recently called for the purpose of considering ways and means of meeting the impending crisis. A committee was appointed composed of Congressmen Taylor, of Colorado; Raker, of California; Welling, of Utah; Smith, of Idaho, and Miller, of Washington. Delegate Sulzer, of Alaska, has been a leading spirit in demanding relief for gold mining and in the organization of this committee. An advisory committee will be formed, composed of prominent men representing the mining industry, the Government, and the monetary interests of the country, to make suggestions as to ways and means of meeting the impending crisis. The gold supply of the world has been falling off rapidly. The increase in demand for money, created by the increase in business transactions, has been met with currency, good so long as the gold foundation upon which it is based is kept at a proper ratio. Low-grade gold mines are now operated at a loss, and there appears to be no hope for the future. New gold properties are not being developed as heretofore, and it is practically impossible for owners of small gold mines or prospects to interest capital in development work. Among the proposals that have been made in the interest of gold mining are: first, gold production may be relieved from the requirements of the war excess-profits tax law; second, gold mining may be classed as a war industry, through which preference might be given in obtaining its supplies; third, freight rate advances relating to mining might be remitted; fourth, its employees may be made immune from draft. It has been advocated, also, that embargo shall be lifted upon the exportation of all newly produced gold, and that the present and future production should be allowed to take advantage of the premiums which now or hereafter may obtain. The present foreign premium of 4% is not consequential except that it brings hope to the gold miner that he has an even chance in the world's market. It is believed by some that unless substantial help is given, gold will be at a premium of 50% within five years. If the appeal of the gold-mining industry remains unheeded, future necessity will involve the unwatering of abandoned mines, the rebuilding of abandoned treatment plants, and the assembling of working organizations at tremendous inconvenience and cost. Not only should all producers of essential metals be relieved of requirements of the war excess-profits tax laws, but in certain cases taxes could be removed altogether to the mutual advantage of the industry and the state.

PHOENIX, ARIZ.—July 10

A Remarkable Deposit of Copper Carbonate occurs fifty miles north of Bright Angel, on the Grand Canyon, on the top of a mesa in the Buckskin Mountain section. The nearest available railroad station is at Lund, Utah, 154 miles distant. A number of years ago the deposit was exploited by a corporation that spent $700,000, of which $200,000 went into an ineffective smelting plant. No flux was available, and transportation costs on coke and supplies were prohibitive. The deposit now is owned by the Kaibab Copper Co., of Santa Barbara, Calif., which has just submitted its capitalization plans to the Arizona Corporation Commission. Its success seems dependent upon the application to the ore of the Agnew reduction process, for which machinery now is being assembled in Los Angeles. The ore is roasted with soft coal, and its oxygen thus eliminated. Then, according to the expectation of the management, the copper will be found in nodules, in condition for easy concentration on the ground. The coal, a sort of lignite, is found only a few miles distant from the copper deposit. Water also is plentiful, in the nearby Jacob's Well. About 100,000 tons of ore already has been broken out and is ready for treatment. Forty men now are employed in preliminary work at the site of the reduction plant and on road work.

BUTTE, MONT.—July 12

Wages of Miners and others connected with the mines have been advanced. Miners and smeltermen get an increase of 50c. a day, and men on monthly salaries receiving $350 or less have been advanced $15 a month, the increase to be effective July 4. The Anaconda company felt that with the Government increase in the price of copper to 26c. a pound, the men should share in the benefit, and it was decided to make the increase. Upward of 21,000 men are affected in Butte, Anaconda and Great Falls. The increase in the price of copper, it is pointed out by the mine owners, will be consumed in paying the increase in wages and in freight rates. Increased freight rates for the Anaconda Copper Mining Co. alone total $3,000,000 yearly. C. F. Kelly, vice president of the Anaconda company, speaking of the advance in wages, said: "The net result of the increased price, so far as the Butte district is concerned, is to distribute the bulk of it at once to the railroads and our employees. Notwithstanding this fact, all of the operators expressed themselves as willing to meet the situation, and we are pleased that the Government has enabled us to provide for the increased freight charges and to make a substantial increase in the wage scale. It is to be hoped that our employees will realize that in the presentation of the matter to the War Industries Board their interests have been considered and that in return they will exert every effort to stimulate production of copper, which is so vitally needed by this country and its Allies for the prosecution of the war."

TORONTO—July 13

Unavoidable Delays have postponed, until next year the experimental work undertaken by the Ontario government to ascertain the feasibility of utilizing peat deposits for the production of a commercial fuel. The Legislature appropriated $100,000 for this work, and early in the spring the Hon. G. Howard Ferguson, Minister of Lands, Forests and Mines, ordered two machines for the manufacture of peat briquetes. Owing to the inability of the manufacturer to obtain the requisite material, in consequence of war conditions, the machines have not been completed, and their delivery is not expected for two months. It will then be too late to place them, as was intended, in the Holland Landing peat bog. Should the fall be an open one, some experimenting may be done with them at a bog in Alfred Township, near Ottawa, in coöperation with the Canadian Government. Experimental work in drying peat with gas engines is in progress near Cochrane, in Northern Ontario, on a limited scale.

VICTORIA, B. C.—July 10

Consolidated Mining and Smelting Co. of Canada has granted a war bonus of 15c. a day to employees at its **Trail** smeltery for every working day during May, and for six months, starting with June 1, an extra 25c per day. It is explained that this action has been taken because of a realization that there has been a further increase in the cost of living within the last several months.

The Geological Survey Branch of the Mines Department, Ottawa, is to have eight parties in the field in British Columbia this summer. Several of these are already at work and the others will be equipped as soon as possible. As there are only about 25 such parties working throughout Canada this year, the comparatively large proportion assigned to this province is taken as an indication that the Federal authorities are recognizing to a greater extent than ever the importance of the most westerly of the Canadian provinces from a mining standpoint. This view is emphasized by the fact that a permanent geological station, under Charles Camsell, of the Geological Survey Branch, has been established in British Columbia.

Establishment of an Ore-Testing Mill in British Columbia by the Dominion government is not to be made this year, but assurances have been received that the necessary financial support will be forthcoming in 1919. It is said that the officials of the Ottawa Mines Department realize the need of such a plant in this province; that they appreciate that the operators of the complex-ore mines of the Slocan, Boundary and other districts would be materially aided in putting their properties on a paying basis were the means provided by which they could obtain accurate information as to the most economical method of treating their ores; and that it is believed that it is in the general interest of the mining industry throughout Canada that the step referred to be taken with the least possible loss of time.

The Mining News

ALASKA

FAIRBANKS GOLD (Fairbanks)—New dredge under construction by Union Construction Co. of San Francisco.

SALTCHUCK (Ketchikan)—Has installed 100-ton concentration-flotation mill.

ARIZONA

Cochise County

SHATTUCK ARIZONA (Bisbee)—June production was: Copper, 805,310 lb.; lead, 83,433 lb.; silver, 18,871 oz. and gold, 118.8 oz. Production for six months of 1918 was: Copper, 5,206,174 lb.; lead, 444,937 lb.; silver, 73,979 oz. and gold, 603 oz. New 400-ton lead-silver mill has begun operations. Power to be furnished from Calumet & Arizona Co.'s plant for the present.

Gila County

INSPIRATION CONSOLIDATED (Miami)—June production was 10,300,000 lb. of copper.

ARKANSAS

Independence County

ALLEN (Batesville) — Waco Manganese Co. to complete 250-ton washery soon.

LUCKY DEVIL (Batesville)—J. C. Shepherd and associates mining low-grade manganese.

HANFORD SHEPHERD (Cushman)—Small washing plant completed.

McCURRY-EDMONDS (Penters Bluff)—Have installed and now operating small hand-operated plant.

Marion County

OHIO (Flippin)—To install 50-ton zinc-concentrating plant at once.

CALIFORNIA

Alameda County

ATLANTIC & WESTERN OIL (Livermore)—Drilling rig being installed to replace equipment destroyed by fire. W. W. French is manager.

Calaveras County

UTICA (Angeles Camp)—New orebody disclosed on 3200 level.

Del Norte County

CLEOPATRA CHROME (Smith River)—Road for motor trucks now finished. Another road being built to connect with Costello & Keating chrome property. Ore now hauled to Waters Creek.

Inyo County

NATURAL SODA PRODUCTS (Keeler)—Plant destroyed by fire July 7. Damage $250,000. Plant operated on orders for Government and foreign account.

Napa County

QUICKSILVER MINING is active. Shipments through Calistoga during May amounted to 138 flasks; Big Chief, 19 flasks; Sulphur Banks, 87; Helen, 25; Barbara Anderson, 5; Akins & Sons, 2.

SILVERADO (Calistoga)—Silver mining resumed after idleness of 20 years. Arrangements made for development.

Placer County

CHROME DEPOSITS are yielding a large aggregate tonnage of ore; 10 motor trucks are hauling between Foresthill and Iowa Hill chrome regions and the railroad station at Colfax. Foresthill ore is high grade.

COLORADO

Boulder County

ROYAL GEM (Caribou)—Sinking shaft under direction of Guy Adams.

ROYAL GEM (Cardinal)—Sinking three shafts. E. McSherry is superintendent.

BUENA MILL (Jamestown)—Remodeling to handle low-grade fluorspar. James Warren is manager.

COLD SPRING (Nederland)—New 500-ft. two-compartment shaft to be sunk in foot-wall 25 ft. from vein. F. C. Armstrong is engineer.

San Juan County

ORE SHIPMENTS FROM SILVERTON during June were: Sunnyside, 51 cars; Iowa-Tiger, 13; Pride of the West, 6; S. D. & G. Leasing Co., 4; Mayflower Leasing Co., and Highland Mary, 3 cars each; Dives Leasing Co., 2; D. L. & W. M. Co., Hamlet, Anvil Mountain Leasing Co., Champion, 1 car each; miscellaneous small shipments, 4 cars; total 90 cars.

MICHIGAN

Copper District

HANCOCK (Hancock)—Mining two new lodes on 53 level.

HOUGHTON COPPER (Houghton) — Drift on new lode now back in good copper.

NORTH LAKE (Lake Mine)—Northwestern crosscut on eighth level 1900 feet from shaft.

WINONA (Winona)—To extend capacity of engine from 1200 to 2000 ft. at King Philip Shaft No. 1.

NEW MEXICO

Grant County

ATWOOD (Lordsburg)—Machinery being installed to sink to 1000 level.

BONNEY (Lordsburg)—Shipped 14 cars during June. Developing on 500 level and has cut new orebody.

EIGHTY-FIVE (Lordsburg)—Operation of new 400-ton mill has given good results.

GREAT EAGLE (Lordsburg)—Shipping three cars of fluorspar per week to San Francisco.

HECLA (Lordsburg)—To sink shaft 300 ft. and crosscut.

MISER'S CHEST (Lordsburg)—Hoist erected at main shaft. Mining on third and fourth levels.

CARLISLE (Steeple Rock)—Mill to be started soon to treat large dump of tailings left in the early days.

RIVAL (Steeple Rock)—Main shaft down 200 ft. crosscut on 100 level shows 50 ft. vein carrying good assay returns 200-gal. pumping equipment installed.

Socorro County

SOCORRO (Mogollon)—New mill to start soon. Completing ore pockets in mine.

UTAH

Juab County

APEX STANDARD (Eureka)—To sink shaft to greater depth. Adjoins Tintic Standard on east.

CHIEF CONSOLIDATED (Eureka)—To sink three-compartment shaft on Crusader claim.

CROWN POINT (Eureka)—Winze from 800 level down 50 ft. and to cut veins at greater depth.

TINTIC MILLING (Eureka)—Secured lease on Northern end of Dragon Consolidated mine.

DRAGON CONSOLIDATED (Silver City)—Shipping iron ore for fluxing, as well as other ore.

IRON BLOSSOM (Silver City)—To drift on 2200 level.

Salt Lake County

UTAH CONSOLIDATED (Bingham Canyon)—Has filed action in district court asking for judgment against Utah-Apex for ore removed.

WASHINGTON

Okonogan County

GREAT METALS (Nespelem)—Machinery being installed and 100-ton concentrator nearly completed. Shipping copper-silver ore to Tacoma.

Stevens County

BONANZA (Deer Trail)—To begin small shipments from crosscut soon.

DEER TRAIL (Deer Trail)—Trucks used to haul copper ore.

REARDAN (Deer Trail)—Shipping copper ore to Trail smeltery.

WISCONSIN

Lead-Zinc District

HERCULES (Cuba City)—Reopening the old Rico property two miles east of Cuba City. R. A. Fox is general manager.

VINEGAR HILL (Platteville)—Kittoe mill being moved to Dale Rundell lease, at Livingston, where new shaft is being sunk. Another shaft just completed on Franklin Rundell lease, ore range being a continuation of Yewdall mine, to the west.

WISCONSIN ZINC CO. (Platteville)—Drilling shows ore deposits on Bourette and Kemper tracts west of Yewdall mine, at Livingston.

BURR MINING (Galena, Ill.)—Wrecking Burr mill, at Benton, for removal to Blewitt lease, one mile north of Galena, where shaft is being sunk. J. H. Billingsley, Galena, is general manager.

NEW JERSEY ZINC (Galena, Ill.)—New orebody developed at Penna Benton mine southwest of the old workings, at New Diggings.

CANADA

British Columbia

MANGANESE SHIPMENTS to Lebanon, Penn., have begun from properties near Kaslo.

CHROME (Rossland)—Prospecting valuable deposits near Velvet mine.

FIDDLER—(Skeena)—Development to begin this year.

GIBSON (Slocan)—Moving mile and half of tram from Trade Dollar to property.

ROSEBERY SURPRISE (Slocan) — Treating 150 tons per day at Rosebery mill.

HOBSON SILVER-LEAD (Ymir)—Shipping 50 tons daily of crude gold and silver ore.

Ontario

DOME MINES (South Porcupine)—Contractors driving crosscut on 1200 level toward boundary line of Dome Extension.

HILL GOLD (Matheson)—Has completed 70-ton mill. Charles Morris is mill superintendent.

ADANAC (Cobalt)—New vein of calcite-cobalt has been encountered at 310 level.

LA ROSE CONSOLIDATED (Cobalt)—Dividends to be discontinued, as management desires to conserve funds for development work on Violet property.

O'BRIEN (Cobalt)—New tube mill being installed. Present mill, now working to capacity, is insufficient for tonnage mined.

OPHIR (Cobalt)—Sufficient stock has been sold to provide funds for continuance of development to diabase Keewatin contact.

TECK HUGHES (Kirkland Lake)—To close, owing to abnormal costs of operation.

WRIGHT HARGRAVES (Kirkland Lake)—No. 1 vein has been cut at 400 level about 500 ft. north of main workings. Vein shows visible gold. Mill of 150 tons capacity to be installed.

OTISSE-ROBB (Matachewan) — Have been purchased by interests represented by Hayden, Stone & Co., of New York.

PATRICIA (Boston Creek)—Mill operating steadily, treating 40 tons per day. Two stopes have been opened at the 100 and one at the 200 level.

MEXICO

Chihuahua

CUSI-MEXICANA (Cusi)—To make regular ore shipments to Chihuahua smeltery. Bulkheads placed to protect the property when owners were forced to shut down have been removed and things found in good condition. William N. Fink is in charge.

Sonora

GREENE CANANEA (Cananea)—Production in June was: Copper, 4,100,000 lb.; silver, 143,500 oz. and gold, 1100 ounces.

The Market Report

SILVER AND STERLING EXCHANGE

Sterling Exchange	Silver New York, Cents	Silver London, Pence	July	Sterling Exchange	Silver New York, Cents	Silver London, Pence
4 7530	99⅝	48$\frac{13}{16}$	15	4 7530	99⅝	48$\frac{13}{16}$
4 7530	99⅝	48$\frac{13}{16}$	16	4.7530	99⅝	48$\frac{13}{16}$
.4 7530	99⅝	48$\frac{13}{16}$	17	4 7530	99⅝	48$\frac{13}{16}$

ew York quotations are as reported by Handy arman and are in cents per troy ounce of bar r, 999 fine. London quotations are in pence per ounce of sterling silver, 925 fine.

ILY PRICES OF METALS IN NEW YORK

Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
*26	†	8.05	7.75	8 40 @8 45
*26	†	8 05	7.75	8.40 @8.45
*26	†	8.05	7.75	8.40 @8.45
*26	†	8.05	7.75	8.40 @8.45
*26	†	8.05	7.75	8.35 @8.45
*26	†	8.05	7.75	8.35 @8.40

rice fixed by agreement between American er producers and the U. S. Government, accord- o official statement for publication on Friday, mber 21, 1917, and July 2, 1918.

o market.

e above quotations (except as to copper, the for which has been fixed by agreement between ican copper producers and the U. S. Govern- , wherein there is no free market) are our isal of the average of the major markets based ally on sales as made and reported by producers gencies, and represent to the best of our judg- the prevailing values of the metals for the eries constituting the major markets, reduced to of New York, cash, except where St. Louis is ormal basing point.

e quotations for electrolytic copper are for cakes, s and wirebars.

quote electrolytic cathodes at 0.05 to 0.10c. the price of wirebars, cakes and ingots.

otations for spelter are for ordinary Prime ern brands. We quote New York price at 35c. 00 lb. above St. Louis.

LONDON

Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
122	122	137	350	350	29½	54
122	122	137	350	350	29½	54
.	...	.	...	...	.	..
122	122	137	355	355	29½	54
122	122	137	365	365	29½	54
122	122	137	365	365	29½	54

e above table gives the closing quotations on on Metal Exchange. All prices are in pounds ng per ton of 2240 lb. For convenience in arison of London prices, in pounds sterling per lb., with American prices in cents per pound llowing approximate ratios are given, reckoning nge at \$4.7515.: £29½ = 6.2576c.; £54 = 11.4545c.; = 23.3333c.; £125 = 26 5151c.; £260 = 55.1513c.; = 59.3937c.; £300 = 63.6362c. Variations, £1 2121205c.

Metal Markets

NEW YORK—July 17, 1918

ere are interesting features in the ket this week, but the control of prices verything except zinc and antimony is that events are not reflected quota- lly as they used to be.

pper—There was a lively demand for er. Producers are straining every nerve to increase production. However, the refinery production in June was a little less than in May. The decrease is attributable largely to the shorter month. Matters of adjusting contracts, following the recent advance in price, are in statu quo.

Copper Sheets are not quoted, as there is a wide diversity in prices of different dealers. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots.

Tin—This market remains as it was. There are rumors that the price for Straits tin in Singapore will be regulated by Great Britain, but there have been such rumors previously. A lot of Banka tin afloat was sold in this market yesterday at 96c. Straits tin was quoted in Singapore at £353½ on July 11 and 12; at £355 on July 15; and at £362 on July 16 and 17.

Lead—There was an urgent demand for lead, including orders from consumers who had to have supplies immediately. Even such urgent orders could not be filled. In spite of the general inquiry, transactions were light, for the simple reason that producers had little or no lead to sell. There is a great shortage of this metal, and the situation is very tight and dangerous. It is not helped by one of the Western smelting works being operated at reduced capacity, owing to shortage of men.

China and Japan inquired for some round lots and succeeded in getting some bonded lead, but were unable to fill all of their requirements, notwithstanding offers to pay premiums. There were also inquiries from South America and from some European countries, which normally get lead from England, but now do not seem to be able to do so.

The present production of lead in Mexico is estimated at about 10,000 tons per month, which is about the rate of recent months. It is believed that this is approximately the Mexican maximum under present conditions, there being numerous impediments to operations. One of the most serious factors in Mexican lead production, just as in our own Western production, is the depletion of ore reserves, operating companies having been unable to keep developments so far ahead as they ought to and would normally do.

The mines and works at Penarroya, in Spain, have been closed since July 1 owing to strike of the 12,000 employees. These works produce about 72,000 metric tons of lead annually out of the Spanish total of about 210,000 tons.

Zinc—This market was very dull and continued to exhibit an easier tone. Some of the producers are well sold ahead, but many are not. In the latter part of the week some of the smaller western concerns were soliciting bids.

Our report of zinc statistics for the first and second quarters of 1918, compiled from returns from all the smelters, is as follows:

	First Quarter	Second Quarter
Production in Short Tons:		
Distilled	125,572	117,512
Electrolytic	8,096	9,404
Total	133,668	126,916
Stock at End of Quarter:		
At works	(a)	43,149
Elsewhere	(a)	2,932
Total	64,443	46,081
Total number retorts	198,894	196,580
Number retorts in use	124,072	110,956

(a) Not segregated in reports.

The reported stocks, as of Apr. 1 and July 1 respectively, include only what was in producers' hands, either at their works or held elsewhere. We shall comment upon the quarterly statistics in our next issue.

Zinc Sheets—Unchanged at \$15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Sheets are 42c. per lb. for 18 gage and heavier. Price established June 1 and continues to Sept. 1.

Antimony—A fair amount of business was reported, but this was largely on Government orders, demand from consumers being slow. We quote spot at 13⅛@13⅜c. We quote futures, July-August shipments, at 11¾@12c., c.i.f., in bond, equivalent to 12¾@13c., duty paid.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at \$1.50 per pound.

Nickel—Market quotation is 40@45c. per pound.

Quicksilver—Unchanged in New York at \$125@130. San Francisco reports by telegraph \$117, strong.

Gold, Silver and Platinum

Gold—Resumption of gold imports on a considerable scale by the United States during the last few weeks is indicated by the weekly reports of gold movements received by collectors of customs for the four weeks ended June 14 and made public July 11 by the Federal Reserve Board, says the "Sun."

The movement in favor of the United States for this period was \$19,410,000, compared with a net outward movement of \$509,000 for the preceding four weeks. Gold imports for the four weeks, totalling \$23,440,000, came largely from Canada, Mexico and Salvador, and gold exports totalling \$3,634,000 were consigned chiefly to Mexico, Colombia and Venezuela. The gain in the country's gold stock since Aug. 1, 1914, is estimated at \$1,066,078,000.

Silver—China buyers are outbidding the British and U. S. governments for silver, and, if allowed to export by the Federal Reserve Board, this demand will seriously interfere with shipments to India. The total exports of bar silver from San Francisco for the month of June amounted to 2,560,000 oz., and from New York to London for the week ended July 13 exports amounted to 200.700 ounces.

Mexican dollars at New York: July 11, 77; July 12, 77; July 13, 77; July 15, 77; July 16, 77; July 17, 77.

Platinum, Palladium and Iridium—Prices fixed at \$105, \$135 and \$175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., July 13.—Blende, per ton, high, \$76.20; basis 60% zinc, premium, \$75; Class B, \$60; prime western, \$55@50; calamine, per ton, 40% zinc, \$37.50@25. Average selling prices: Blende, \$50.80; calamine, \$34.59; all ores, \$50.44 per ton.

Lead, high, \$100; basis 80% Pb, \$97.50; average selling price, all grades of lead, \$96.26 per ton.

Shipments the week: Blende, 9436; calamine, 153; lead, 1114 tons. Value, all ores the week, \$591,960.

The activity of last week dropped to zero in midweek, when sellers asked an advance of \$2.50 per ton. By the week-end sellers were numerous enough, with ore for sale on last week's basis range, to supply the limited demand. Heavy purchasing last week gave buyers sufficient ore for shipping, and the shipment was above the output of the week.

Platteville, Wis., July 13—Blende, basis 60% zinc, highest price reported paid for premium grade was \$70 per ton; high lead blende advanced to \$52.50 per ton base. Lead ore, basis 80% lead, \$90 per ton base. Shipments reported for the week were 2339 tons blende, 257 tons galena and 1069 tons sulphur ore. For the year to date the totals are 70,625 tons blende, 3851 tons galena and 28,173 tons sulphur ore. During the week 2277 tons blende was shipped to separating plants.

Other Ores

Manganese Ore—Such lots of metallurgical ore as reached New York unsold were steadily absorbed on the basis of \$1.35.

Chrome Ore—Unchanged.

Molybdenum Ore—Small business was reported done at $1.25 per lb. of molybdenum sulphide in ore containing 90% or over. There was some foreign inquiry.

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight. Tonnage is extremely difficult to obtain. Domestic pyrites is selling at prices ranging from 20 to 25c. per unit, f.o.b. mine, according to delivery basis.

Tungsten Ore—The market was active, with prices ranging from $18 to $24.50 per unit. High-grade ores free from impurities are quoted at from $23.50 to $24.50 per unit; low-grade ores containing impurities are quoted at $18 to $22 on the basis of 60% or over.

Iron Trade Review

PITTSBURGH—July 16

The Carnegie Steel Co. will blow in its Zanesville furnace at the beginning of next week. This is a small detached furnace, producing about 150 tons of pig iron daily, and is only operated when there is a very heavy demand for pig iron and at the same time an assured supply of coke.

Pig-Iron—Apparently some pig-iron sales agents are influenced more by habit than by information, when they intimate that pig iron is cheap at present prices on the ground that furnaces are losing money. The Valley producers themselves make no such claim, but admit that they are making substantial profits. A few furnaces, particularly in Tennessee and Virginia, are having trouble with exceptional labor costs, due to slack performance, but it is doubtful whether even they are losing money. The prospective meeting of the American Pig Iron Association, to consider this difficult subject, has not been called and probably no meeting will be held. Steel works are fairly well supplied with pig iron and in few cases could they produce more steel if furnished more iron. A larger supply of good grades of scrap is what they need. Foundries are getting light deliveries of iron, but do not seem to be inconvenienced. The market remains quotable at the set limits: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40, while there are lower freights from six merchant furnaces outside the Valleys.

Steel—No soft steel is offered in unfinished form and very little discard steel, most of the latter being remelted at works. There is not much demand for discard steel. Set prices continue: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys—Demand for ferromanganese and spiegeleisen is light. There is less uneasiness about the future supply. Unfortunately, no precise count has been kept of the number of successive manganese scares there have been since Aug. 1, 1914. Ferromanganese remains at $250, delivered, for 70%, with $4 a unit for higher manganese content. Spiegeleisen is now very generally quoted at $75, furnace, for 16 to 18%, any delivery. This price first appeared a few weeks ago as applicable to early deliveries, but now the old $70 price is about wiped out. Sellers assert that they will not equalize freights.

Coke—The Carnegie Steel Co. is now operating practically full its first battery of 128 ovens at the Clairton byproduct plant, but output is not normal yet. The remaining four batteries may not be in full operation until late in the year. Since May 1 the byproduct coking capacity of the country has increased 20,000 tons a week, according to the reports made to the Geological Survey by operators, but actual outputs run only 90% of rated capacities. The Connellsville region is doing a shade better than a few weeks ago, but is still operating far below capacity, chiefly because the men are not working full time. Furnace coke is rarely offered in the market, but foundry coke is frequently offered, and some operators have been paying brokers small commissions. The market remains at the set limits: Furnace $6, foundry, 72-hour selected $7, crushed, over 1-in., $7.30, per net ton at Connellsville ovens. The Fuel Administration appears to have set prices of $5 on coke breeze passing inspection and $3 on that which does not, but nobody would pay anything like these prices for the Connellsville material. Screenings from old dumps are bringing up to [illegible] depending on skill and thoroughness in preparation.

STOCK QUOTATIONS

N. Y. EXCH.†	July 16
Alaska Gold M.	3⅛
Alaska Juneau	2¼
Am.Sm.& Ref.,com.	78⅝
Am. Sm. & Ref., pf	105
Am. Sm. Sec., pf., A	89⅜
Am. Zinc	19
Am. Zinc, pf	51
Anaconda	68¼
Batopilas Min	1⅛
Bethlehem Steel	81
Bethlehem Steel, pf.	‡88¼
Butte & Superior	28½
Butte Cop. & Zinc	11⅛
Cerro de Pasco	34
Chile Cop	16⅜
Chino	39½
Colo.Fuel & Iron	45½
Crucible Steel	65⅜
Crucible Steel, pf.	90½
Dome Mines	7½
Federal M. & S.	10½
Federal M. & S., pf.	33
Great Nor., ore ctf.	32¼
Greene Cananea	42½
Gulf States Steel	‡84
Homestake	71
Inspiration Con.	53
InternationalNickel	29¼
Kennecott	33¼
Lackawanna Steel	82¼
Mexican Petrol	98¼
Miami Copper	29⅜
Nat'l Lead, com.	59½
National Lead, pf	101½
Nev. Consol.	19¼
Ontario Min	11
Ray Con	24¼
RepublicI.&S.,com.	92
Republic I. & S., pf.	99⅝
Sloss-Sheffield	61
Tennessee C. & C.	19¼
U. S. Steel, com.	105⅜
U. S. Steel, pf.	‡111¼
Utah Copper	81⅜
Va. Iron C. & C.	71½

N. Y. CURB†	July 16
Big Ledge	1 1/16
Butte & N. Y.	‡.75
Butte Detroit	‡⅛
Caledonia	.45
Calumet & Jerome	1⅛
Can. Cop. Corpn.	1¾
Carlisle	‡2
Cashboy	.05
Con. Ariz. Sm.	1 13/16
Con. Coppermines	5¾
Con. Nev.-Utah	‡ 1/16
Emma Con.	.19
First Nat. Cop.	1 15/16
Goldfield Con.	.20
Goldfield Merger	.02
Greenmonster	‡⅜
Hecla Min	4 1/16
Howe Sound	‡4¼
Jerome Verde	.50
Kerr Lake	5.50
Louisiana	.50
Magma	‡32
Majestic	.22
Marsh	.05
McKinley-Dar-Sa.	.38
Milford	‡.75
Mohican	.06
Mother Lode	.37
N. Y. & Hond.	‡12⅛
Nipissing Mines	8.65
Nixon Nevada	.45
Ohio Cop	11/16
Rawley	‡2¼
Ray Hercules	4⅛
Richmond	‡.56
Rochester Mines	.38
St. Joseph Lead	14½
Standard S. L.	⅜
Stewart	.17
Success	‡.10
Tonopah	2⅝
Tonopah Ex.	1 11/16
Tribullion	‡ 1/16
Troy Arizona	.12
United Cop.	‡ 3/16
United Verde Ext.	39
United Zinc	‡1½
Utica Mines	‡.08

SAN FRAN.*	July 16
Alta	.03
Andes	.05
Best & Belcher	.03
Caledonia	03
Challenge Con.	03
Confidence	.04
Con. Virginia	.31
Gould & Curry	.01
Hale & Norcross	.01
Jacket-Cr. Pt.	.06
Mexican	.26
Occidental	.51
Ophir	.10
Overman	.02
Savage	.03
Sierra Nevada	.09
Union Con	.44
Utah Con	01
Belmont	2.90
Jim Butler	.56
MacNamara	.23
Midway	04
Mont.-Tonopah	.10
North Star	06
Rescue Eula	07
West End Con.	1 00
Atlanta	.03
Booth	.02
Comb. Frac	‡.02
Florence	.10
Jumbo Extension	.07
Kewanas	.02
Nevada Hills	02
Nevada Packard	.27
Round Mountain	.18
Silver Pick	.02
White Caps	.33
Big Jim	‡ 75
United Eastern	3.00

BOSTON EXCH.*	July 16
Adventure	.50
Ahmeek	77½
Algomah	.15
Allouez	50
Ariz. Com., ctfs.	13¼
Arnold	.20
Bingham Mines	9¾
Bonanza	.15
Butte-Balaklava	.25
Calumet & Ariz.	68
Calumet & Hecla	457
Centennial	12½
Copper Range	48
Daly West	1¾
Davis-Daly	6¼
East Butte	9½
Franklin	4¼
Granby	75
Hancock	6½
Hedley	‡12
Helvetia	.15
Indiana	.50
Isle Royale	26
Keweenaw	1
Lake	5¼
La Salle	2½
Mason Valley	3½
Mass	5¼
Mayflower	2¾
Michigan	2¾
Mohawk	59¾
New Arcadian	1¾
New Idria	‡14
North Butte	14¾
North Lake	.65
Ojibway	.60
Old Dominion	42
Osceola	52
Quincy	69
St. Mary's M. L.	50
Santa Fe	.65
Seneca	10½
Shannon	4¼
Shattuck-Ariz	15½
So. Lake	1⅜
So. Utah	.18
Superior	4¾
Superior & Bost.	2 1/16
Trinity	3½
Tuolumne	1 3/16
U. S. Smelting	42
U. S. Smelt'g, pf.	43½
Utah Apex	1¾
Utah Con	9¾
Utah Metal	2 1/16
Victoria	2½
Winona	1½
Wolverine	28
Wyandot	.50

BOSTON CURB*	July 16
Alaska Mines Corp.	.12
Boston Ely	.80
Boston & Mont.	.52
Butte & Lon'n Dev.	.13
Calaveras	.75
Calumet-Corbin	‡.01
Chief Con.	2½
Cortez	.07
Crown Reserve	.15
Crystal Cop.	.22
Eagle & Blue Bell	2⅜
Gila Copper	‡17
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	18½
Mexican Metals	.38
Mines of America	1⅛
Mojave Tungsten	.09
Nat. Zinc & Lead	.14
Nevada-Douglas	.50
New Baltic	.90
New Cornelia	18
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.10
Yukon Gold	1

SALT LAKE*	July 11
Bannack	‡.26
Cardiff	2.00
Colorado Mining	.07½
Daly	1.92
Empire Copper	‡.92
Gold Chain	‡.05
Grand Central	.30
Iron Blossom	.42½
Judge	5.50
Lower Mammoth	‡.03
May Day	.01½
Moscow	‡.05
Prince Con.	.48
Rico Wellington	.11
Silver-King Coal'n	1.17½
Silver King Con.	1.80
Sioux Con.	.02
So. Hecla	.69
Tintic Standard	‡1.91
Uncle Sam	.02
Walker Cop.	1.50
Wilbert	.07½
Yankee	.02

TORONTO*	July 11
Adanac	.08½
Bailey	03
Beaver Con.	.23
Chambers Ferland	.12
Coniagas	2.75
Hargraves	.04½
La Rose	.35
Peterson Lake	09½
Temiskaming	.30½
Wettlaufer-Lor.	.04
Davidson	.35
Dome Exten	.09
Dome Lake	.14
Hollinger	4.60
McIntyre	1.31
Newray	.15
Porcu. Crown	.13
Teck-Hughes	.19
Vipond	.12
West Dome	.07½

STOCK QUOTATIONS—Continued

COLO. SPRINGS	July 16
Cresson Con.	4.50
Doctor Jack Pot	.03
Elkton Con.	.04
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.62
Granite	.19½
Isabella	.04½
Mary McKinney	.05½
Portland	.80
United Gold M.	.13
Vindicator	.40

LONDON	Apr. 15		
Burma Corp.	£4	0s	0d
Cam & Motor	0	11	0
Camp Bird	0	7	9
El Oro	0	8	6
Esperanza	0	8	6
Mexican Mines	5	5	0
Min. Corp.Can.	0	16	3
Nechi, pfd	0	10	6
Oroville	0	17	9
St. John del Rey	0	16	6
Santa Gert'dis.	0	12	9
Tomboy	0	17	3

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar	57.935	73.861	88.082	27.597	36.410	43.62
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	......	30.000	40.110	...
Aug.	66.083	85.407	......	31.498	43.418	...
Sept	68.515	100.740	......	32.584	50.920	...
Oct.	67.855	87.332	......	32.361	44.324	...
Nov	71.604	85.891	......	34.192	43.584	...
Dec.	75.765	85.960	......	36.410	43.052	...
Year	65.661	81.417	......	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.00
Feb.	31.750	23.500	137.895	110.000	148.100	125.00
Mar.	31.481	23.500	136.750	110.000	151.000	125.00
April	27.935	23.500	133.842	110.000	147.158	125.00
May	28.788	23.500	130.000	110.000	142.000	125.00
June	29.962	23.500	130.000	110.000	142.000	125.00
July	26.620	......	128.409	......	140.409	...
Aug.	25.380	......	122.391	......	137.000	...
Sept.	25.073	......	117.500	......	135.250	...
Oct.	23.500	......	110.000	......	125.000	...
Nov.	23.500	......	110.000	......	125.000	...
Dec.	23.500	......	110.000	......	125.000	...
Year	27.180	......	124.892	......	138.401	....

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.22
February	51.420	92.000	198.974	311.52
March	54.388	(a)	207.443	318.87
April	55.910	(a)	220.171	329.90
May	63.173	(a)	245.114	364.21
June	62.053	(a)	242.083	331.92
July	62.570	......	242.181	....
August	62.681	......	243.978	....
September	61.542	......	244.038	....
October	61.851	......	247.467	....
November	74.740	......	274.943	....
December	87.120	......	298.556	....
Av. year	61.802	......	237.563	....

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	191
January	7.626	6.782	7.530	6.684	30.500	29.5
February	8.636	6.973	8.595	6.899	30.500	29.5
March	9.199	7.201	9.120	7.091	30.500	29.5
April	9.288	6.772	9.158	6.701	30.500	29.5
May	10.207	6.818	10.202	6.704	30.500	29.5
June	11.171	7.611	11.123	7.511	30.500	29.5
July	10.710	......	10.644	......	30.500	...
August	10.594	......	10.518	......	30.500	..
September	8.680	..	8.611	......	30.500	..
October	6.710		6.650	......	30.500	.
November	6.249	...	6.187	......	30.500	.
December	6.375	...	6.312	......	30.500	.
Year	8.787	......	8.721	......	30.500	..

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	191
January	9.619	7.836	9.449	7.661	48.329	54.0
February	10.045	7.814	9.875	7.639	47.000	54.0
March	10.300	7.461	10.130	7.286	47.000	54.0
April	9.459	6.890	9.289	6.715	54.632	54.0
May	9.362	7.314	9.192	7.114	54.000	54.0
June	9.371	8.021	9.201	7.791	54.000	54.0
July	8.643		8.473	..	54.000	
August	8.360		8.190		54.000	
September	8.136		7.966		54.000	
October	7.983		7.813		54.000	
November	7.847		7.672	.	54.000	
December	7.685	.	7.510	..	54.000	
Year	8.901	.	8.813	.	52.413	

New York and St. Louis quotations, cents per poun London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No 2 Foundry	
	1917	1918	1917	1918	1917	191
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33
February	36.37	37.25	30.95	33.95	30.95	33
March	37.37	37.25	33.49	33.95	35.91	33
April	42.23	36.15	38.90	32.95	40.06	33
May	46.94	36.20	42.84	33.00	43.60	34
June	54.22	36.36	50.05	33.16	50.14	34
July	57.45		53.80	.....	53.95	
August	54.17		50.37	....	53.95	
September	46.40		42.24	.....	48.58	
October	37.25		33.95	...	33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from ware-ise, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
. 10	4.25	5 52	5 52	6.50	5 495	9 50
. 12	4.30	5.57	5 57	6 55	5.545	9 55
. 14	4.35	5.62	5 62	6 60	5 595	9.60
3lack						
s. 18 and 20	4.80	6 32	6 32	7 40	6.295	9 80
s. 22 and 24	4.85	6 37	6 37	7 45	6 345	9 85
26	4 90	6.42	6 43	7 50	6.395	9 90
28	5.00	6 52	6 52	7 60	6.595	10 00
Galvanized:						
10	5.25	6.97	6 97		6 845	. . .
12	5.35	6.97	6 97	7 95	6 795	
14	5.35	6.97	6.97	8 10	6 945	11 65
s. 18 and 20	5.65	7.17	7.17	8.25	7 245	11 85
s. 22 and 24	5.80	7.32	7.32	8 40	7 295	12.55
26	5.95	7.47	7 47	8.55	7.445	12.70
28	6.25	7.77	7.77	8 85	7.745	13.00

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is rged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
ndard bessemer rails	$55.00	$38.00	$65.00	$38.00
ndard openhearth rails	57.00	40.00	67.00	40.00
ht rails, 8 to 10 lb	3.13½*	63.00	3.13½*	68.00
nt rails, 12 to 14 lb	3.09*	62.00	3.09*	67.00
nt rails, 25 to 45 lb	3.00*	60.00	3.00*	65.00

Government price per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. sburgh for carload lots, together with the warehouse prices at the places ned:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
ndard railroad spikes, 9/16-in. nd larger	$3.90	$4.50	$4.50	$5,30	$6.70
ck bolts	4.90	6.25	5.50	Premium	8 00
ndard section angle bars	. . . .	. . . .	4.45	Premium	5.15

STRUCTURAL MATERIAL—The following are the base prices f. o. b. , Pittsburgh, together with the quotations per 100 lb. from warehouses at the es named:

	Mill, Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
ms, 3 to 15 in.	$3.00	$4.245	$5.25	$4 27	$4.27	$5 25	$5.50
nnels, 3 to 15 in.	3.00	4.245	5.25	4 27	4 27	5 25	5.50
les, 3 to 6 in. ¼ in. ick	3 00	4.245	5.25	4 27	4.27	5 25	5.50
s, 3 in. and larger	3.00	4.245	5.30	4.27	4.27	2.55	5 50
es	3.25	4.495	9 00	4.52	4 52	5.50	6 50

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. sburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4–5	$3.10

RIVETS—The following quotations are per 100 lb.:

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
STRUCTURAL							
and larger	$4.65	$6.145	$7.00	$5 57	$5 55	$7 15	$8.00
CONE HEAD BOILER							
and larger	4 75	6.245	7.10	5.67	5 65	7 25	8 00
d 11/16	4.90	6.395	7.25	5 82	5 80	7 40	8 15
d 5/16	5 25	6 745	7 60	6 17	6 05	7 75	8 50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and anized are as follows:

	New York and St. Louis
vanized iron rigging	List + 20%
vanized cast steel rigging	Net List
ht plow steel	30%
ht cast steel	17½%
ht iron and iron tiller	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities ned:

	Mill Pittsburgh	Cincinnati	Chicago	St Louis	Denver	Birmingham
ight	$5.25	$7.50	$7 00	$6 25	$8 00	$7 50
orted	5.40	7.50	7.15	6.40	8.25	7 75

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh

on bars . . . . . . 3.5c. Steel bars . . . 2 [illegible]

COAL BIT STEEL—Warehouse price per pound is as follows:

v York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
0 12	$0.16½	$0 18	$0 18	$0 17	$0 12

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	15c	14c.	15c.
Hollow	24c.	25c.	. . .

PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
BUTT WELD					
⅛, ¼ and ⅜	44%	17%	¾ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			
LAP WELD					
2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%
BUTT WELD. EXTRA STRONG PLAIN ENDS					
⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			
LAP WELD. EXTRA STRONG PLAIN ENDS					
2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
¾ to 3 in. butt welded	33%	43%	41.9%
3½ to 6 in. lap welded	15%	39%	37.9%

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
¾ to 3 in. butt welded	16%	28%	26.9%
3½ to 6 in. lap welded	3%	25%	23.9%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 5 and 5%.

MISCELLANEOUS

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil	$0.56	$0.61	$0.30	$0.27
Pure destructively distilled pine oil	.49	.54	.30	. . . . .
Pine tar oil	.35	.36	.24½	.19
Crude turpentine	.40	. . . . .	.44	.38
Hardwood creosote	.23	. . . . .	.34½	.31

* F.o.b. Cadillac, Mich.

SODIUM CYANIDE—New York price is 39c. per lb.; Denver, 44c.; Chicago, .385; St. Louis, 45c.

SODIUM SULPHIDE—In New York the price per pound is 4c. to 4¼c. for concentrated, 2¼c. to 2½c. for crystals. The Denver price for crystals is quoted at 9c.; the St. Louis price, 7c. for concentrated; the Chicago price is 6c. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb. in 1600-lb. barrel; Chicago, 16¾c.; Denver, 13c. f.o.b. Pueblo; St. Louis, 20c.

ALUMINUM DUST—Chicago price is $1.65 per lb.

CALCIUM CARBIDE—Price f.o.b. cars at warehouse points east of Mississippi River (except in Alabama, Georgia and Florida) is $97.50 for Cameo. $102.50 for Union miners' carbide. In territory between Mississippi River and the Rockies and in Alabama, Georgia and Florida, add $5; west of Rockies, add $10 to $15.

LINOLEUM—No orders being taken, owing to shortage of manufacturing materials.

HOSE-

Fire

	50-Ft. Lengths
Underwriters' 2½-in	75c. per ft.
Common, 2½-in	33⅓%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.60	$0.35	$0.30

Steam Discounts from List

First grade...... 25% Second grade......30% Third grade.......40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	40 + 5%	40%
Chicago	45%	40 + 5%
Birmingham	30%	40%
Denver	35%	30%
Cincinnati	40—10%	

RAWHIDE LACING—40—5% off list.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft. ¾-in., 6; ⅞-in., 4½; 1-in., 3⅓; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0 34½	Denver	$0 35½
New York	36	Kansas City	34
Cincinnati	33¼	San Francisco	32
Chicago	.33	Seattle	.34
St. Paul	.34	St. Louis	.34

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Chrome brick	net ton	$175.00
Chrome cement	net ton	75.00
Clay brick, 1st quality fireclay	per 1000	50.00— 55.00
Clay brick, 2nd quality	per 1000	35.00— 40.00
Magnesite, raw	ton	30.00— 35.00
Magnesite, calcined	ton	32.00— 35.00
Magnesite, dead burned	net ton	32.00— 35.00
Magnesite brick, 9 x 4½ x 2½ in	net ton	110 00—125.00
Silica brick	per 1000	50.00— 60.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000

St. Louis—High grade, $55; St. Louis grade, $40.
Birmingham—Fire clay, $55–60; silica, $55–60.
Chicago—Second quality, $25 per ton.
Denver—Silica, $35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
St. Louis	No. 1 White Oak	$1.10	$0.95
Chicago	Plain	1.33	1.18
Chicago	Creosoted	1.65	1.45
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2.70	1.92

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	Cincinnati	Chicago	St. Louis	Birmingham	Denver
Cup	7	5¼	13 0	7½	12
Fiber or sponge	8	6	13.	7½	20
Transmission	7	6	13.	7½	20
Axle	4½	4	3.8	3	5½
Gear	4½	4½	7.0	7½	9
Car journal	22 (gal.)	3½	4.3	3	8

COTTON WASTE—The following prices are in cents per pound:

	New York			
	Current	One Year Ago	Cleveland	Chicago
White	11 00 to 13 00	13.00	16 50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	$52.00	$58.00
Chicago	48.00	50.00

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$1.65	$1 31	$1 75	$1 32	$1 72	$1 32
5-gal. cans	1.75	1 41	1 90	1 42	1.92	1 37

* Nominal

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
25- and 50-lb. kegs	12 38	12 83	13 25	13.50	12.38	13 00
12½-lb. keg	12 60	13 05	13.50	13 50	12 60	13.25
100-lb. keg	12 15	12 60	13 75	14 00	12 15	
5-lb. cans	13 95		15 25	15 50	13 95	13 50
1-lb. cans	14 85				14 85	...

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	$2 50*	List	$1 40	$1 65	$1 05	$3 00
Hot pressed hexagon	2 50*	List	1 20	1 50	85	3 00
Cold punched square	2 50*	List	75	1 40	1 00	1 75
Cold punched hexagon	2 50*	List	75	1 40	1.00	2.25

* List price

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	30—5%	46%	45%
Larger and longer up to 1 in. by 30 in.	15%	40%	45%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York........ $2.50 Cleveland....... $3.00 Chicago........ $2.5
For cast-iron washers the base price per 100 lb. is as follows:
New York........ $5.00 Cleveland....... $4.00 Chicago........ $3.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing	Gelatin			Black
	20%	40%	60%	80%	Powder*
New York	......	$0.27½	$0.34½	....	$2.40
Boston	$0.24¼	.27¼	.34¼	.41¾	2.40
Kansas City	.20	.26¼	.33¼	.43¼	2.45
Seattle	.17½	.23¾	.31¾	.41¾	....
Chicago	.18¾	.22¾	.33	.43	2.35
St. Paul	.19	.23	.28	.43¼	2.75
St. Louis	.19	.26¼	.33¼	.43¼	2.35
Denver	.18	.25¼	.32¼	.42¼	2.45
Dallas	.23	.30½	.37½	.47½	....
Los Angeles	.22	.28	.36	....	....
San Francisco	.17¼†	.23½†	.30½†	.40½†	....

* Per keg. † In carload lots.

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tarfelt (14 lb. per square of 100 sq. ft.)	$64	$65
Tar pitch (in 400-lb. bbl.)	21	22
Asphalt pitch (in barrels)	37	42
Asphalt felt	72.50	77.20

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No' 1 grade	$1.30	$1.55	$1.60	$1.75	$1.90	$2.50
No. 2 grade	1.15	1.30	1.45	1.60	1.75	1.90

Asbestos asphalt-saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.95 per roll in carload lots and $2.20 for smaller quantities.

Shingles, red and green slate finish, cost $5.25 per square in carloads, $5.50 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul	.056	.11	.162
Kansas City	0786	.15	.205
Seattle	.07	.11	.16
Los Angeles	.0633	.1071	.1966
Cincinnati	.069	.129	.174
Chicago	.072	.134	.....

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Y. P.	Fir	Hemlock	Spruce	Y.P.	Fir
Boston			Government only			
Cincinnati	$39.00	......	$38.00	......	$43.00	$42.00
Kansas City	37.25	38.00	......	......	39.25	40.00
Seattle	24.50	24.50	$24.50	$24.50	24.50	24.50
St. Paul	......	52.00	47.50	47 50	......	64.50
Denver	35.00	......	......	32.00	......	39.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Boston			Government only		
Cincinnati	$45.00	......	$41.00	$44 00	$40.00
Kansas City	46.25	$53.00	53.00	49.00	58.00
Seattle	24.50	24.50	24.50	24.50	24.50
St. Paul	62.50	40 00	43.00	43.50	43.50
Denver	35.00	32.00	32.00	......	32.00

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.50	$4.50	$4.75	$4.32	$5.05
Cut	4.00	5.40	....	4.47	6.40

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Current	One Month Ago	One Year Ago
New York	$2.59	$2.59	$2 22
Jersey City	2 50	2.50	2 16
Boston	2 81	2.81	2 77
Chicago	2 45	2.36	2 31
Pittsburgh	2 45	2.46	2 31
Cleveland	2 68	2.59	2 44
Denver	3.39	3.40	2 39

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16 50	$13 50	$2 35	$2 10
Kansas City	21.20	19 20	2 15	2 05
Chicago	18 00	17.50	1.80†	1.10†
St. Louis	14 00			1 50
Boston	22 50	17.00	3 45	3 15
Dallas	16 50			
San Francisco	17 00			1 90
St. Paul	17 00	14 00	1.35†	1 25†
Denver	25 00	......	....	2 30
Seattle	23 00		....	2 50
Cincinnati	13.70	13.40	.....	

† 200 lb. barrels.

Note—Refund of 10c. per bag, amounting to $2 per ton.

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olume 106 Number 4

LOWER VEIN OF ALUNITE, DEPOSITS OF WHICH OCCUR NEAR SULPHUR, HUMBOLDT COUNTY, NEVADA

Recently Recognized Alunite Deposits At Sulphur, Humboldt County, Nevada

BY I. C. CLARK[*]

Alunite, the sulphate of potash and aluminum, is a valuable source of the salts of both elements. The grade of alunite found at Sulphur, Nev., in certain fissures, is high, and the deposit shows considerable promise. The only other known commercial deposits of alunite are in the Marysvale district of Utah. The treatment of alunite is a comparatively new industry in this country, but has been practiced abroad for many years. At Marysvale the Minerals Product Company recently installed a plant and worked out the details for the commercial extraction of potash.

THE alunite deposit near Sulphur, Humboldt County, Nev., was discovered and located in the spring of 1917. Depressions marking the out ops of the veins were prominent and had for years en known to exist. Several small cuts and tunnels had een driven into the fissures, but the prospectors, not nding gold or silver, soon abandoned their work. Alu te was known locally as "burnt lime," and was considered worthless. It seems unusual that such pronounced deposits escaped detection for so long; apparently no one tried to find out the true nature of the material.

Upon returning from the examination of a cinnabar prospect in April, 1917, I noticed the outcrops of alunite and the small dumps from the cuts and tunnels. Samples were taken and the material was definitely classified as alunite. The first sample analyzed contained 10.5% K_2O. Immediately after this determination, the claims were located and surveyed, as shown in Fig. 1, under the direction of the U. S. mineral surveyor of that district. Arrangements were made for the purchase of several claims previously located for silver, antimony, or other deposits, which were in conflict with the alunite group. The required location work on each claim was performed, and all location notices and deeds were recorded at Winnemucca with the county recorder of Humboldt County, Nevada.

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[*] Mining engineer, Salt Lake City, Utah.

The alunite group of 22 lode-mining claims covers an area of more than 400 acres. The ground is situated about two miles northeast of Sulphur, Nev., a station on the Western Pacific R.R. Sulphur is about midway between Salt Lake City and San Francisco and is 45 miles west of Winnemucca, county seat of Humboldt County. This district is known locally as the "Black Rock mining district," the Humboldt range of mountains bordering the Black Rock Desert on the east.

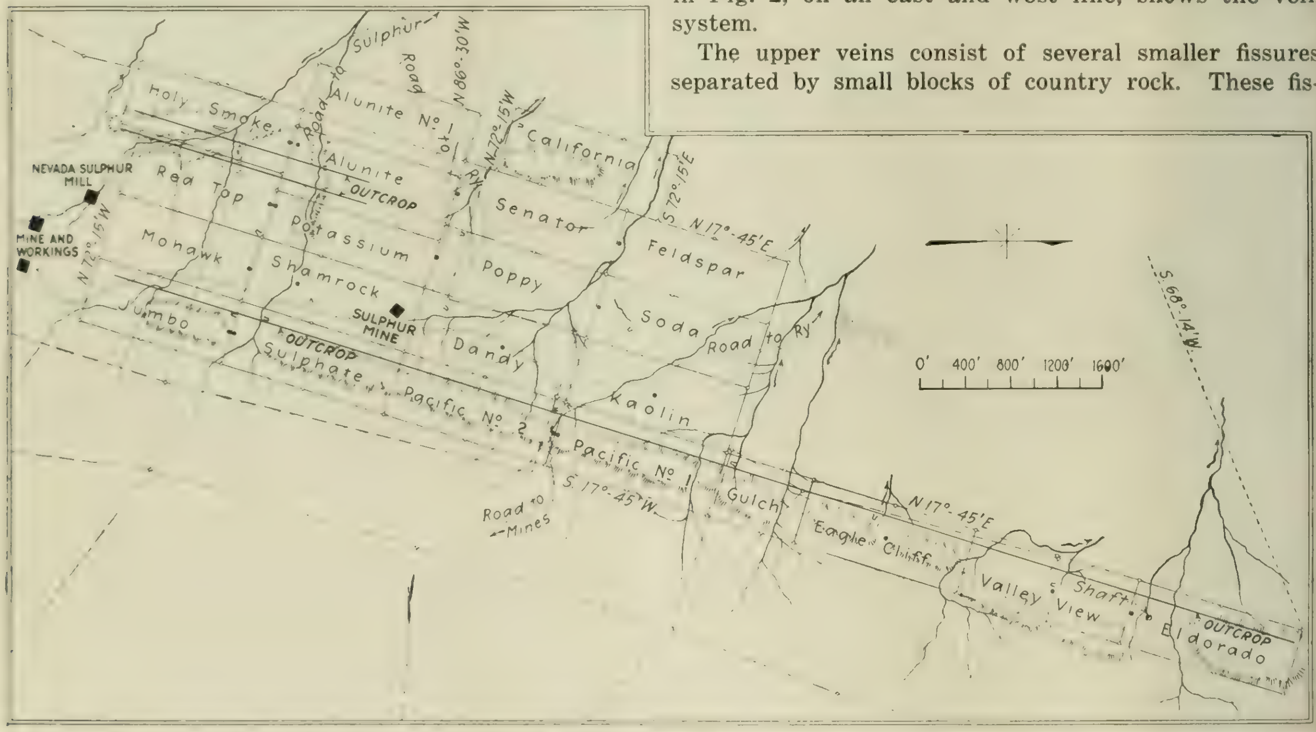


FIG. 1 TOPOGRAPHY OF ALUNITE CLAIMS, BLACK ROCK MINING DISTRICT, HUMBOLDT COUNTY, NEVADA

Unusual transportation facilities are afforded by the geographical position of the property. Eight thousand feet of track will connect the mine ore bins with the Western Pacific main line. It has been estimated that this road can be built for about $15,000, using good second-hand ties and rails, which can be procured in the vicinity. Comparatively little grading will be necessary for the construction of the roadbed. The grade is less than 2% for the most part, the maximum for a few hundred yards near the mine terminus not exceeding 4 per cent.

Sulphur is 4000 ft. above sea level. The mine is situated in the foothills of the Humboldt Mountains, the highest point on the property being less than 5000 ft. elevation. The absence of rough mountain conditions greatly diminishes the difficulties of operation. Although cold in winter, the climate is dry, and little snow falls. The summer days are dry and hot, but the nights are cool. Sufficient water for domestic purposes can be obtained without difficulty, but large quantities for a reduction plant are not available without development. Mining timber is shipped in from the west, coal from Utah or Wyoming and oil from California.

The Humboldt range of mountains was formed by a volcanic uplift during the Tertiary period. The principal rock on the alunite property is a rhyolite breccia, covered over in part by volcanic ash or tuff and wash. The shore line of ancient Lake Lahontan is traceable along the foot of the mountains, accounting in part for the wash deposited in such quantities. The rhyolite is a hard, brittle rock, resistant to erosion. It has been fractured in a direction nearly magnetic north and south, and some faulting is to be noticed parallel to the main fractures. Three parallel veins have been determined thus far, each with unusually strong outcrops, persisting for great distances on the surface. An approximate cross section of the property, indicated in Fig. 2, on an east and west line, shows the vein system.

The upper veins consist of several smaller fissures separated by small blocks of country rock. These fissures are from two to five feet wide, and are filled with a pure, hard, white, lustrous alunite having a fibrous or woody texture. This alunite contains from 9 to 11.6% K_2O, closely approximating the theoretical composition of alunite in its potash, alumina and other constituents, and the lime, silica and iron content is low. The fissuring of this vein system can be traced for two miles, alunite itself being exposed on the surface for several thousand feet.

The middle vein, about 1400 ft. west of the upper series, is 15 ft. wide at the surface and 20 ft. wide at the bottom of a 65-ft. shaft. On and near the outcrop the ore has been partly decomposed by weathering and the potash leached from the alunite. The ore at the surface is rather soft and powdery, but becomes harder with depth. Samples from the outcrop contain about 2% K_2O (as sulphate), but at 65 ft. depth the ore averages 4% K_2O over the entire 20-ft. width. The alumina content varies from 15 to 30%, the lower results coming from the surface ore.

It is probable that at greater depths this fissure will contain alunite unaltered by surface agencies, for it is readily apparent that the upper portions of a vein of such width could be acted upon by atmospheric agencies, and this is especially evident when the vein matter is more easily decomposed than the surrounding rock.

The third or lower vein is from 7 to 10 ft. wide and contains a high-grade alunite, though the ore is somewhat softer than that found in the upper series. The potash content of this alunite varies from 7 to 10.5% K_2O and the alumina content is about 33%. These last two veins can be traced at least 2000 ft. south from the point of discovery. Wash and volcanic ash have buried the outcrops north of this point, but prospecting can be expected to prove their continuity for a similar distance in that direction.

The composition of alunite as given by Dana is: Al_2O_3, 37.0%; SO_3, 38.6%; K_2O, 11.4%; H_2O, 13.0%. Some analyses made of Sulphur alunite are as given in Table I (the soda content in these is abnormally high).

TABLE I. ANALYSES OF THREE SULPHUR ALUNITE ORES

	No. 1	No. 2	No. 3
Insol. (SiO_2)	0.9%	1.6%	2.0%
Al_2O_3	37.4	37.52	37.9
Na_2O	2.31	2.36	2.27
K_2O	8.63	9.54	9.10

When exposed to atmospheric conditions for long periods alunite gradually decomposes into a white, chalky, powdery mass. The potash is replaced partly by ferric oxide, staining the rock a reddish brown. This action is clearly shown on the several small alunite dumps on the property that have been exposed to the weather for years, and along old water courses in the various alunite fissures these brown stains are also noticeable.

The depressions marking the outcrops of known alunite fissures are characteristic. Other similar depressions have been noted on the property, though they have not been prospected. Indications lead to the supposition that other fissures of alunite will be discovered between the veins already proved. Large areas of the rhyolite have been covered with a comparatively shallow deposit of volcanic ash, cemented together with impregnations of silica, sulphur and other minerals as fumerole deposits. Similar deposits in this district have been mined for their sulphur content for years. The deposits of ash on the alunite property may have buried alunite fissures which can be discovered only by underground prospecting.

The probable origin of the Sulphur alunite deposits may be from deep-seated feldspar formations or from beds that were subjected to the action of hot, sulphurous vapors. The feldspars were partly decomposed and the vapors enriched with potash, alumina, silica and other minerals. The hot vapors and solutions ascended through the open fissures, depositing their potash and alumina content as sulphate, forming alunite as the temperature and pressure decreased. Silica was also deposited, as shown by a quartz lining on the walks of the alunite fissures. Similar vapors no doubt account for the sulphur deposits in the volcanic ash. The alunite deposits are thus probably of deep-seated origin, and may continue to considerable depths without change. Alunite is known to exist at the Marysvale, Utah, deposits over a vertical distance of 1100 ft., taken from the different elevations of points on outcrops.

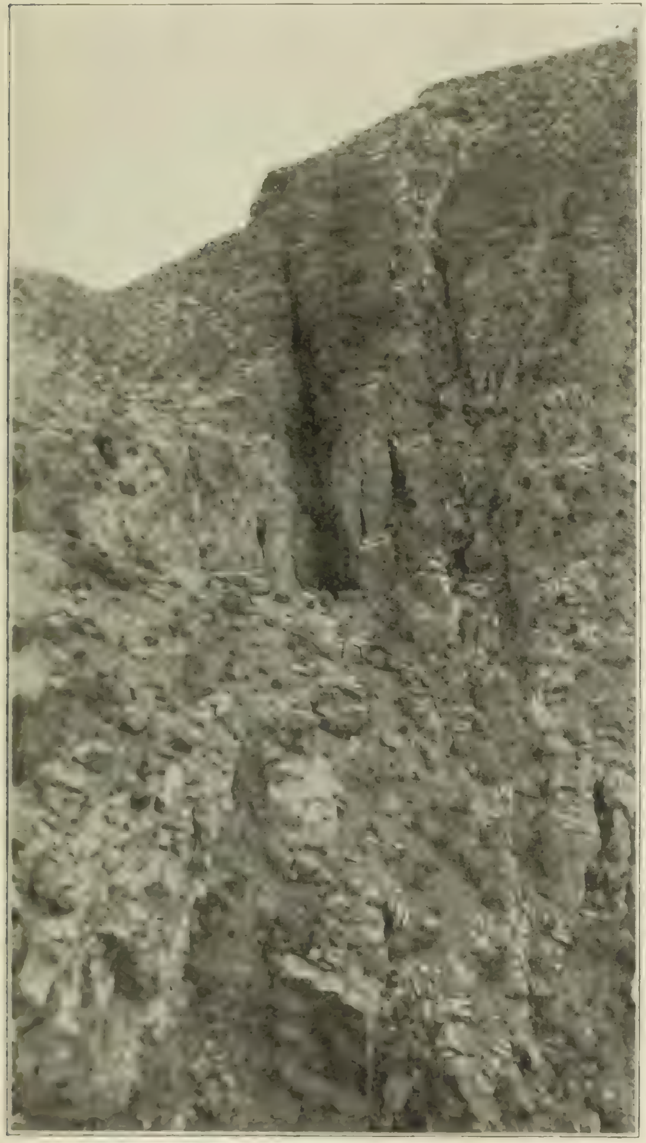
The specific gravity of alunite is 2.82, a cubic foot weighing 175 lb. in place. Assume the Sulphur alunite to weigh approximately 165 lb. per cu.ft., or 12 cu.ft. per short ton, and a column of alunite 1 x 1 x 12 ft. will weigh one ton. Assuming a fissure width of 12 ft., a block of ore 1000 ft. long and 100 ft. deep will contain 100,000 tons. The middle fissure alone, and the upper and lower fissures combined, have a greater width than 12 ft. If the length of the fissures is assumed to be 1000 ft., 200,000 tons of alunite will be developed for each 100 ft. gained in depth.

OLD PROSPECT TUNNEL IN MIDDLE VEIN, LOOKING NORTH

DEVELOPED BY 65-FT. SHAFT AND 325 FT. IN ADITS

Approximately 500 ft. of development work has been done underground during the last year. This has been more largely from the standpoint of prospecting than for permanent development, but several thousand tons of alunite averaging from 7 to 11.5% K_2O have been opened up. The principal work is 150 ft. of tunnel on upper veins, exposing 3000 tons of ore; 175 ft. tunnel on lower vein, showing 7000 tons of ore; 65-ft. shaft (vertical) sunk on middle vein, exposing large quantities of low-grade ore, a cross-cut at the bottom of this shaft showing the vein to be 20 ft. wide; prospecting pits and trenches sunk on outcrops of the veins to prove their continuity.

The proposed adit development, as shown in Fig. 2, would prove excellent for future mining as well as prospecting. It would cut the lower two fissures at a depth of 50 to 175 ft. (depending upon contour of surface) within a distance of 275 ft. The total length of this cross cut to cut all the veins would be less than 1700 ft. The known fissures would thus be developed and the probable fissures, already mentioned, prospected. A large tonnage of ore could be mined above this tunnel level by means of drifts driven on the strikes of the veins at their intersection with the main crosscut. The present work has all been done above this level along the strike or dip of the veins. Greater depth for future operations can readily be obtained by sinking a working shaft near the portal of the proposed tunnel.



OUTCROP OF ALUNITE FISSURES ON SIDE OF BOX CANYON, NEAR SULPHUR, NEVADA

Several processes have been developed for the commercial reduction of alunite to a marketable product. A partial calcination will convert it to the soluble potash alum. Calcination at a higher temperature will render the potash soluble as K_2SO_4 and the alumina insoluble as Al_2O_3. The calcined material may be marketed directly after calcination, or the potash leached out as high-grade potassium sulphate and a residue formed of nearly pure alumina. Both of these products are of commercial value. Other processes combine various roasting and water leaching methods, leaching with sulphuric acid, and other metallurgical treatment. The plant of the Mineral Products Co., at Marysvale, Utah, is described by V. C. Heikes, of the U. S. Geological Survey, in Bull. 620 (1915) p. 265:

> From the ore bins at the mill the alunite passes through a gyratory crusher, then through a set of rolls, and thence is delivered to a storage bin. This material is mixed with powdered slack coal and is fed into a rotary kiln, in which it is roasted. The roasted material is elevated to a storage bin, from which it is drawn off into a digester. In the digester it is mixed with water, and the sulphate of potassium dissolved out. The charges from the digesters are stored in wooden tanks. From these tanks the mixture is pumped into a filter press, where the insoluable alumina and the water-soluble potash are separated.
>
> The solution is then evaporated in triple-effect vacuum pans. The sulphate of potassium crystals are separated out, drained, and dried. The dried powder is pulverized, screened, and sacked for shipment.
>
> The boiler plant uses slack coal for fuel. Boilers having a rating of 600 hp. produce steam for driving three engines, running the machinery of the plant. The exhaust steam is used for evaporating the solutions and drying the product.
>
> The capacity of the first unit of the plant is estimated to be from 25 to 35 tons of sulphate of potassium a day. In addition to the valuable sulphate of potassium, the operators expect to gain some return from the filter cake left after the potash solution has been removed from the calcined material. This cake consists of nearly pure alumina and may be used for making refractory brick, for it is reported to withstand temperatures as high as 2020° C. It may also prove to be available for making aluminum.

The plant described has been in operation for some time and is the largest plant of its type in the country. At least one other plant has been operated at Marysvale, and several plants are either contemplated or in the process of erection.

BYPRODUCT OF SULPHURIC ACID YIELDED IN ORE TREATMENT

Alunite has been mined for many years in foreign countries as a source of potash alum. Its production in this country is comparatively recent, and so far principal attention has been given to its potash content. Potassium sulphate is now being extracted from alunite on a commercial scale. The alumina residue and sulphuric acid byproducts will no doubt find commercial use in the near future. W. T. Schaller, of the U. S. Geological Survey, has made the following observations (Bull 620, p. 264):

> Laboratory experiments showed that on igniting the powdered alunite all of the water and three-fourths of the sulphuric acid are volatilized. On leaching the residue with water, the potassium sulphate is dissolved, leaving the insoluable aluminum oxide behind.
>
> The average amount of potassium sulphate leached from the ignited mineral powder is 17.9% of the original material used. As the coarsely crystallized alunite was found to contain 19.4% of potassium sulphate [about 10.5% K_2O] 92% of the total potash present was obtained by simple ignition and subsequent leaching.
>
> It is worth noting that, according to the laboratory experiments, 32.7% of the ignited alunite consists of available potassium sulphate, which can be extracted by simple water leaching and evaporation. The remaining 67.3% consists of nearly pure aluminum oxide.

The manufacture of metallic aluminum from the alumina residue of calcined alunite is feasible if the siliceous content of the ore is low and cheap electrical power is available. Certain grades of the Sulphur alunite are well suited for this purpose, and it is probable that metallic aluminum will be one of the products from this ore if suitable arrangements can be made. Other products now obtained from bauxite may also be derived from the alumina residue of alunite. Among these are the various aluminum salts, refractory bricks, alundum and calcium aluminate for use in certain high-grade cements and plaster.

Theoretically 28.9% SO_3 is driven off during calcination of the alunite to render the potash soluble. This amounts to 578 lb. per ton of crude alunite. During the present emergency especially, the sulphuric acid byproduct derived from the reduction of this ore should be a valuable asset. Comparatively little additional equipment is needed to save the acid and produce it in commercial form.

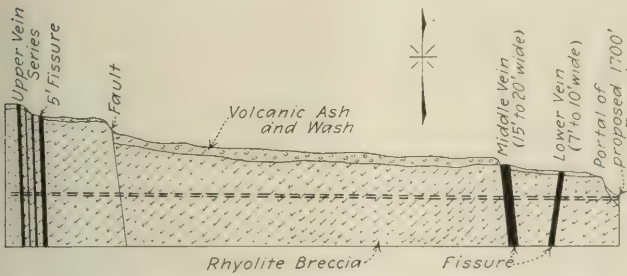

Upper Vein Series
5' Fissure
Fault
Volcanic Ash and Wash
Middle Vein (15' to 20' wide)
Lower Vein (7' to 10' wide)
Portal of proposed 1700' Tunnel
Rhyolite Breccia
Fissure

FIG. 2. CROSS SECTION THROUGH ALUNITE FISSURES NEAR SULPHUR, HUMBOLDT COUNTY, NEVADA

Sulphur Alunite Deposits Promise Large Tonnages

The alunite deposits at Sulphur are still in a prospective stage. No large tonnages of ore have been blocked out, and no work at depth has been performed. However, the small amount of development work already accomplished has proved a considerable tonnage of ore of value in potash. Large paper profits may be easily figured from this source, but how these will work out in practice is purely speculative. It seems probable, however, that a profitable commercial enterprise should result from the operation of the property and the reduction of its ores.

Alunite production and reduction are still in their infancy in this country. However, much of the experimental stage has been passed, and several plants are reported to be in operation. Although commercial alunite has so far been found in only two localities in the United States, large tonnages for many years' operations seem assured. Many commercial products may be obtained from this ore, some of which are now urgently needed.

Tungsten Has the Highest Melting Point of all known metals, namely 3350° C.; it is one of the hardest of the metals; it has the highest equiaxing, or recrystallization temperature after strain hardening, of all pure metals known. It is particularly distinguished because, when composed of small equiaxed grains, it is extremely brittle and fragile at room temperature, and when possessing a fibrous structure it may be ductile and pliable at room temperature. The common ductile metals act in exactly the opposite manner in this respect, according to Zay Jeffries in an article on the "Metallography of Tungsten," in the June Bulletin of the American Institute of Mining Engineers.

Macquisten Tube Flotation Machine

By C. T. Rice

The Macquisten tube was the first flotation machine to prove a practical success in the United States. In 1907 it was tested in Nevada, but it was not until the design had been modified at the Morning plant, Mullan, Idaho, in 1910, that it really became of commercial importance. This ingenious device, which consists of a screw thread turned on the inside of a tube, works well on a granular feed between 30 and 150 mesh, the best results being obtained with 60-mesh pulp. At the Morning plant, where 85% of the feed sent to the Macquistens is plus 100 mesh and half of it plus 60 mesh, but where all will pass a 16-mesh (0.032-in.) wire screen, 200 tons of pulp are treated daily in the 248 tubes with which the plant is equipped. These tubes are arranged in two units of 124 tubes each, and the second unit re-treats the tailings from the first unit. The tubes are arranged in banks of eight to a frame, being divided in two vertical rows of four each. The feed to the bank is split between the two rows, and therefore goes through four tubes in series before being discharged. It then flows to the second unit, where it undergoes similar treatment in another bank of tubes. The tubes are set level in the banks and revolve at 30 r.p.m. It is the lifting of the pulp above the surface of the water that permits the sulphides to be floated by surface tension.

In order to promote this action, a small quantity of sulphuric acid is added, together with a small amount of 28° Beaumé crude California fuel oil. This serves to keep down the siderite and copper sulphate and to increase the floatability of the sulphides, especially of zinc. Though these liquors are recovered and re-circulated, only a trace of any one of them is ever present in the feed, which is sent through the tubes at a dilution of between 4 and 6 to 1.

The machines need delicate adjustment, and in order to get good work out of them the pulp and liquors must be fed evenly and equally to the various tube banks. A close watch must also be kept on the gooseneck by which the height of the pulp in the tube is regulated. Both the lead and zinc sulphides in the feed are lifted, but as most of the lead has already been removed by gravity concentration, so that it assays 7 to 8% zinc and only 2% lead, comparatively little lead is saved by the tubes. The concentrate obtained from the Macquistens is taken to James tables, where it is separated into two products, one containing 50% lead and 8% zinc, and the other 49% zinc and 6% lead. The tailings from the Macquisten tubes contain 1.0% lead and 2.3% zinc, which is mainly occluded mineral, as great care is taken to keep slime out of the feed.

Though the Macquisten tube is a delicate and rather complicated machine, it has a special field—that of separating zinc from siderite or other heavy non-metallic gangues; and this field it fills admirably and well. When the operation of the machine is once mastered, it gives little trouble, and one man can watch a unit of 124 tubes, and also attend to other machinery, such as dewatering classifiers and the like. In dewatering the feed going to the Macquisten installation, both Dorr and Akins classifiers are used, but the Akins seems to be somewhat better for this work, giving less moisture in the product.

The Crisis in Gold Production—Congress Must Act

BY B. L. THANE*

The gold-mining industry is in a critical condition. Production costs—labor and materials—are mounting daily. Value received for the product remains stationary and at the pre-war basis. The writer of this paper draws attention to the absurdity of the situation, and calls for an immediate consideration of the question by Congress and the Allied governments, with the idea of advancing the price of gold to compensate for greatly increased cost of production, to preserve the industry from collapse, and to insure the commercial supremacy of the Allies after the war.

THE attention of the Treasury Department of the United States, and, in a limited degree, of members of Congress and the banking industry of the country, has recently been called to the serious situation in which the gold-mining industry of the world finds itself. This is due to the materially increased cost of labor and supplies resulting from the war and to the unique fact that the product—gold—being fixed in price by the Government, has had no proportionate increase in its market value.

By far the greater quantity of gold now produced necessarily comes from low-grade deposits in which the margin of profit, even in normal times, over and above working costs, is comparatively small. This is true because of the unusual occurrence of gold as found in nature. Though it is widely distributed, such distribution occurs, as a rule, in minute quantities; and high-grade deposits resulting from unusual concentration, are, by the very nature of things, rare. In addition to this fact, the high-grade deposits are the first to be found, mined and depleted. The active and persistent search for gold as conducted in the past has resulted in a complete knowledge of its occurrence in nature, and the discovery and subsequent working out of the higher-grade deposits. Those engaged in the industry and familiar with the occurrence of gold are agreed that the future of the gold-mining industry will be dependent, mainly, upon low-grade deposits. Taking this into consideration, and in view of the present fixed value of gold and the rapidly increasing costs of material and labor, it is obvious that the entire industry as now constituted is threatened in its very existence.

BONUS FOR PRODUCING MINES NECESSARY

The situation has been developing for the last four years, and has become so acute that the actual production of gold from the majority of the low-grade deposits is now being made at a loss. Last month 300,000 oz. of gold produced on the Rand—the most substantial producing area in the world—was sold to the government at less than cost, and this same condition is true of several of the largest operations in Alaska, Canada and the United States.

It is inevitable that unless some form of bonus is given to the producing mines or an actual increase in the value of the products itself is made by the several countries in the world in which gold is now being mined, the important producers will be compelled to discontinue operations, and the present decreased production of gold will be still further seriously curtailed. It is obvious, likewise, that the calculated profits on ore based on pre-war conditions, and on which operations were established, have ceased to exist. Tonnages of developed ore in the mines today which were carried as an asset because profits were indicated on pre-war basis, have, under present conditions, to be entirely written off. Only the higher-grade and less extensive sections of the operating mines can now be safely carried in the form of reserve. In other words, no low-grade gold-mining operation conceived, financed and developed under pre-war conditions can possibly work out as originally planned; nor can its owners or managers hope to continue their operations for any length of time unless a bonus is offered by the Government to compensate for the increased operating costs, or the actual value of the gold, fixed by the Government, is materially increased.

GOLD AS A BASIS OF CREDIT AND EXCHANGE

The problem therefore presents itself thus: Is the production of gold a necessity and is gold mining an essential industry? In order to determine this matter, some of the operators from Alaska, through Delegate Charles Sulzer, from that territory, raised this question with William G. McAdoo, Secretary of the Treasury, who, in a letter addressed to Mr. Sulzer, dated June 10, 1918, very clearly and forcibly defines the position of the gold-mining industry as next to that of the production of food and ammunition, pointing out at the same time the necessity of increasing the gold reserve of the country to sustain the great credit structure now being developed in order to finance the war.

The use of gold as the basis of credit and exchange has been firmly established and has proved universally satisfactory. Its occurrence in nature and its physical and chemical characteristics are such that it may be positively stated that no other commodity compares with gold for this particular purpose, and there is no other likely or possible substitute; nor will there be so long as there are separate nations and governments on the face of the earth. All balances in international trade must be paid for in some fixed and unchangeable medium like gold. Nations will not accept the paper of other countries in payment for credits unless it be backed up with proper gold reserve; and, as a rule, will not accept payment other than in gold itself.

The necessity of finding a fixed basis for credit became pronounced as international trade developed to large proportions. The first country to adopt gold as the standard of value was Great Britain, and this was later accepted and adopted by all the principal nations of the earth.

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*Managing director, formerly manager, of the Alaska Gastineau Mining Co.

One of the most important and interesting questions arising in this discussion is the value of gold as now fixed and accepted by the leading nations of the world. The price of pure gold in our standard of money is uniform at \$20.67 an ounce. This value was arbitrarily fixed by the Bank of England, when, as a nation, Great Britain decided that it was advisable to fix the value of gold in order to standardize exchange. Prior to this, though the British government had adopted gold as a standard, it had been in the habit of purchasing the metal in the open market at a variable range of prices. This necessarily affected, from day to day and from purchase to purchase, the very basis of exchange. Hence the necessity of establishing a fixed price.

It is generally conceded that the price, as fixed, was taken from the last purchase made by the Bank of England for gold in the open market, which in U. S. currency, as stated above, happened to be \$20.67. Soon all of the other leading nations in the world accepted this gold standard, and likewise the price which had arbitrarily been fixed by the Bank of England and sustained with the approval of the British government.

The important fact regarding this, in so far as the present discussion is concerned, is that the price as fixed was purely arbitrary.

Even if measured in the currency of the time at which the price was fixed, when gold was calculated to be worth \$20.67 an ounce, it is evident that because of the very great increase in the demand for the metal, and the increased cost in producing it, this valuation is now incorrect and much too low.

Accepting gold as the basis of all credit structure, there has never been a period in the history of the world when the demand has been as great as now, in order to sustain a reasonable reserve against government issues of bonds, certificates, and like evidences of indebtedness.

E. M. Patterson, of the University of Pennsylvania, discussing the national financial situation of the United States, points out that although the amount of gold held by the Reserve Banks has almost doubled, the ratio of gold to net deposits and Federal Reserve notes combined has fallen in the last year from 83 to 61 per cent.

TRADING WITH NEUTRALS AND ALLIES

The quantity of gold coming into the United States and now held by the United States has doubled because of the tremendous quantities of war materials and supplies sold to the foreign governments, which had to be paid for in gold. This gold, heretofore held in reserve by England, France, and other countries, temporarily found its way to this country. It is unlikely that this condition will continue now that America has entered the war. Our large armies now in France require huge expenditures and purchases made in foreign countries, which must be paid for in gold; and as Mr. McAdoo has pointed out in the letter already referred to, the country is, at least for the time being, compelled to pay in gold for purchases from neutrals, because our own supply of needed commodities is required for home consumption. There is, therefore, no balance of trade with them.

Combining this fact with the circumstances that the producing and operating gold mines of the country will be compelled to discontinue operations unless assistance is given, it can be seen that the gold reserve held by the United States (because of the necessity of additional issue of new bonds, certificates, and like fiduciary obligations, in order to finance the war) will experience a further and material decrease in the immediate future.

As a matter of actual fact, the United States is paying out gold today to neutrals for purchases at a fixed value which is considerably less than the cost of production of the gold.

THE INTERNATIONAL SITUATION

There is an international phase to this gold situation which apparently has been lost sight of, but which has a direct and most important bearing on the war itself. As has been pointed out by Hennen Jennings, consulting engineer to the Bureau of Mines, 91% of the gold and gold-mining districts of the world is owned and controlled by France, England, and the United States; approximately *only 1% is owned and controlled by the Central Powers, with whom we are at war;* and 9% is in the hands of neutrals. This is not only an interesting fact but one which, if properly handled as a war measure, can be used to very great advantage by the Allies in affecting the credit structure of the Central Powers.

It is a well-known fact that the issue of paper credit by the Central Powers to their own people and the adjacent neutrals has been, necessarily, in far greater proportion to their gold reserve than in the case of the Allies. So long as these countries are dealing with themselves only, and are unable to engage in international business, and just so long as their governments remain strong enough to compel the people to accept such paper issue on its face value, their actual gold reserve is not important; but the instant the war is ended, and the Central Powers are again compelled to enter foreign trade in order to replenish their exhausted supplies of material, their paper credit structure will have to be maintained by a proper gold reserve; otherwise it will fall to pieces and a tremendous financial disaster will result. The German financiers are aware of this, but expect to build up their gold reserve through their ability to sell, in the world markets, materials and supplies at a much lower figure than that for which they can be produced in the Allied countries.

There is grave danger that this condition will actually develop so far as this country and the Allies are concerned. One of the results of the war has been a greatly increased cost of labor in these countries; that is to say, labor has demanded—and received—a much larger wage—approximately 100% greater than before the war. As a net result of this, the cost today, in gold in the United States, and, to a lesser degree in England and France, of producing all commodities, has increased approximately 100%. Pig iron is selling at \$33, as against \$15 before the war, and the cost of almost every other important commodity has risen in like proportion.

The danger from this is that the Central Powers in general, and Germany in particular, have not increased the wage scale in like proportion; so that the cost, measured in gold, of producing all articles in Germany after the war, or even now, is less than it is in this country. German financiers have boasted of this condition repeatedly. To balance this inequality it would be necessary to place a premium on our gold supply equivalent to the difference in the average cost of labor between the Central Powers and the United States and her allies.

Though tariffs and trade agreements may be developed and arranged which will offset this difference to some degree, the easiest, most sensible, most practicable, and quickest way to place German labor and industry on a parity with that of the United States and her allies will be to *arbitrarily increase the value of gold* in an amount sufficient to offset the average difference in wage scale now existing between the Allies and the Central Powers. This is feasible only because of the condition mentioned earlier in this discussion, namely, that 91% of the gold and gold-producing properties of the world is controlled by the Allies, and less than 1% by the Central Powers. It is evident that if the governments of the Allies owning and controlling this gold resource would arbitrarily double its value, the Central Powers would have to do twice the amount of work and sell twice the quantity of material in order to obtain the gold supply necessary to establish a proper reserve against the paper credit structure which has been developed by them on account of the war. In other words, the governments of the Allies would compel Germany to pay twice as much for her necessary gold supply.

It has been argued that such change in value of the basic metal would derange credit structure, but this can be obviated by agreement of the governments of England, France and the United States, which, as pointed out, control the gold supply of the world. It would be necessary, of course, first for them to not only draw in all gold coin and hereafter command the entire existing supply, but all gold produced in the future. In a very large degree this has already been done, and gold coins are rapidly going out of circulation. The issue of the Federal Reserve certificates is an illustration of what would take place in lieu of the issuance of gold coin. It would not derange the value of the currency as issued, because it is apparent that the value of gold behind this currency is in any case arbitrarily fixed by the Government.

For instance, if the Allied governments arbitrarily agreed that gold should be fixed at $40 per ounce, instead of the present price of $20.67, the holders of certificates or bonds would receive half as much gold as they now receive in return for their paper; but if half an ounce of gold were worth twice as much as it is now worth (and this would be the case) there would be no actual derangement or change in the value of the currency or paper issues. In other words, half an ounce of gold worth $40 would be just as satisfactory to the holder of paper as an ounce worth $20.67, because in both cases the value itself would be arbitrarily fixed by the Government. Moreover, this value would be more in keeping with the actual cost of production of the gold.

Fineness of gold should not be considered in this connection, because fineness has to do only with the purity of gold. The fixed price of $20.67 an ounce, as now established, refers to pure gold only. Gold of lower fineness than pure gold is obviously worth less than $20.67 per ounce in proportion to the quantity of other alloys or impurities contained therein. For instance: In the twenty-dollar goldpiece as now issued there is not quite an ounce of pure gold—the difference between the $20 and the $20.67 being made up of copper added for the purpose of making the coin harder and more serviceable. This is mentioned because, in general discussion of this subject, it is apparent that those who are not familiar with gold are inclined to confuse the element of fineness with the fixed price of gold, with which it really has nothing to do.

Though this conception of the situation, and the remedial suggestion, may at first seem radical, it is interesting to note that the entire gold-producing industry of the British empire called a meeting for this identical purpose on July 4 and appointed a committee of six immediately to bring this situation to the attention of the British government. So far as the United States is concerned, the first and immediate necessity is legislation which will permit the continuation of the present gold-mining industry. This can be accomplished temporarily by establishing an adequate bonus sufficient to offset the increased cost of labor and materials as against pre-war conditions; by the formation of an international commission to act jointly with the committee now formed in London and with the proper representatives of the governments, for the purpose of reëstablishing a proper fixed price for gold, commensurate with present conditions; the enactment of such legislation as will protect all paper issues which have been made on the present gold basis; and the taking of such steps as are necessary to see that the international gold asset controlled by the Allies is properly utilized in order to place the Central Powers on a parity with us so far as the cost of production is concerned. In this way they will be prevented from drawing out the gold supply of the Allies, through neutrals or other channels, by selling materials in the world markets at a lower gold cost.

It is hoped that this discussion, together with a general consideration of the subject, may lead to the immediate enactment of legislation necessary to protect the present operative gold-mining industry of the Allied countries; and that the latter will take full advantage of the control of this metal, in dealing with the credit structure of the Central Powers.

Given the realization of the fact that the United States and her allies actually control 91% of the gold and gold-producing areas, these questions arise:

First—Why should we continue to pay for supplies purchased from neutrals in gold at less than its actual cost of production?

Second—Should not the United States and her allies immediately recognize the possession of gold as a great international asset and take steps to prevent Germany and the Central Powers from entering the world markets, and so draining from the United States and her allies the gold necessary to preserve the very paper credit structure developed for the purpose of carrying on the war against us?

Third—Why should the gold-mining industry perforce be compelled to sell its product at a price less than that which it is actually worth?

Kennecott Copper Corporation

The third annual report of the Kennecott Copper Corporation embraces the operating reports for 1917 of its mines at Kennecott and Latouche, Alaska, and for the Braden unit, in Chile. At the Kennecott property 265,579 tons of ore, averaging 13.78% copper, was produced, and 89,799 tons of it, averaging 38.57% copper, was shipped direct to the smeltery. The metallurgical efficiency at this plant was 94.65%, as indicated by the copper contained in the ore mined and the products shipped. The concentrator yielded 29,559 tons of concentrates, averaging 53.52% copper, from 206,253 tons of ore, averaging 8.92% copper, indicating a recovery of 85.98%. The ammonia leaching plant treated 98,075 tons of mill tailings containing 0.90% copper in the carbonate form, and yielded 1,244,200 lb. of copper, which increased the total average milling recovery for the year to 89.4 per cent.

The mine at Latouche produced 273,523 tons of ore, assaying 2.44% copper, and 49,141 tons, averaging 11.48% copper, was shipped direct to the smeltery. The metallurgical efficiency at this plant was 84.53%. Ore milled amounted to 253,805 tons, averaging 2.06% copper and 29,423 tons of concentrates was produced, containing 14.20% copper. The mill recovery for the year was 80.28%. Mining development work totaled 10,770 ft. at Kennecott and 5320 ft. at Latouche, and, in addition, 14,419 ft. of diamond drilling was done.

There was received at the smeltery of the combined properties, after allowing for smelter deductions, 78,211,429 lb. of deliverable refined copper and 933,573 oz. of silver. Of these receipts 56,904,650 lb. of copper and 681,641 oz. of silver were settled for during the year, the remainder being inventoried at cost. The copper was sold at 27.015c. per lb., the silver at 95.848c. per oz., and the combined revenue from these metals amounted to $16,026,105. Operating charges totaled $4,208,909, and other income, including $7,147,801 received from dividends on Utah Copper Co. stock, amounted to $7,466,285. Charges for interest, commissions and taxes amounted to $1,318,579, and left a balance of $17,964,902 for net earnings. A total of $6,419,482 was charged for depreciation and depletion, and $10,311,665 was distributed in dividends.

At the Braden mines a total of 1,799,694 tons of ore, averaging 2.32% copper, was treated. The ore supplied by the Teniente workings averaged 3.07%, and increased in volume during the year so that 21.5% of the total ore was from this source. The mill treated an average of 4931 tons per day, an increase of 32% over its performance for the previous year, and recovery was 81.61%, as against 78.97% in the previous year. Tonnage smelted was 158,275, of which 71% was nodulized. The net weight of charge was 193,290 tons. The converters averaged 87.6 tons of blister copper per day. Development work totaled 43,003 feet for the year. Ore reserves as of the end of the period were:

149,192,000 tons positive ore averaging 2.42% copper
90,000,000 tons probable ore averaging 1.88% copper

239,192,000 tons total ore averaging 2.21% copper

Operating revenue from the sale of 41,010,502 lb. of copper at 31.88c. per lb. was increased by miscellaneous income amounting to $876,937. Operating charges totaled $6,699,726, taxes, interest and miscellaneous charges $1,110,749, and items of depreciation, including $1,182,746 for plant superseded or abandoned during the year, amounting to $3,245,276 were charged, leaving a net surplus for the year's operation of $2,863,111. The surplus of $6,738,705 previously reported at the end of 1916 is adjusted and reduced to $2,193,628, and the total obtained by crediting the 1917 surplus is further reduced by $1,170,000, being the balance of unamortized discount on bonds, so that the net earned surplus as of Dec. 31, 1917, is $3,886,739.

Old Dominion Co.

The 1917 report of the Old Dominion Co., previously a holding company for the Old Dominion Copper Mining and Smelting Co. and the United Globe Mines, copper producers of Globe, Ariz., indicates that early in the year the organization was simplified by direct purchase of the operating companies by the parent company. Operating conditions were normal during the first half of the year, but subsequent to the calling of the strike on July 1 results were poor. After September, conditions became nearer normal, but high costs of labor and supplies and the comparatively low price for copper kept profits down.

The production of smelting ore, amounting to 81,728 dry tons, came mostly from the west side orebodies, and the east side orebodies furnished most of the concentrating ore, which totaled 114,217 tons; small amounts of siliceous and iron ores brought the total tonnage up to 199,888, of an average grade of 4.97% copper, compared with 152,059 tons, averaging 5.88% copper, in the previous year. Development work totaled 24,321 ft., as compared with 42,018 in 1916. Favorable developments were made on the lowest level, the 18th; on the west side of that level an orebody 140 x 110 ft. was shown to average 5.8% copper over its entire length of 140 ft.; on the east side one vein 33 to 61 ft. wide was developed and proved to connect with ore on the 16th level.

Copper produced totaled 32,365,795 lb., and was sold at an average price of 25.91c. per lb. The extraction for 1917 was 88.01%; 30.5% of this total being secured by flotation, 69.0% by water concentration, and 0.5% from overflow slimes sent to the smeltery. The concentration cost was $1.25 per ton milled, the smelting cost $3.13 per ton for the 198,548 tons of charge, and the converting $8.96 per ton of fine copper produced in bullion. All of these operating costs show considerable increases over the corresponding results for 1916, but the cost of power decreased to $65.17 per hp. year from $74.14 in the previous year. Sales of metals amounted to $8,595,444, miscellaneous income was $39,727, and total operating and administrative expenses were $6,258,662. Charges for taxes, depreciation of plant and depletion of mines amounted to $1,155,244, and reduced net surplus for the year to $1,221,264. Dividends totaling $2,376,262, or $8 per share, were paid, and $4,820,403 remains at the credit of surplus.

South African Asbestos Supply is now assured, an ample supply having been discovered in the Asbestos Mountains and in the lower Griquatown beds. The deposits have been developed as far north as the Bechuanaland Protectorate. The work is carried out by the aid of Kafir labor, and the fibre produced averages 25% 1 in. or over.

Tall Chimneys in Metallurgical Plants

A summary of data concerning the notable chimneys of the leading metallurgical plants in North America and the Saganoseki chimney in Japan, until recently the tallest in the world. Illustrations of important structures are presented, including the recently completed chimney at Tacoma, Wash., built of paving brick, and holding the present world's record for height.

AMERICAN engineers have built not a few great chimneys. The large scale on which metallurgical operations in the United States have developed has made the metallurgical industry a fertile field for the talents of experts in the building of tall chimneys, the highest of which has recently been completed at Tacoma, Wash. There are probably more chimneys of the first magnitude in the United States than in any other country, though until recently the record for the world's highest stack was held by Japan. However, it is worth noting that even the 570-ft. Saganoseki chimney was designed and built under the direction of American engineers.

To record adequately the creation of these engineering monuments, for such they are, would require a volume. Each of the chimneys illustrated in this issue is of itself an engineering poem, worthy of a special article devoted solely to its design and construction. It is possible to present here only some miscellaneous and necessarily incomplete data that accumulated in the course of securing a group of photographs originally intended for the department of "Photographs from the Field." The data have come mainly from the constructors, and, so far as possible, are presented practically as received. The endeavor has been to secure important examples of each type of chimney and, wherever possible, the highest one known.

In discussing chimneys, one of the features of most interest is the height; hence it is practically necessary in writing of tall chimneys to violate one of the *Journal's* rules and use the superlative freely. To eliminate it would destroy to a considerable extent the interest in these great structures. For example, to read of the "highest chimney in the world at Tacoma, Wash.," is more interesting and, in a general way, more informative than the possibly prosaic description of the "chimney at Tacoma, Wash., 572 ft. 10 in. high by 23 ft. 11 in. inside diameter at top." "The world's highest reinforced-concrete chimney at Saganoseki, Japan," is likewise a more expressive and suitable caption of the splendid monument, illustrated on another page, than the mere statement that it is 570 ft. high. Hence, we are taking the liberty of indulging in superlatives, with

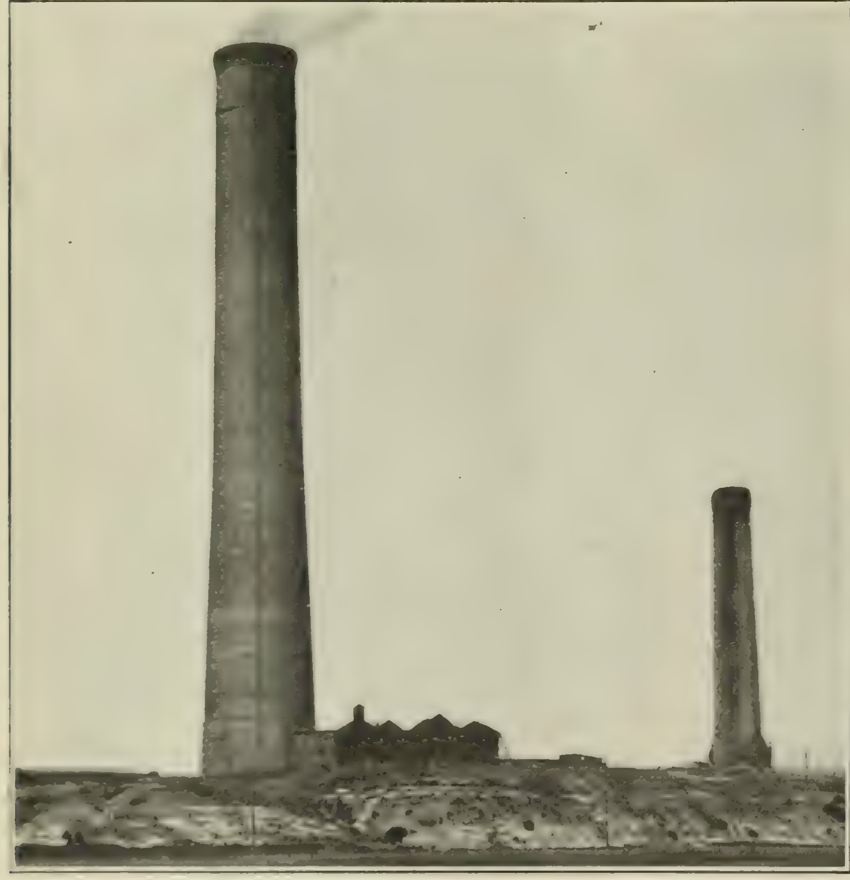


FIG. 1

TALLEST PERFORATED RADIAL BRICK STACK

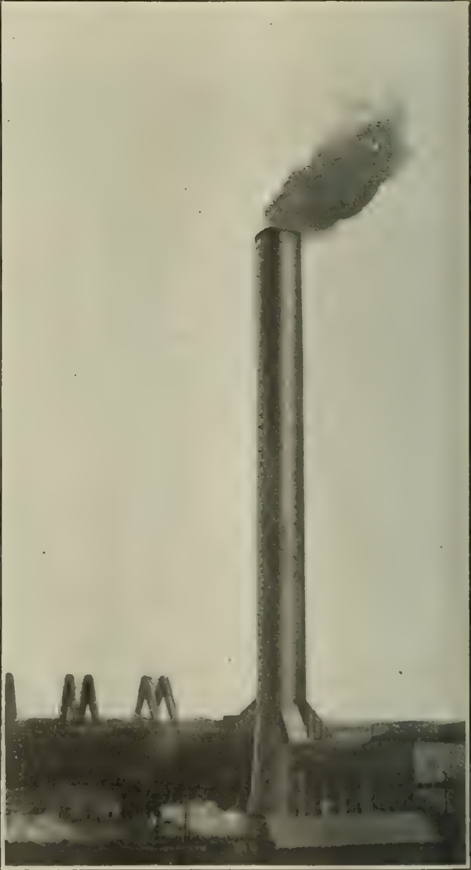


FIG. 2.

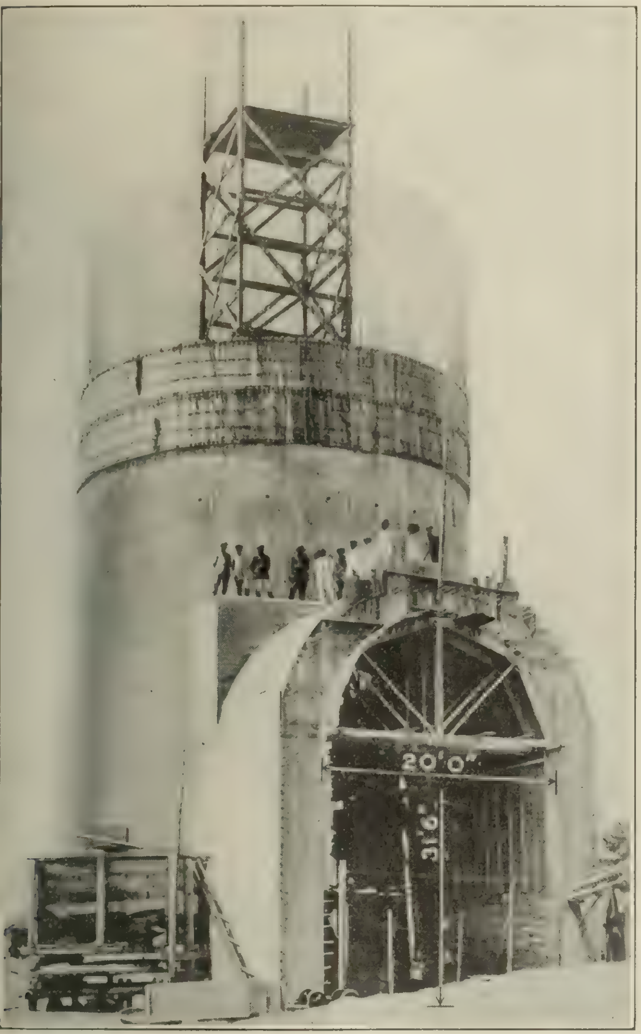
WORLD'S HIGHEST STEEL STACK

Fig. 1—This stack was erected at the Great Falls, Mont., works of the Anaconda Copper Mining Co. by the Alphons Custodis Chimney Construction Co. It is 506 ft. high and 50 ft. inside at the top. Fig. 2—When the United Verde Copper Co. erected its new smelting works in 1913 its engineers, Repath & McGregor, decided upon a 400 x 30-ft. steel stack, which was erected by the Chicago Bridge and Iron Works.

a full appreciation of the dangers of being wrong and the possibility of correction by some observant and meticulous reader. This usually happens when one says anything is the greatest, smallest, or longest in the world. If the superlative is not correct as here set forth, the notes may prove ultimately informative by eliciting correction and amplification.

The chimney which naturally engages attention first is the latest one to enter the lists as "the highest in the world." The Tacoma stack was placed in operation about the first of March, 1918. As built, it is 572 ft. 10 in. high and 23 ft. 11 in. inside diameter at the top and 38 ft. 11 in. inside the lining at the base. The outside diameter of the stack shell at the base is 50 ft. 2 in. The shell is built of paving brick on a concrete footing. Owing to the unevenness of the hardpan, the concrete base was put down to a depth of 30 ft., where the hard blue clay extended under the entire area of the concrete block. Details of the foundation have been discussed by Charles Evan Fowler in *Engineering News-Record* of Apr. 4, 1918. The superstructure was built by the Alphons Custodis Chimney Construction Co., of 95 Nassau St., New York. The brick shell ranges in thickness from 5 ft. 1 in. at the base to $13\frac{1}{2}$ in. just below the bell at the top. The stack has a 4-in. sectional firebrick lining, separated from the shell by a 2-in. air space. Over 2,500,000 bricks were used in the construction of the stack shell, and, including the brick lining, the total weight on the foundation is over 12,000 tons. An accompanying view shows the recently completed stack, which is built on a ridge about 150 ft. high, making the top of the chimney about 725 ft. above tidewater, a few hundred feet away. A better appreciation of the height of the new stack is obtained when it is known that the other chimney shown in the same illustration is 300 ft. high and 18 ft. in diameter.

The smaller reinforced-concrete stack was built in 1905 by the Weber Chimney Co., 1452 McCormick Bldg., Chicago, and was of a standard type of construction at that time, referred to as cylindrical chimneys, being of uniform inside diameter from base to top; it cost about $30,000 and was built on a reinforced-concrete base, 39 ft. 6 in. square and 6 ft. 6 in. thick, made with 1:3:5 mix, stone not over 2-in. size. The wall thickness was 9 in. up to a height of 90 ft., where the shell wall was reduced to 7 in. in thickness. The lower 90 ft. of the chimney has a double wall, the inner shell being 4 in. thick; it is separated from the outer wall by a 4-in. air space. The calculations allowed for a compression of 600 lb. per sq.in. on the concrete and a tension of 21,000 lb. per sq.in. for the steel, assuming maximum wind conditions of 100 miles per hour. The 1905 chimney was constructed with $1\frac{1}{4}$ x $1\frac{1}{4}$ x $\frac{3}{16}$-in. T-bars for horizontal reinforcing. More recent coniform chimneys, built by the Weber Chimney Co., such as the Blackwell, Okla., stack, have "horizontal" reinforcing of $\frac{1}{2}$-in. round bars, spaced at 14-in. centers, but wound spirally for the entire height of the stack and lining. The usual vertical bars are, of course, used. The maximum tension allowed for the steel does not exceed 16,000 lb. per sq.in. The compression in these stacks varies from 350 to 450 lb. per sq.in., depending on the dimensions of the chimney.



STARTING THE SAGANOSEKI CONCRETE STACK

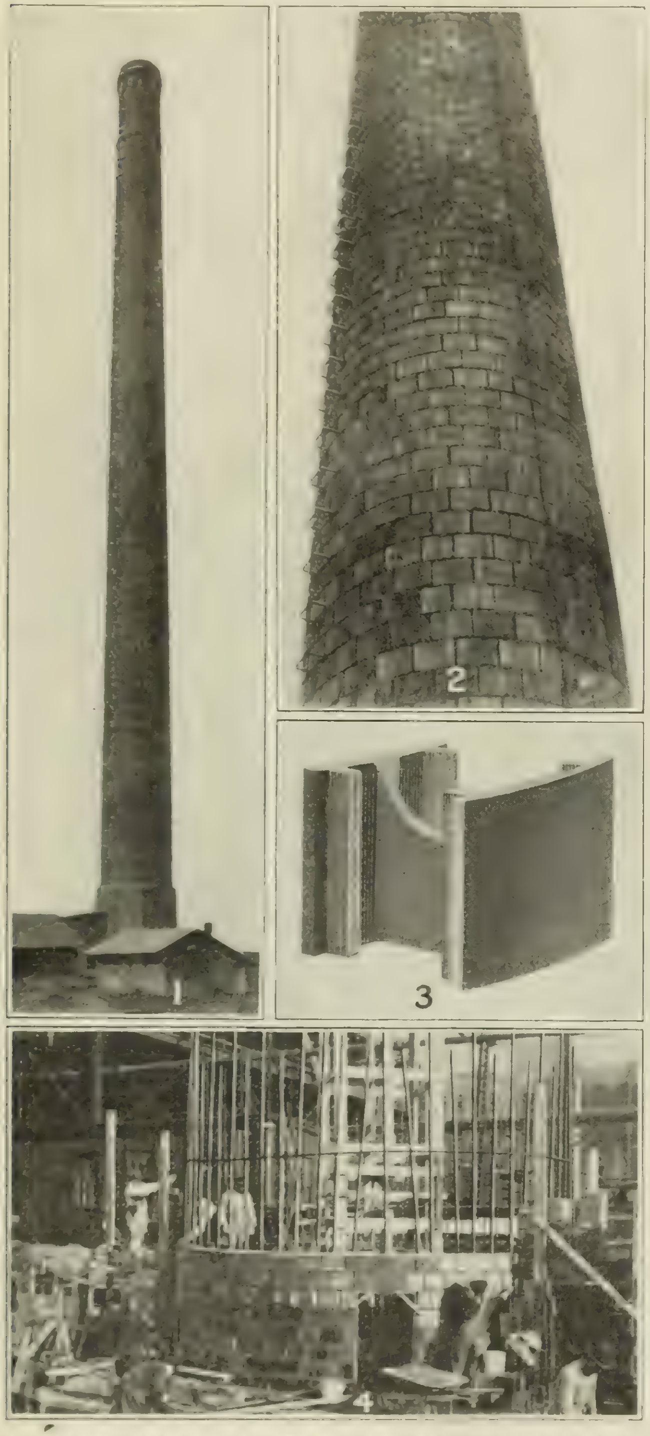
The chimney built for the Saganoseki copper smeltery until recently held the record as the highest chimney in the world; it is still the highest reinforced-

TALL CHIMNEYS FOR METALLURGICAL WORKS

Situation	Works	Material	Height, Ft.	Inside Diam. at Top, Ft.	Builders
Tacoma, Wash	Tacoma Smelting Co	Paving brick	572.8	23.9	Alphons Custodis Chimney Construction Co.
Saganoseki, Japan		Reinforced concrete	570	26.25	Weber Chimney Co.
Anaconda, Mont. (*a*)	Anaconda Copper Mining Co	Perforated radial brick	525	60	Alphons Custodis Chimney Construction Co.
Great Falls, Mont.	Anaconda Copper Mining Co	Perforated radial brick	506	50	Alphons Custodis Chimney Construction Co.
Murray, Utah (*a*)	American Smelting and Refining Co	Perforated radial brick	450	20	
Clarkdale, Ariz. (*a*)	United Verde Extension Mining Co	Perforated radial brick	425	30	Alphons Custodis Chimney Construction Co.
Clarkdale, Ariz	United Verde Copper Co	Steel	400.1	30	Chicago Bridge and Iron Works
East Helena, Mont	American Smelting and Refining Co	Perforated radial brick	400	16	Alphons Custodis Chimney Construction Co.
El Paso, Texas	El Paso Smelting Works	Perforated radial brick	400	30	Alphons Custodis Chimney Construction Co.
Collinsville, Ill	St. Louis Smelting and Refining Co	Reinforced hollow tile	375	16	Wiederholdt Construction Co.
Bayonne, N. J. (*b*)	Orford Copper Co	Perforated radial brick	365	10	Alphons Custodis Chimney Construction Co.
Port Colborne, Ont. (*b*)	International Nickel Co., Canada	Reinforced concrete	350	12	General Concrete Construction Co.
Anaconda, Mont	Anaconda Copper Mining Co	Brick	300	30	
Blackwell, Okla. (*c*)	Bartlesville Zinc Co	Reinforced concrete	307.5	12	Weber Chimney Co.
Tacoma, Wash	Tacoma Smelting Co	Reinforced concrete	300	18	Weber Chimney Co.
El Paso, Texas (*d*)	El Paso Smelting Works	Reinforced concrete	300	16	General Concrete Construction Co.

(*a*) Building. (*b*) Two chimneys of same dimensions. (*c*) Wislicenus top. (*d*) Wislicenus top, but openings have since been closed.

concrete chimney. Tetsurow Komakine has stated[1] that a 1000-ft. concrete stack was being constructed in Japan, but builders in the United States are under the impression that Mr. Komakine had reference to the stack at Saganoseki. The stack proper is 570 ft. high and is built on a hill 430 ft. above the sea, the sum of these two figures just equaling the 1000 ft. mentioned by Mr. Komakine. According to the builders of the Saganoseki chimney, the Weber Chimney Co., the Japanese stack is 570 ft. high, 42 ft. 8 in. outside diameter at the base and 26 ft. 3 in. inside diameter at the top. The chimney is of the coniform type and with appurtenances cost about $250,000. The flue connecting the smelting furnaces with the chimney is 2500 ft. long. The foundation block contains 2711 cu.yd. of concrete and is 95 ft. in diameter. The double wall in this stack runs to a height of 150 ft. The shell thickness at the base is 29½ in. and tapers to 7 in. at the top. Compression on the concrete is figured at 550 lb. per sq. in. The mix used for the builders' later concrete chimneys is 1:2½:4, which they consider superior to the old dry, tamped mix of one part of cement to three parts of sand.



A 375-FT. SMELTERY STACK AT COLLINSVILLE, ILL., BUILT OF REINFORCED HOLLOW TILE

No. 1—General view of the completed stack. No. 2—A closer view of the shaft and ladder. No. 3—A part sectional view of the Wiederholdt tile. No. 4—Beginning of construction work on the Collinsville chimney, the highest of its type.

The Great Falls stack, 506 ft. high by 50 ft. inside diameter at the top, probably offers the greatest gas-carrying capacity of all chimneys now operating. It will soon be surpassed by the new Anaconda chimney, 525 x 60 ft., which is just being started at the Washoe works of the company, at Anaconda, Mont. The Great Falls stack, which has been fully described[2], was designed to remove 4,000,000 cu.ft. of gas at a temperature of 600° Fahrenheit.

The United Verde Copper Co.'s steel stack, 400 ft. 1 in. high by 30 ft. diameter, is unique among large smelting stacks, no other works of the first magnitude in this country using steel as the material for its main stack. This chimney was designed to handle 2,000,000 cu.ft. of gas and has been described at length by C. W. Cromwell[3]. Several smelting-works stacks have been erected in this country with Wislicenus tops—a lattice or openwork effect to assist in diffusing the gases with the air. There is some difference of opinion as to the value of the Wislicenus dissipator, but American practice is trending toward high stacks and delivering the gases into the air at a high temperature, rather than to reduce the draft in the stack through the Wislicenus openings. It is worthy of note that the openings in the 300-ft. concrete stack at El Paso have been closed, and at some other works the Wislicenus arrangement is regarded as more useful for its moral effect than for superior dispersion of the gases.

The twin 350-ft. chimneys recently erected at the International Nickel Co.'s refinery at Port Colborne, Ont., are stated by the builders, the General Concrete Construction Co., of 30 Church St., New York, to be the tallest reinforced-concrete chimneys in North America. They are 29 ft. 4 in. outside diameter at the base and 12 ft. inside at the top. Flue conditions were unusually severe, there being four flues, each 7 x 20 ft. in the clear. On this account the concrete shell was made 51¼ in. thick at the bottom. The chimneys are lined with firebrick to the tops, which have special terra-cotta caps. The vertical reinforcing in these chimneys is ¾-in. square twisted rods and the horizontal reinforcement is wire mesh consisting of ¼-in. longitudinal rods spaced at 4-in. centers, laced triangularly and placed around and wired to the vertical rods. Altogether, five concrete chimneys were erected at the Port Colborne refinery, their application being to a variety of conditions. The concrete was mixed in the proportion of one part of cement, 2½ parts of sand and three of gravel; it was prepared in a batch mixer and poured wet in special steel forms, adjustable to the taper of the chimney. The forms and several of the Port Colborne chimneys are shown on p. 173 of this issue.

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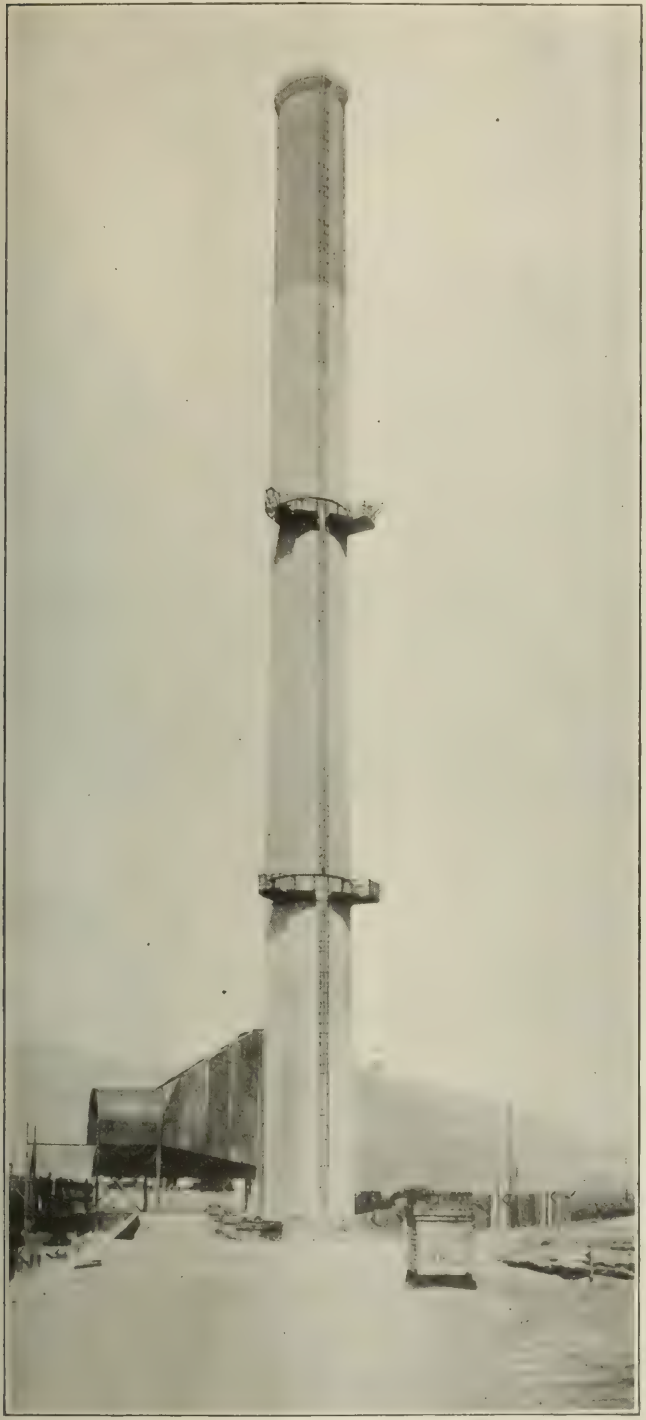
[1] "Met. and Chem. Eng.," Oct. 15, 1917; abstr. "Eng. and Min. Journ.," [illegible] 1917.

[2] "Eng. Record," Nov. 29, 1908.

[3] "Eng. and Min. Journ.," Dec. 6, 1913.



CONCRETE CHIMNEY AT EL PASO SMELTING WORKS

The chimney, built at El Paso, Texas, by the General Concrete Construction Co., is 300 ft. high by 16 ft. inside diameter. The peculiar perforated effect at the top of the chimney is the Wislicenus top, which was made by inserting rows of 2-in. pipe in the concrete for about 50 ft. from the chimney cap. The Wislicenus "dissipator" was found to reduce the draft so much that the openings have since been closed.

Besides these metallurgical chimneys, there are several industrial chimneys in America over 300 ft. in height. Two of these are noteworthy for their height and some special features. One is the chimney at the paint works of C. K. Williams & Co. at Easton, Penn. This radial-brick chimney is 375 ft. high, but tapers to only 7 ft. inside diameter at the top. A 300 x 19 ft. radial-brick chimney was recently erected for the Arlington Mills, at Lawrence, Mass. It has as a special feature two superimposed hoppers in the base for the purpose of collecting and discharging soot, thus keeping the opening at the chimney base practically free from accumulations of soot and ash and preventing dangerous temperatures from the burning of a large accumulation of soot. Difficulties from this source, however, do not arise in metallurgical chimneys.

Water Tanks and Piping in Cold Climates

At mines and mills where severe winter conditions prevail, precautions must be taken with exposed tanks, pipes and launders. The following notes on experience at a mill where the thermometer frequently goes to 40° F. below, and where zero weather is continuous over long periods, may be of interest:

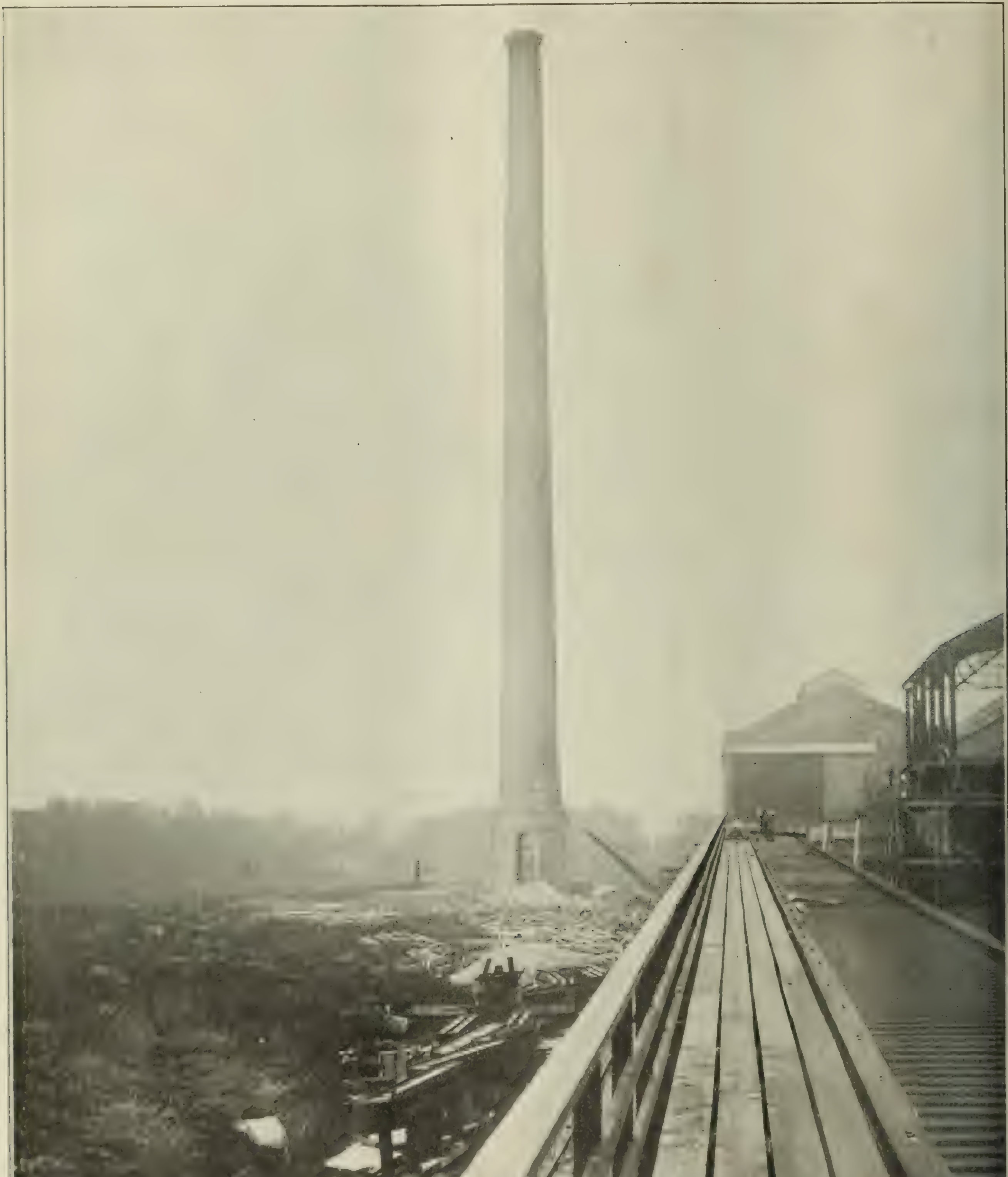
Pipe lines, when buried, should have sufficient depth of covering to avoid any possibility of freezing, even if the water in them should become stagnant. If doubt exists on this point, they had best remain above ground and be provided with an easily removable covering. Light snow is a good insulator; and, in regions of deep snow, pipes do not require a great depth of covering. Where snowfall is scant, they freeze at considerable depth, as at Leadville, Colo., where this occurs at depths of six and seven feet beneath the surface. Special attention should be given to points where pipes cross under wagon roads or trails, where the soil over them becomes compacted and transmits cold several times more readily than where not so compacted. Put the pipe in a box and fill in with a poor conductor.

Avoid wherever possible the placing of valves and drain cocks outside of buildings. The usual box filled with stable manure is frequently a necessary evil, but many times all valves can be put inside a building by proper planning. If extra expense is involved, it should be met. A case in point is the valve in the pipe line leading from a tank. Instead of putting it outside the tank and providing a box, it will be found far preferable to put the valve inside the tank, where it will be immersed, and to provide it with a long handle extending up through the water.

Tanks must be given some protection to prevent bursting, as the formation of ice in any considerable thickness exerts great pressure. An economical method is to enclose the tank in a rough board, hip-roofed housing with a minimum clearance between tank and housing of, say, one foot, the outside being papered and the space filled with hay, sawdust, or other light, dry and cheap non-conducting material. The opening under the roof and over the surface of the water is small, and can be heated easily in the severest weather with a kerosene burner or electric heater.

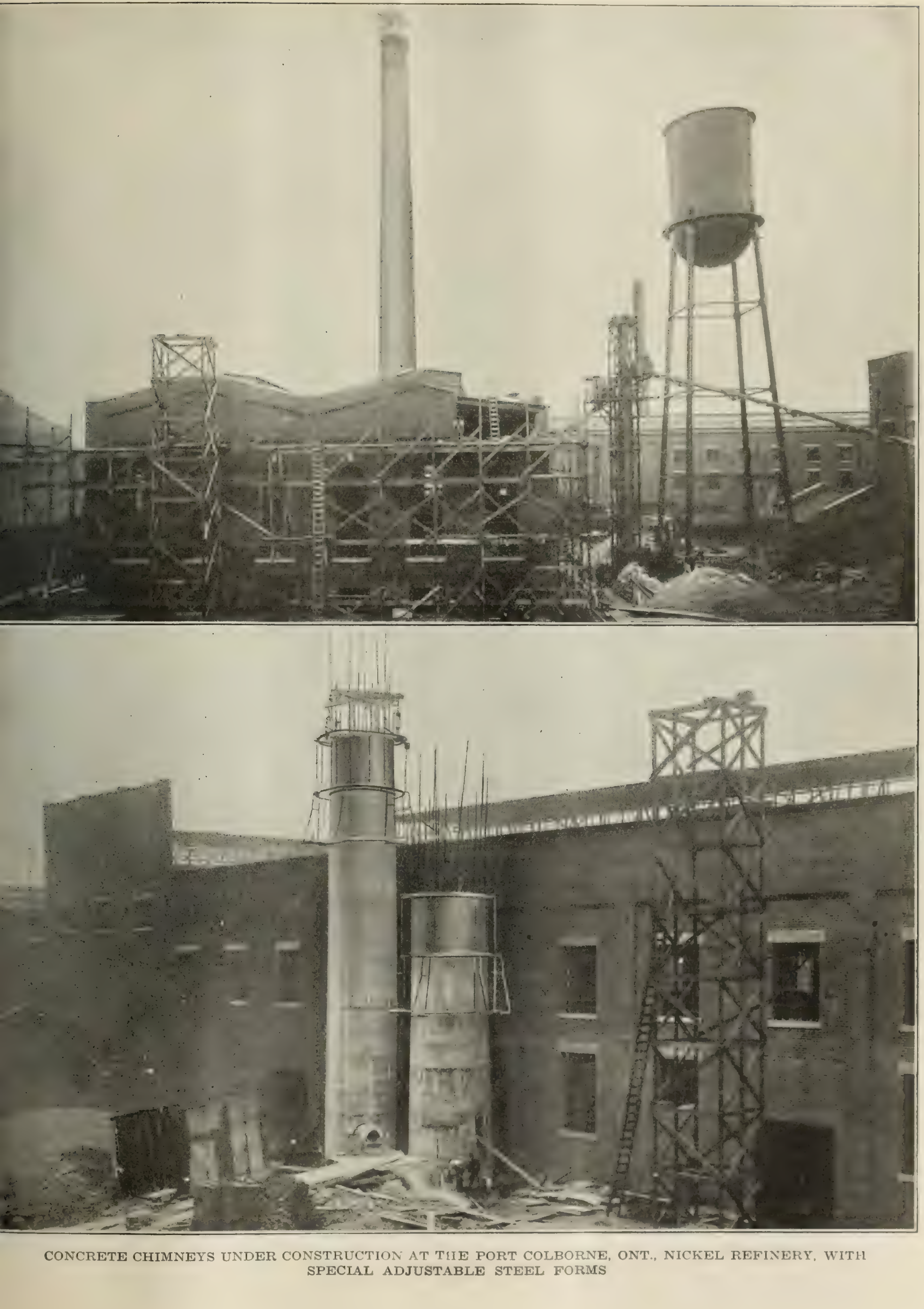
Exposed iron-pipe lines require a high velocity of water. The contents of an exposed 4-in. pipe line delivering water at 250 g.p.m., i.e., with a velocity of about 5 ft. per sec., were found to freeze when the thermometer remained at or below 15° F. The difficulty was overcome by enclosing the pipe in a box with a 3-in. clearance filled with sawdust.

Notable Smelting Works Chimneys

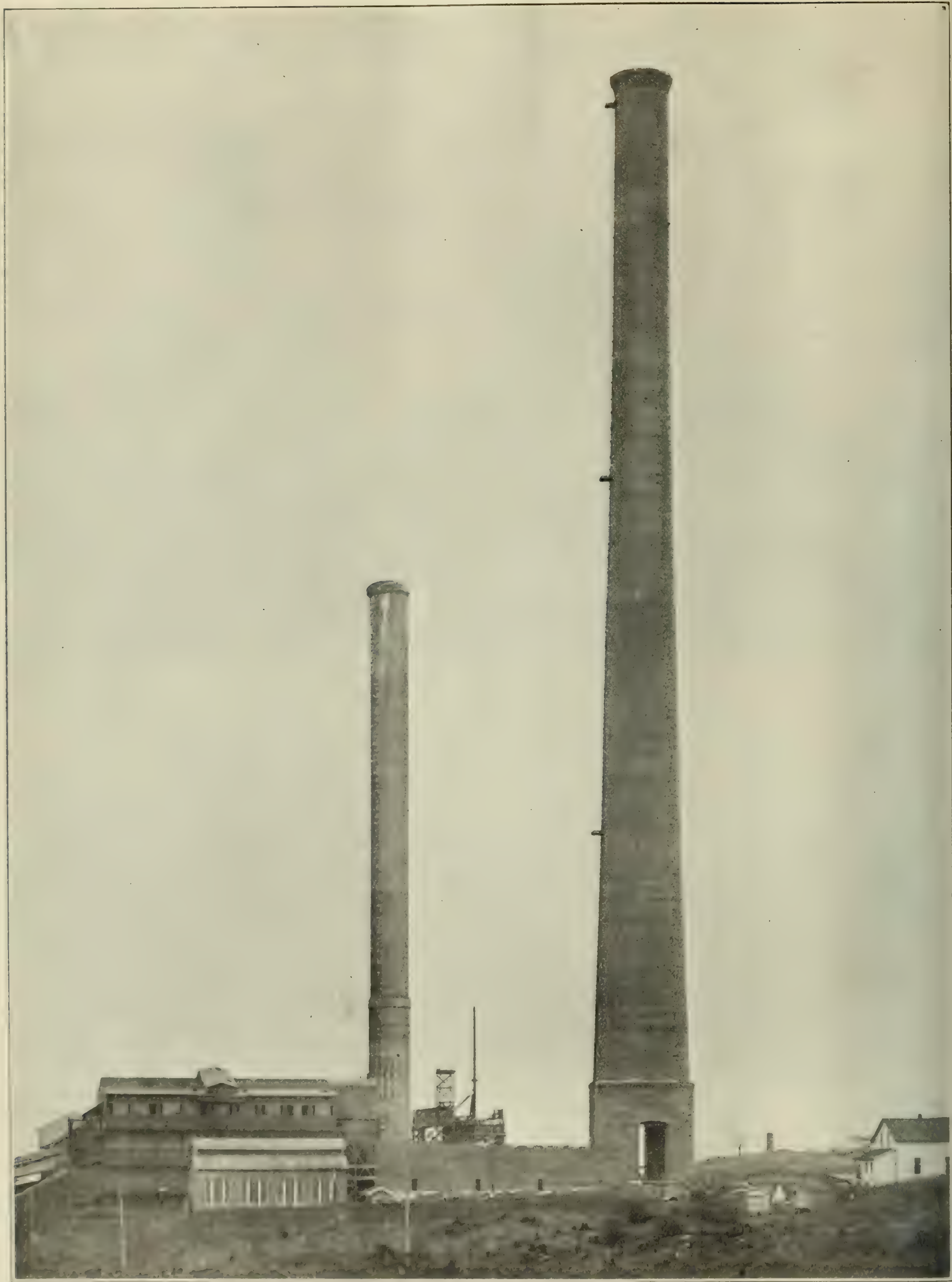


ONE OF TWO 350-FT. CONCRETE CHIMNEYS AT INTERNATIONAL NICKEL CO.'S REFINERY AT PORT COLBORNE

These are the highest reinforced-concrete chimneys in North America. They are 350 ft. high, 12 ft. inside diameter at the top and 29 ft. 4 in. outside diameter at the base. Five reinforced-concrete chimneys were built at the Port Colborne refinery by the General Concrete Construction Co. of New York and Chicago. The chimneys were built of a 1:2½:3 mix poured in the special steel forms shown on the opposite page. These forms are adjustable to the taper of the chimney.

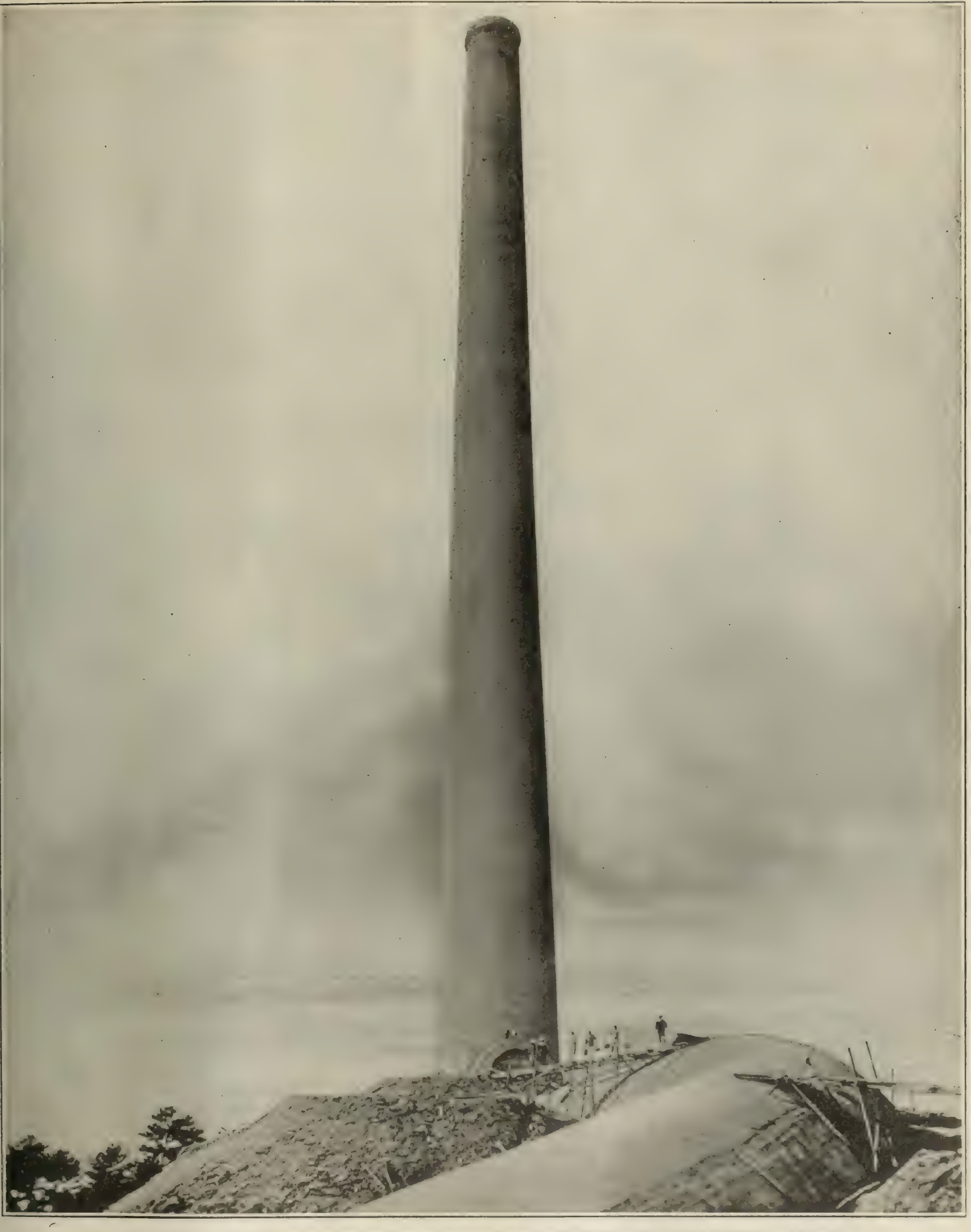


CONCRETE CHIMNEYS UNDER CONSTRUCTION AT THE PORT COLBORNE, ONT., NICKEL REFINERY, WITH SPECIAL ADJUSTABLE STEEL FORMS



THE TALLEST CHIMNEY IN THE WORLD, AT TACOMA, WASH.—572 FT. 10 IN. HIGH

The chimney was completed in February, 1918, for the Tacoma Smelting Co. and is erected on a ridge or hogback about 150 ft. high, making the top of the chimney about 725 ft. above tidewater. It was built of paving brick on a concrete footing extending 29 ft. in the ground through a bed of sand and into hard blue clay.



THE WORLD'S HIGHEST REINFORCED-CONCRETE CHIMNEY, AT SAGANOSEKI, JAPAN

This chimney was until this year the world's highest chimney, being 570 ft. high and 26 ft. 3 in. inside diameter at the top. It is now eclipsed by the newly completed brick chimney at Tacoma, Wash., which is 572 ft. 10 in. high. The Saganoseki chimney was built by the Weber Chimney Co. and is on the top of a hill 430 ft. above the smelting works, making the top of the stack about 1000 ft. above the smeltery site, or the adjacent sea. It has been stated by Tetsurow Komakine that a 1000-ft. concrete stack was being erected in Japan, but American builders are under the impression that Mr. Komakine had reference to the stack at Saganoseki, which is 570 ft. above foundation. With the 430-ft. elevation of the hill, the total height above sea level would total the 1000 ft. mentioned by Mr. Komakine.

Spelter Statistics for 1917

By W. R. INGALLS

REVISED and complete statistics of the zinc industry of the United States in 1917 are given in this article, reports having been received from all of the ore smelters. I did not undertake to collect the statistics of production by the dross smelters either in 1916 or 1917, and the total of spelter production reported as available for consumption is short by just so much. Some of this spelter is as good as, some of it is even better than, prime Western, this referring to redistilled spelter. Simple remelted spelter is, of course, inferior. In a statistical investigation of this subject it is difficult to draw the line between spelter recovered *after use* and spelter reworked from waste *in the course of manufacture.* The former is a true addition to the supply available for consumption; the latter is merely an incident to consumption. About all that may safely be said statistically on this subject is that there is a rather large production of reclaimed spelter and that statistics of consumption that do not take it into account are incomplete.

At the same time that the statistics for 1917 were collected, those for 1916 were revised. There are always likely to be some errors, both in the original reports of producers and in the computations in this office. However, these are generally slight and quite immaterial with respect to the general results. Corrections are made from year to year. This explanation accounts for the slight alterations of figures for 1916 from those that have previously been published.

Production—The total production of spelter by ore smelters in 1917 was 682,411 tons, against 680,018 tons in 1916. In 1917 there were 17 ore smelters who produced spelter from dross to a more or less extent, an increase of three over the previous year. The production from dross, skimmings, etc., was 16,166 tons in 1917, against 11,681 tons in 1916.

The statistics of spelter production by quarters show the maintenance during the first half of 1917 of the high rate attained toward the end of 1916. Indeed, the output in the second quarter of 1917 was but little inferior to the maximum recorded for any quarter in the history of our industry. With the third quarter came a decline, however, which has continued during 1918, the output of spelter for the last year having been less in each quarter than in that immediately preceding.

PRODUCTION OF SPELTER
(In Tons of 2000 Lb.)
By Ore Smelters Only

States	1913	1914	1915	1916	1917
Arkansas	....	.	.	7,637	25,701
Colorado	8,637	8,152	8,984	8,908	7,735
Illinois	111,551	130,587	161,665	181,495	176,071
Missouri-Kansas	85,157	53,424	111,052	154,396	86,505
Oklahoma	83,230	92,467	111,405	169,064	204,587
Electrolytic	....		.	10,963	27,245
East and others (a)	69,687	85,682	114,036	147,555	154,567
Totals	358,262	370,312	507,142	680,018	682,411

(a) Includes Anaconda and other electrolytic production in 1915.

The closing of plants began in the second quarter of 1917, when two dropped out. Operations were ceased in five in the third quarter and in five more in the fourth quarter. As an offset, two new plants went into operation, these being the Athletic, which began smelting in the second quarter, and the Terre Haute plant of the Grasselli company, which began in the third. These represented the tail end of the new construction begun in 1916. The plants that blew out were chiefly those with coal-fired Belgian furnaces and some in the natural gas fields that were subject to high costs. At the end of 1917 there were 12 plants idle which had been producers earlier in the year.

Spelter Production According to Fuel—Of the total spelter production of the ore smelters in 1911, concerns using coal as fuel produced 119,989 tons, or about 40% of the total. In 1912 they produced 134,077 tons, which was only about 38% of the total. In 1913 their production was 157,653 tons, or about 44% of the total; in 1914 it was 173,520 tons, or about 48% of the total; in 1915 it was 227,143 tons, or about 45% of the total; in 1916 it was 289,007 tons, or about 42% of the total; and in 1917 it was 282,498 tons, or about 41% of the total. The remainder of the production was made by smelters using natural gas as fuel. Up to 1915 there was a general tendency toward increasing production by the smelters using coal as fuel, their proportion of the total output having risen from 40% in 1911, to 48% in 1914. In 1915 it fell to 45%, in spite of the revival of smelting at Pittsburg, Kan., which is easily explained. There were a lot of inactive natural-gas smelteries that could be put quickly into operation, which was done, and, moreover, it was quicker and easier to build new plants in the natural-gas fields than in the coal fields. The same conditions continued in 1916, and the ratio of the spelter produced by smelting with coal fell to 42%, which took us about back to the situation of 1912.

SPELTER PRODUCTION, 1913–1917, BY QUARTERS
(In Tons of 2000 Lb.)
Reports of Ore Smelters Only

District	I	II	III	IV
1913				
Illinois	27,924	28,523	26,118	28,986
Kansas-Missouri	22,006	23,820	19,204	20,127
Oklahoma	21,430	21,840	18,502	21,458
Others (a)	20,722	20,153	19,238	18,211
Totals	92,082	94,336	83,062	88,782
1914				
Illinois	31,005	32,482	32,512	34,588
Kansas-Missouri	13,939	14,659	13,193	11,633
Oklahoma	22,563	22,960	22,945	23,999
Others (a)	22,717	22,715	24,106	24,296
Totals	90,224	92,816	92,756	94,516
1915				
Illinois	35,786	39,511	41,791	44,577
Kansas-Missouri	14,090	24,554	32,152	40,256
Oklahoma	24,713	26,984	28,613	31,095
Others(a)	26,255	30,575	31,360	34,830
Totals	100,844	121,624	133,916	150,758
1916				
Illinois	45,344	45,547	41,953	48,651
Arkansas	....	....	2,977	4,660
Kansas-Missouri	38,513	42,488	39,447	33,948
Oklahoma	34,994	38,786	42,604	52,680
Others (a)	37,853	39,873	41,514	48,186
Totals	156,704	166,694	168,495	188,125
1917				
Illinois	48,756	47,237	40,379	39,699
Arkansas	5,597	6,847	7,596	5,661
Kansas-Missouri	26,350	25,621	19,443	15,091
Oklahoma	53,280	57,227	48,478	45,602
Electrolytic	7,950	8,362	5,096	5,837
Others (a)	42,013	41,700	39,736	38,853
Totals	183,946	186,994	160,728	150,743

(a) With the exception of one plant in Colorado, these are all Eastern works. In the fourth quarter of 1915 and in 1916 is included Anaconda and other electrolytic production.

Electrolytic Zinc—The production of electrolytic zinc in the United States in 1917 was 27,245 tons, against 10,963 tons in 1916. The Consolidated Mining and melting Co., of Canada, at Trail, B. C., produced 9956 ons in 1917 and 2986 tons in 1916. The American roducers in 1917 were the Anaconda, River Smelting nd Refining Co., Judge Mining and Smelting Co., and e Mammoth plant of the United States Smelting, efining and Mining Co. One other concern was ngaged in the electrolytic refining of crude spelter, hose output does not appear in these statistics, for e reason that it duplicates the report of distilled pelter.

The Electrolytic Zinc Co. of Australia, which has uilt a plant at Risdon, near Hobart, in Tasmania, for e treatment of Broken Hill ore, began production early 1918, and since then has been producing about 10 ns of spelter per day.

Fine Zinc—It was reported from 11 works in 1917 at they had been engaged in the redistillation of mmon spelter. The aggregate production of refined pelter reported by them was 41,468 tons. This was pelter of high grade, probably assaying in the main om 99.75 to 99.90% of zinc. The production of restilled spelter in 1916 was 63,000 tons. Among other ne spelters is the Mascot brand of the American Zinc, ead and Smelting Co., produced directly from ore. pelters running above 99.9% zinc are the Horsehead d Bertha brands, directly distilled; and the electrotic metal. Altogether, the output of fine zincs in 17 was probably close to 100,000 tons.

Late in 1917 an investigation of the suitability of pelter for the manufacture of cartridge brass and her high-grade brass was made, which investigation to the following representations to the War Indusies Board, jointly by nine large smelting companies:

> Failure of cartridge cases by seasoning-cracking and litting is due, according to the consensus of opinion among ass metallurgists, to the release of mechanical strains troduced during the manufacture. Possibility of impuris, especially cadmium, as a contributory factor, is by em dismissed. Cartridge brass made from the highest ade, non-cadmiferous spelter is subject to seasoning-crack. Experiments with brass into which cadmium in vary amounts has been purposely introduced exhibit no creased tendency toward seasoning-cracking, as compared th brass free from cadmium. There is some evidence to licate that cadmium in brass may improve its mechanical operties; and the opinion is entertained by some brass etallurgists that some cadmium in spelter may be beneial in brass manufacture. However, in making brass th spelter containing high cadmium, but little cadmium not more than 0.02%—is to be found in the brass, and effect is regarded as inappreciable one way or another. e bulk of the cadmium is volatilized from the brass pot d is found largely in the flue dust therefrom. The entire bject of cadmium is practically ignored by the most expenced brass-makers. The influence of lead and iron in brass well understood, and these impurities are covered by ecise specifications. The French government has saped American contractors for cartridge discs with large antities of spelter containing up to 0.4% lead plus iron, thout any specification as to cadmium. The British govnment, which, in the early years of the war, required igh-Grade" spelter, has recently liberalized its specificans, and for cartridge brass now takes spelter containing to 0.3% lead and does not stipulate anything as to cadum. American producers have supplied both of these vernments, and also the Russian and Italian, with large antities of spelter, without receiving any complaint. If manufacture of cartridge brass during the war had en limited to "High-Grade" spelter, the supply would ve been far from sufficient. Finally, and most conclusly, the Brass Committee of the Advisory Council of National Defence, comprising the leading brass manufacturers of the United States, advised the United States Government that with the use of spelter containing not more than 0.10 to 0.12% lead, 0.02% iron and up to 0.05% cadmium, they could make good cartridge brass, and included brands of spelter refined by redistillation among those which they considered suitable. This recommendation by the Brass Committee is in itself considered a sufficient reason for the liberalizing of the spelter specifications of the United States, and by comparison with what the French and British are actually doing is regarded as being very conservative. Indeed, such spelter will make brass coming within the limits of toleration of impurities in the existing specifications of the Ordnance Department of the Army of the United States.

The above representations led to a liberalizing of its specifications by the Ordnance Department of the Army early in 1918. I may say, further, that there has since then been full confirmation of the representations by the British munitioning authorities.

I think that the practice of classifying spelter among grades is insufficiently definite and ought to be discarded, except, perhaps, for general expressions. The common impurities of spelter are lead, iron and cadmium. The iron content is easily controlled and is nearly constant. Cadmium, as has been shown, is harmless for most purposes, and may even be beneficial for some. The controlling factor in the quality of spelter in general is therefore the lead content. Spelter should be bought, I think, upon specifications limiting lead plus iron, say, to less than 0.05%, from 0.05 to 0.1%, from 0.1 to 0.15%, and so on. If a restriction upon cadmium be really necessary—and for a few purposes it is—let the toleration of it also be specified.

General Conditions of Ore Supply—The reports as to ore receipts give interesting indications as to practice in smelting and as to market conditions. The smelters who make sulphuric acid continue, as in the past, to draw their ore mainly from Wisconsin and from the Joplin district (including Oklahoma). For the manufacture of sulphuric acid this ore is recognized to be superior, but it is noteworthy that several of the zinc acid makers are using a larger and larger proportion of Western ore. Of the total number of works—48—there were 16 in 1917 that used nothing but ore from the high-grade districts, viz., Missouri, Kansas, Oklahoma, Wisconsin and Arkansas, the total quantity taken by them from those states being 290,026 tons.

There were nine works that did not use any ore from the high-grade districts, their chief supply being ore from the Rocky Mountain region and from foreign countries. Imported ores were smelted by 20 works. In 1917 Australian ore was received at three smelteries, all of which were east of the Mississippi River.

These figures do not show any great change from the previous year, except with respect to the use of Australian ore. The arrivals of the latter in 1917 were only the fag end of the contracts made in 1915-16, the increase in freight rates having checked further importations from that source.

Ore Smelted—The smelters, as distinct and separate from the electrolytic producers, reported that in 1917 they treated 1,149,172 tons of blende and 424,311 tons of calamine, a total of 1,573,483 tons. In 1916 they smelted 1,203,839 tons of blende and 510,075 tons of calamine, a total of 1,713,912 tons. As I remarked last year, it should not be attempted to draw too fine distinctions from these figures respecting either the quantity or the average yield of the ore smelted, some smelters apparently having reported "ore received" as "ore smelted," and there was probably some other confusion respecting this inquiry. However, we may draw some rough deductions.

In 1914 the calamine smelted was about 26½% of the total; in 1915 it was about 28½%; in 1916 about 29¾%; and in 1917, about 26.9%. The tendency to use a larger proportion of calamine in smelting that was exhibited in 1915 and 1916 was checked in 1917, when the smelters were forced by adverse market conditions to seek high-grade blende rather than low-grade calamine, as in 1915, but the increase was not so marked as it was between 1915 and 1914.

Grade of Ore Smelted—In the accompanying table an attempt has been made to estimate the average grade of the ore smelted during the last few years. The most uncertain factor is the percentage of metallurgical extraction, which has been assumed at 83.3% in 1915-17 and at 86% in 1914. These assumptions are purely arbitrary. Of course, the calculated grade of the ore is too low in just the proportion that the estimate of metallurgical recovery is too high. However, the figures afford a sort of an index as to the nature of the raw material purchased by the smelters.

ORE SMELTED AND YIELD

	1914	1915	1916	1917
Total production of spelter, tons.....	370,312	507,142	680,018	682,411
Ninety per cent. of production of zinc dust..........................	938	1,299	2,086	4,424
Total production of zinc, tons......	371,250	508,441	682,104	686,835
Less production of electrolytic, tons	......	......	10,963	27,245
	371,250	508,441	671,141	659,590
Less production from dross, tons.....	12,355	12,538	11,681	16,166
Net production of spelter, tons.....	358,895	495,903	659,460	643,424
Amount of ore smelted, tons.........	855,435	1,188,075	1,713,912	1,573,483
Average spelter per ton ore, per cent...	41.96	41.74	38.49	40.88
Estimated average recovery, per cent.	86.0	83.3	83.3	82.0
Estimated grade of ore, per cent......	48.8	50.1	46.2	49.9

Receipts of Ore—The receipts of ore by smelters in 1917 showed a decrease, the grand total having been 1,613,272 tons, compared with 1,777,891 tons in 1916. These totals include the receipts of ore by the smelters only, and do not include the ore that was taken by the manufacturers of zinc oxide or what was used by the producers of electrolytic zinc. Such a decrease was, of course, to be expected, in view of the large number of plants shutting down, using up their ore stocks and not taking any more.

In my report last year I said:

> The aggregate of ore receipts in 1916 was considerably larger than the aggregate of the ore smelted, just as was the case in 1914 and 1915. The explanation of this feature in 1916 must in the main be the same as in the previous years, namely, the stocking up of new plants. A large tonnage of ore must always be carried in the bins for a working reserve, a sort of balance wheel, so to speak. Not until a considerable number of plants go out of operation, and not until there be a general contraction in smelting, shall we see statistics showing a greater quantity of ore smelted than received. However, I desire to point out in this connection that extremely fine deductions should not be drawn from these statistics, for, although they are compiled from returns made by all the smelters, it is possible, nay, even probable, that some smelters misunderstood the inquiry and unintentionally made incorrect returns. This, of course, is a factor that enters into all statistics.

Following the above reasoning, we should have expected a larger quantity of ore smelted than received in 1917. The statistics show 1,573,483 tons smelted and 1,613,272 tons received. It is likely that statistical inaccuracies are responsible for this exhibition.

The zinc-ore statistics for the United States do not require any extended comment. In the case of every state there was decreased production, except in the Joplin district and Wisconsin. It has been necessary to group Arkansas, Missouri, Kansas and Oklahoma, as some producers were unable to report them separately. The totals of those who did report separately were as follows: Arkansas, 7047; Missouri-Kansas, 204,781; Oklahoma, 97,518. The grouped reports aggregated 165,723 tons.

RECEIPTS OF ZINC ORE

(In tons of 2000 lb. This table includes the receipts of ore by the smelters only and does not include the production of ore exported or what was taken by the electrolytic producers or by the manufacturers of zinc oxide.)

State	1912	1913	1914	1915	1916	1917
Arizona..........	11,937	9,347	6,357	14,718	17,243	14,837
Arkansas.........	1,567	1,500	1,737	7,017	12,854	(*c*)
California........	6,639	6,796	8,827	27,445	41,291	12,444
Colorado..........	212,423	220,166	164,739	148,359	194,418	184,304
Idaho............	19,482	31,835	57,001	78,767	104,575	86,172
Kentucky.........	947	441	434	1,863	2,460	2,019
Missouri-Kansas..	289,177	280,000	247,723	278,099	369,397	(*c*)
Missouri - Kansas- Oklahoma - Arkansas.........	(*d*)	(*d*)	(*d*)	(*d*)	(*d*)	475,069
Montana..........	34,034	91,257	125,663	200,528	233,645	171,904
Nevada...........	20,654	22,313	20,447	24,949	51,670	35,045
New Mexico.......	25,889	14,593	15,369	37,042	35,734	16,353
Oklahoma.........	4,325	23,500	26,247	25,231	42,799	(*c*)
Tennessee.........	6,635	8,297	18,708	38,527	43,309	38,488
Utah.............	24,539	27,073	20,322	21,535	43,240	21,381
Wisconsin........	90,762	89,662	74,311	90,128	91,561	137,248
Others and undistributed........	56,099	57,241	57,936	122,490	111,273	192,393
Totals..........	805,109	884,021	845,821	1,116,698	1,395,469	1,387,657
Mexico...........	29,436	19,965	16,414	49,171	142,687	135,368
Canada...........	9,707	6,012	10,532	14,000	31,877	21,502
Australia	....	....	....	68,448	134,464	37,031
Other foreign.....	....	....	....	9,211	73,394	31,714
Grand totals(*b*)..	844,252	909,998(*b*)	872,767	1,257,528	1,777,891	1,613,272

(*a*) Including Illinois and Iowa. (*b*) In addition to the ore reported from Canada and Mexico, zinc smelters received a few thousand tons from Europe and Eastern Siberia in 1913. (*c*) See "Missouri-Kansas-Oklahoma-Arkansas." (*d*) See under separate states.

Spelter Stocks—The stock of spelter at works on Dec. 31, 1917, being the aggregate of the reports of all the smelters, was 56,591 tons, compared with 16,085 tons at the beginning of 1917. These figures include both high-grade and common spelter.

Sulphuric Acid—In 1917, there were 12 smelters who produced sulphuric acid from blende, one more than in 1916. The enumeration is, however, open to some criticism, owing to complications that are developing in the industry. It is often good business to roast the blende at a good center for the distribution for sulphuric acid, and reship the roasted ore to a good point for zinc distillation. The Western Chemical Co. has for a long time roasted ore at Denver, Colo., and sold the product to smelters. The National Zinc Co. has no roasting furnaces at its smeltery at Springfield, Ill., which gets its ore from the roasting plant of the company at Argentine, Kan. Similarly, the Grasselli Chemical Co. roasts at Canton, Cincinnati, Newcastle, Cleveland and Grasselli the ore that is needed by its smelteries at Clarksburg, Meadowbrook and Terre Haute. The New Jersey Zinc Co. has a roasting plant at Tiltonville, Ohio, which supplies other smelters. With the movement of the zinc-smelting industry to the eastward, the separation of blende roasting and zinc distillation is becoming more marked, as it has been for a long time in Europe.

STATISTICS OF SPELTER-SULPHURIC ACID WORKS

(In Tons of 2000 Lb.)

	1913	1914	1915	1916	1917
Ore received...............	364,741	434,666	614,565	752,021	779,941
Spelter produced...........	148,188	196,529	244,252	293,525	313,433
Sulphuric acid, basis 60 deg...	305,167	355,424	475,740	683,514	817,573

It will appear from this that the definition between zinc smelters' acid and acid derived from other sources is becoming more and more uncertain. The statistics that I offer are to be regarded, therefore, as more valuable for comparative purposes than as indicative of precise results, although in the latter respect they are probably not far out of the way.

It is to be remarked that no attempt should be made to determine from the accompanying statistics any ratios between ore received and sulphuric acid produced or between spelter produced and sulphuric acid produced, for the reason that certain concerns received and smelted a good deal of calamine, which, of course, never went through the blende-roasting department at all.

Smelting Capacity—The capacity of the zinc-smelting works of the United States at the end of 1917 is given in the accompanying table. This statement falls short of measuring the real increase of zinc-producing capacity, for it takes no account of the electrolytic plants.

ZINC-SMELTING CAPACITY OF THE UNITED STATES
(Number of Retorts at End of Years)

Name	Situation	1916	1917
American Spelter Co. (*a*)	Pittsburg, Kan.	(*b*) 896	(*b*) 896
American Steel & Wire Co.	Donora, Penn.	9,120	9,120
American Zinc and Chem. Co. (*a*)	Langeloth, Penn.	7,296	7,296
American Zinc Co. of Ill.	Hillsboro, Ill.	4,864	4,864
American Zinc, Lead and Smg. Co. (*a*)	Dearing, Kan.	4,480	4,480
American Zinc, Lead and Smg. Co. (*a*)	Caney, Kan.	6,080	6,080
American Zinc, Lead and Smg. Co. (*c*) (*a*)	Neodesha, Kan.	3,760	3,760
American Zinc, Lead and Smg. Co. (*c*)	E. St. Louis, Ill.	4,864	5,620
Arkansas Zinc and Smelting Corpn	Van Buren, Ark.	2,400	3,200
Athletic Min. and Smelting Co.	Fort Smith, Ark.	(*d*)	1,664
Bartlesville Zinc Co.	Bartlesville, Okla.	7,488	5,184
Bartlesville Zinc Co.	Blackwell, Okla.	8,800	9,600
Bartlesville Zinc Co.	Collinsville, Okla.	13,440	13,440
Bartlesville Zinc Co., Lanyon-Starr Branch	Bartlesville, Okla.	3,456	3,456
Chanute Spelter Co.	Chanute, Kan.	1,280	(*g*)
Cherokee Smelting Co.	Cherokee, Kan.	(*h*) 896	(*h*) 896
Collinsville Zinc Co. (*a*)	Collinsville, Ill.	1,984	(*b*) 1,984
Eagle-Picher Lead Co.	Henryetta, Okla.	3,000	(*b*) 3,000
Edgar Zinc Co.	Carondelet, Mo.	2,000	1,982
Edgar Zinc Co.	Cherryvale, Kan.	4,800	5,040
Fort Smith Spelter Co.	Fort Smith, Ark.	2,560	2,560
Grasselli Chemical Co.	Clarksburg, W. Va.	5,760	5,760
Grasselli Chemical Co.	Meadowbrook, W. Va.	8,544	8,520
Grasselli Chemical Co.	Terre Haute, Ind.	(*d*)	3,360
Hegeler Zinc Co.	Danville, Ill.	5,400	5,400
Henryetta Spelter Co.	Henryetta, Okla.	3,000	(*a*) 3,000
llinois Zinc Co.	Peru, Ill.	4,640	(*b*) 4,640
ola Zinc Co.	Concreto, Kan.	(*b*) 660	(*h*) 660
oplin Ore and Spelter Co.	Pittsburg, Kan.	(*j*) 1,792	(*g*) .....
. B. Kirk Gas and Acid Co. (*a*)	Iola, Kan.	3,440	3,440
Kusa Spelter Co.	Kusa, Okla.	3,720	7,520
La Harpe Spelter Co.	Kusa, Okla.	4,000	(*k*) ...
Lanyon Smelting Co.	Pittsburg, Kan.	448	(*h*) 448
Robert Lanyon Zinc and Acid Co.	Hillsboro, Ill.	3,200	(*b*) 3,200
Lanyon-Starr Smelting Co. (*e*)	....	.....	......
Matthiessen & Hegeler Zinc Co.	La Salle, Ill.	6,168	6,168
Mineral Point Zinc Co.	Depue, Ill.	9,068	9,068
Missouri Zinc Smelting Co. (*a*)	Rich Hill, Mo.	(*j*) 448	(*b*) 448
National Zinc Co.	Bartlesville, Okla.	4,970	4,256
National Zinc Co.	Springfield, Ill.	3,800	4,480
Nevada Smelting Co.	Nevada, Mo.	672	(*h*) 672
New Jersey Zinc Co. of Penn.	Palmerton, Penn.	7,200	7,200
Oklahoma Spelter Co.	Kusa, Okla.	(*j*) 1,600	(*h*) 1,600
Owen Spelter Co.	Caney, Kan.	1,920	1,920
Pittsburg Zinc Co.	Pittsburg, Kan.	910	(*h*) 910
Prime Western Spelter Co.	Gas City, Kan.	4,866	4,866
Quinton Spelter Co.	Quinton, Okla.	1,340	2,016
Sandoval Zinc Co.	Sandoval, Ill.	672	(*a*) .....
Tulsa Fuel and Manufacturing Co.	Collinsville, Okla.	6,232	6,232
United States Smelting Co. (*a*)	Altoona, Kan.	4,600	4,640
United States Smelting Co.	Checotah, Okla.	4,480	5,120
United States Smelting Co.	La Harpe, Kan.	1,926	(*g*) .
United States Zinc Co. (*l*)	Henryetta, Okla.	1,200	2,400
United States Zinc Co.	Sand Springs, Okla.	8,000	8,000
United States Zinc Co.	Pueblo, Colo.	1,984	2,200
United Zinc Smelting Corpn.	Moundsville, W. Va.	(*d*)	(*m*) 1,728
United Zinc Smelting Corpn. (*i*)	Clarksburg, W. Va.	3,648	3,648
Weir Smelting Co.	Weir, Kan.	448	(*a*) 448
Totals		213,510	218,090

(*a*) Closed during latter part of 1917. (*b*) No report received; entered the same as previous year. (*c*) Formerly Granby Mining and Smelting Co. (*d*) Under construction. (*e*) See Bartlesville Zinc Co. (*g*) Dismantled end of 1917. (*h*) Idle. (*i*) Formerly Clarksburg Zinc Co. (*j*) Idle latter part of 1916. (*k*) Absorbed by Kusa Spelter Co. (*l*) Formerly Western Spelter Co. (*m*) Not yet in operation.

At the end of 1917 the listed smelters of the United States possessed a total of about 218,100 retorts, of which operating smelters had 196,560. Of these the number in use on Dec. 15 was 127,193.

At the end of 1917 new furnaces, comprising 840 retorts, were reported as being in process of construction, the corresponding figure at the end of 1916 being 14,108.

Imports and Exports—The imports and exports of ore, spelter, sheet zinc and zinc dust are given in an accompanying table, the figures of which require no explanation. It will be observed that the Government figures for the exportation of spelter are different from those representing the production of spelter in bond as reported by the smelters; also that there are discrepancies with respect to the importation of ore. These differences are explained in part by the difference of the periods comprised within the respective reports, the smelters reporting the spelter when it leaves their works and the Government reporting it when it is entered for export in the custom house. In 1917 the smelters reported the production of 82,530 tons of spelter in bond, of which 18,771 tons was exported, while the Government reported the exportation of 63,889 tons of foreign origin.

In addition to the figures given in the tables which accompany this article, the following data are of in-

IMPORTS AND EXPORTS, BY QUARTERS

		1914	
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	3,355	500,253	1,288,249
II	4,727	512,123	1,256,259
III	6,849	664,012	535,471
IV	13,607	83,191	1,524,128
Year	28,538	1,759,579	4,604,107
Exports	Ore, Long Tons (*c*)	Spelter, Lb. (*a*)	Dross, Lb.
I	2,883	842,465	572,477
II	4,297	872,511	
III	1,319	48,177,681	1,239,570
IV	1,421	90,591,936	3,259,020
Year	9,920	140,484,593	5,071,067
		1915	
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	14,909	480,949	502,008
II	44,449	496,601	316,073
III	33,863	461,957	355,431
IV	48,611	369,457	538,861
Year	141,832	1,808,964	1,712,373
Exports	Ore, Long Tons (*c*)	Spelter, Lb.	Zinc Sheet, Lb.
I	. .	83,313,386 (*a*)	(*e*)
II	605	56,829,272 (*a*)	(*e*)
III	108	39,528,063 (*b*)	12,929,438
IV	30	58,318,807 (*b*)	11,836,786
Year	743	237,989,528	24,766,224
		1916	
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	110,293	435,896	779,253
II	98,497	492,823	477,425
III	74,855	243,186	273,899
IV	60,966	196,655	337,125
Year	344,611	1,368,560	1,867,702
Exports	Ore, Long Tons	Spelter, Lb. (*b*)	Zinc Sheet, Lb.
I	......	66,840,110	7,174,116
II	30	78,645,760	3,748,914
III	40	113,997,791	6,399,813
IV	. . . .	128,219,039	7,701,339
Year	70	387,702,700	25,024,182
		1917	
Imports	Ore, Long Tons	Spelter, Lb.	Dust, Lb.
I	65,087	153,127	112,199
II	123,859	119,005	304,638
III	39,392	99,868	228,510
IV	22,587	141,153	155,990
Year	188,925 (*d*)	513,153	801,337
Exports	Ore, Long Tons	Spelter, Lb.	Zinc Sheet, Lb.
I	......	124,254,565	3,843,800
II	32	111,881,657	8,896,880
III	334	92,476,060	10,557,745
IV	814	75,970,949	8,331,372
Year	1,180	(*d*) 404,562,152	(*d*) 31,700,915

(*a*) Includes zinc in sheets. (*b*) Does not include zinc in sheets, which was reported separately from July 1, 1915. (*c*) In addition to the exports of ore here reported, there were exported ore and calamine of foreign origin, the zinc content of which amounted to 279,000 lb. in 1914 and 1,218,500 lb. in 1915. (*d*) The quarterly figures do not foot up to the total given. Both are from the report of the U. S. Dept. of Commerce, and the difference is probably due to corrections made after the monthly figures were published, of which we have no knowledge. (*e*) Included with spelter.

terest: The zinc content of ore imported in 1916 was 148,146 short tons, whereas, in 1917, it was only 72,474 short tons. In 1916 the United States exported only 48 tons of zinc dross, but 13,305 tons of that byproduct was shipped abroad in 1917.

There have been some changes in the figures of exports of spelter and sheet zinc in 1916, which it is well to note. The total spelter exported in 1916 was reported by the Department of Commerce in its *Monthly Summary* for December, 1916, as 384,230,412 lb. In the December, 1917, issue of the *Monthly Summary* it is given as 387,702,700 lb., and our table is corrected in accordance therewith. Similarly, the sheet zinc exported in 1916 was first stated to be 28,501,869 lb., the revised figure being 25,024,182. It would appear that there had been an error in the classification of these forms of the metal, which was later on discovered.

Bonded Spelter—In 1917 there was produced 82,530 tons of spelter in bond. In 1916 the production in this way was 94,626 tons; in 1915 it was 15,781 tons; in 1914, 5630 tons; in 1913, 5904 tons, and in 1912, 15,781 tons.

Zinc Dust—The production of commercial zinc dust in 1917 was 4915 tons, as compared with 2318 tons in 1916; 1443 in 1915; 1042 in 1914; 423 in 1913; and 492 in 1912. In 1913 only two smelters were engaged in this manufacture, but when the outbreak of the war in 1914 cut off America's foreign supply and the price rose from about 6c. per lb. to 15@16c., several additional smelters engaged in the manufacture of it, until there are now nine.

The importation of zinc dust was 401 tons in 1917, compared with 934 tons in 1916; 856 in 1915; 2302 in 1914; 2200 in 1913, and 2400 tons in 1912.

Large Producers—A particularly interesting feature of the zinc business in recent years has been the entry of several general metallurgical companies into this field. I mean companies that are engaged in the production of other metals and have begun the production of spelter as a new feature of their business. Inasmuch as several of these companies make public reports, their outputs in tons in 1917 and 1916 may be stated as follows, the figures for 1917 being given first and those for 1916 in parentheses immediately following: United States Steel Corporation, 67,418 (55,898); American Smelting and Refining Co., 26,261 (23,904); United States Smelting Co., 26,795 (32,292).

Consumption—In my report for last year I explained the great difficulty in arriving at statistics of actual consumption, although in the main the large consumers are generous in their coöperation and just as willing to communicate their figures as are producers. However, there are exceptions, whose failure to respond prevents the figures from being complete, and there are numerous small consumers whose figures it is impossible to ascertain.

CONSUMPTION OF SPELTER
(In Tons of 2,000 Lb.)

Purpose	1916	1917
Galvanizing	200,000	190,000
Brass-making	175,000	170,000
Sheet mills	47,500	57,000
Lead desilverization	6,100	6,300
Castings	2,300	2,300
Other purposes	4,300	4,300
[illegible]	15,100	15,100
Totals	450,000	445,000

The consumers in 1917, as in previous years, were asked to state the amount of their *use*, not *purchase*, but there is doubt if this discrimination was in all cases understood. However, I am bound to assume that it was. Statistics computed on this basis will not tally with estimates of consumption arrived at in any other way, for the items of stocks in transit and in the hands of consumers, for which there are no statistics, intervene.

Galvanizers to the number of 92 reported the use of 136,079 tons of spelter in 1917, against 143,631 in the previous year. There were reports aggregating 8148 tons in 1917 from concerns from whom I had no information for 1916, and there were reports aggregating 11,218 tons from concerns which furnished reports for 1916 but did not do so for 1917. There were no reports from three large galvanizers whose use of spelter in 1916 was estimated at 8650, and whose use of it in 1917 was probably less. Furthermore, we had on our list the names of 17 galvanizers from whom no reports were received in either year, and for whom no satisfactory estimates could be made. The definite statistics show one thing clearly, viz., the use of spelter for galvanizing in 1917 was less than in 1916, but the setback was not so great as was currently supposed. I think it probable that the total use of spelter for galvanizing in 1917 was in the neighborhood of 190,000 tons, against about 200,000 tons in 1916.

DELIVERIES FOR CONSUMPTION
(In Tons of 2000 Lb.)

	1913	1914	1915	1916	1917
Stock, Jan. 1	4,264	40,115	23,500	14,300	16,085
Production	378,762	388,312	507,142	680,018	682,411
Imports	6,100	880	904	684	257
Totals	389,126	429,307	531,546	695,002	698,753
Exports, domestic	7,782	64,802	106,220	150,622	138,392
Exports, foreign	6,526	5,440	12,775	43,229	63,889
Stock, Dec. 31	40,115	23,500	14,300	16,085	56,591
Deliveries	334,703	335,565	398,251	485,066	439,881

Treating the consumption of spelter for brass-making in the same way, 43 brass manufacturers reported the use of 136,278 tons in 1916 and 133,166 in 1917, also a decrease, although not so large as in the case of the galvanizers. Brass-makers who reported only for 1916, five in number, used 7918 tons of spelter, and eight concerns who reported only for 1917 used 847 tons. Four brass-makers who are large consumers and who did not report for either year were estimated as using 22,000 tons in 1916, and in 1917 they probably used about as much. There are about six important brass-makers who are not represented in the statistics, as they did not give information, and it is impossible to estimate for them. I think it probable that the consumption of spelter for brass-making was about 175,000 tons in 1916 and about 170,000 tons in 1917.

The consumption of spelter for sheet zinc by the concerns that reported for both years (four in number) was 44,399 tons in 1917, and 38,955 tons in 1916. One large consumer reported for 1917 only, and another, not so large, for 1916 only. Making an estimate for the missing year in each of these cases, we have a total of 57,000 tons for 1917, and 47,500 tons for 1916. In my report for last year there was an inadvertent omission of one large concern, wherefore the figure now given for 1916 is quite different from that of a year ago. The figures for sheet-zinc production include the manufacture of wide sheets and narrow sheets, or ribbons; also of plate zinc, but I think it likely that there is a considerable production of the latter that has escaped reckoning.

We can estimate the consumption of zinc used in lead desilverization with sufficient accuracy by reckoning the use of zinc to the amount of 1% of the lead refined. Computing in this manner, the consumption of zinc for this purpose in 1917 was 6300 tons, against 6100 tons in 1916.

Returns respecting the use of zinc for castings, for the manufacture of zinc chloride, zinc sulphate and other chemicals, for lithophone and other pigments (not with any reference to zinc oxide made directly from ore) are too incomplete to permit me to make any reliable deductions for 1917.

The above figures are summarized in the table headed "Consumption of Spelter," and in another table are given the "Deliveries for Consumption," computed in the usual manner. In the estimates of actual consumption, galvanizing is, if anything, reckoned too high, and brass-making too low, but these comments, if correct, are true of each year in about the same proportion.

Last year the consumption estimated on the basis of reports by consumers was about 40,000 tons less than the deliveries estimated by difference in the usual manner. It was remarked also at that time that "there was in reality a large increase of stock, which, however, was unavailable owing to delays in transit, and did not become released until 1917. Consumers then obtaining possession of what they had previously bought were able to reduce their buying." In view of this appreciation of the invisible stock a year ago, it is not surprising to find that in 1917 actual consumption was in excess of the deliveries.

L. Vogelstein & Co.—Beer, Sondheimer & Co. Boards Reorganized

The Alien Property Custodian, in view of the report which L. Vogelstein & Co., Inc., had made to him of their former connection with Aron Hirsch & Sohn, Halberstadt, Germany, has taken control of L. Vogelstein & Co., Inc., and has reorganized the board, which now consists of the following seven directors: Edward M. McIlvain, James N. Wallace, Louis A. Watres, Alfred E. Smith, C. C. Daniels, L. Vogelstein, E. G. Hothorn. The management was left in the hands of the former officers. Announcement of this was made in the morning papers of July 23.

L. Vogelstein & Co., Inc.—capitalization $5,000,000—was organized in December, 1916, under the laws of the State of New York, and is successor of the copartnership of L. Vogelstein & Co., of which L. Vogelstein and E. G. Hothorn were general partners and Aron Hirsch was special partner. This firm was a successor, since 1905, of L. Vogelstein, who established the business in this country in 1897 and worked it up from a small beginning to one of the largest metal distributors.

At the same time it was announced that the Alien Property Custodian had taken over the business of Beer, Sondheimer & Co., Inc., whose business was founded in 1904 as an American branch of Beer, Sondheimer & Co., of Frankfurt-am-Main, and has been conducted since then by Benno Elkan and Otto Frohnknecht. The new directors of Beer, Sondheimer & Co., Inc., are James N. Wallace, Edward M. McIlvain, Louis A. Watres, John P. Greer, Ford Huntington, Benno Elkan and Otto Frohnknecht.

The Winter of Discontent

The Twenty-seventh Engineers

The trend of events on the Western front makes those of us who are not active in war work feel rather out in the cold. Things have lost their old-time flavor, and nothing matters much save winning the war. The man who is not exerting himself to the utmost in this direction, but is drifting along in comfort, will surely regret it when the boys come home.

It should be as a pleasure that we lend a hand in every way in the great contest. For one thing, let us discount in part the cheer awaiting the mining regiment when it returns and give that part now when it is wanted. Not a man in the industry but will throw up his hat when the regiment passes, nor should he fail to throw something in the hat when it passes him. In calling attention to the Comfort Fund, we are passing the hat, and all contributions are welcome, no matter how they are made. You will feel better when you meet the men of the Twenty-seventh on their return if you seize this opportunity now.

HOW THE COMFORT FUND STANDS AT PRESENT

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	20.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grepher	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Francis Thomson	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burral	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S . R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd	100.00
United Eastern Mining Co	50.00
W. A. Wilson	20.00
Oscar Lachmund	10.00
W. Rowland Cox	10.00
Total	$15.754.11

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Owing to the large volume of work involved in administering the fund, contributions are acknowledged only by publication in the *Journal*.

Correspondence and Discussion

Import Duty on Wolfram

The suggested imposition of an import duty of 10% on tungsten mineral and concentrate is of practical interest and importance alike to consumers and producers within the United States. On the assumption that the foreign producer is making a great deal of money and can produce cheaper at less than domestic cost, the proposition should have the support of all patriotic citizens. There is no particular reason why Americans should pay more than is necessary, thus enriching foreigners at the expense of the United States Government. The same argument applies to an import duty on antimony and silver and manganese, as all of these metals can be produced in this country. Before it is decided definitely to add this duty we should be sure that we are not trying to have our cake and eat it. In other words, there are several points which should be carefully settled.

First, is the home production sufficient for all our needs? Second, if not, could it be increased sufficiently to supply all our needs by fixing a minimum price? Third, if there is no way of obtaining sufficient wolfram from our home producers, will the proposed duty seriously decrease importation?

I have gathered a few facts bearing on these points which ought to be of interest. Aside from a few tons spasmodically imported from Portugal, the main source of foreign tungsten, so far as we are concerned, is Bolivia, from which country approximately 200 tons a month are imported. It is easy to see, therefore, that if our home production is increased by 200 tons, we will receive all that is required, in which case the duty could as well be made 50 or 100% or importation could even be prohibited. It is for the tungsten miners to say whether this increased output can be obtained, either at the present price or at a fixed minimum.

An interesting side light on the importation of wolfram is the fact that more than half of that shipped from Bolivia is owned by American and English producers such as Messrs. Dillon, Easley, Bruce, Penny & Duncan, Duncan & Fox, Mella, W. R. Grace & Co., and others, so that if we impose an import duty we will be robbing Peter to pay Paul. With the idea of imposing an import duty as much as the "traffic will bear," and simply as a revenue measure, it is advisable to recall the industrial conditions as they are at present in Bolivia.

Owing to the disproportion between exports and imports from that country, the exchange is against the exporter, the difference being over 20%, and, owing also to the same causes which have increased the cost of labor and supplies in our own country, these charges have increased in Bolivia in a still greater proportion. Wages are nearly three times what they were before the war. Such supplies as coal, oil, steel and dynamite and lumber are three times their former price. The distance of Bolivia mines from sources of supply of machinery makes it extremely difficult, if not impossible, for them to obtain suitable concentration equipment. One company that I have in mind is in the market for a small hydroelectric power plant, which will increase the production of wolfram about 50 tons monthly. Judging from replies received so far, no manufacturer will promise a delivery under a year on this equipment, unless the order is placed on a priority certificate. Of course, if there is a shortage of tungsten, there is no doubt that the War Industries Board will grant the priority, but if the contrary is the case—that is, if sufficient tungsten is produced in the States—there will be no object in assisting the foreign producer to compete with our own mines.

On the assumption that it is advisable to continue to receive at least a portion of the tungsten produced in Bolivia, it should be borne in mind that the wolfram deposits there are not similar to the tin deposits. The latter are well-defined dependable veins, whereas the wolfram mines are pockety. One example of this is a mine which during December produced 120 tons and during May produced 25 tons. The concentrate is shipped in a special paper-lined jute bag, which before the war sold for about 12c. and is now worth around 50c. owing to profiteering and difficulties placed in the way of exporting these bags by interested Americans.

Another point which is influential in limiting the production in Bolivia is the huge increase in freight, which before the war was $18 per ton and is now 6% of the value of the shipment, or, on the basis of the present value of the mineral, about $72 per ton, equivalent to 400% of the former rate. Lumber, which really should not have increased in price, is double pre-war prices.

In case it is decided that some protection should be extended to domestic producers without desiring to interfere with importations, the bonus system should be considered. If it be considered feasible to impose a duty and still not diminish importation, on the supposition that the Bolivian producer is making a great deal of money and would continue to import, even though his expenses were increased, it should not be forgotten that a large differential would result in diverting shipments to Europe. As in the States, tungsten is produced in Bolivia by the leaser and small miner who, at the present time, are working on a narrow margin.

Another fact that should be borne in mind is that the exportation of ores from Bolivia to this country always results favorably for the United States, for the reason that the majority of the mine owners in Bolivia, in order to get their money back and because of the prohibition in connection with the export of gold from the United States, find it necessary to buy merchandise here and export it to Bolivia in order to reimburse themselves.

Whether one is a producer in Bolivia or in California, whether a consumer in England or in the States, whether a user of tool steel or a manufacturer of mining machinery, the above details are pertinent and will be useful as a basis for an argument for or against an import duty.

MARK R. LAMB.

New York, July 3, 1918.

Cutting Timber on Public Domain

This letter is written in the hope that it will bring any mining concerns to the support of a bill that assed the Senate last February and is now before the Iouse. The measure, authorizing the cutting of timber n the public domain for mining purposes by corporaions formed in one state and conducting mining operaions in another, is intended to amend a similar law nacted in 1878, but which specified "citizens of the Inited States and other persons, bona fide residents of" olorado, Nevada, New Mexico and other mineral disricts, and which failed to mention corporations, in articular those incorporated without the district in hich they were operating.

At the time of the passage of this act, many corporaions and individuals who had been trespassers upon e public domain, though unmolested as such, were reatly relieved. The law as enacted, however, forbids e cutting of the timber referred to unless application, due form prescribed by the law, is first made to offiials mentioned in the act for a permit to cut, fell and emove such timber as is needed. At the present time, e greater number of people engaged in mining and aving cause to use timber from the public domain are naware that they are technically trespassers and so able to punishment, if they have not applied for such ermits.

About 10 years ago, I was engaged in mining operaions in Nevada at mines patented by a corporation ith offices in New York and incorporated under the ws of Arizona. It was desirable to use wood, which as plentiful in the neighborhood, for fuel, as other uels would have to be hauled from the railroad, 35 iles away. Boilers adapted to the use of wood were stalled. An application to cut timber was made in ue time to the Chief of the Second Forestry Division, San Francisco. We were authorized to take such imber as we needed and advised that the permit would oon be mailed to us, subject to the approval of the Comissioner of the General Land Office. After having the ermit in our possession for some time, imagine our urprise on being informed that the Commissioner had ancelled the permit, because our company was not ncorporated in the State of Nevada.

It was pointed out to the Commissioner that a citizen f Arizona, or any other state, when living in Nevada, nd doing business here for six months, was recognized s a citizen of Nevada, and that he enjoyed all privileges s such; that our corporation had been doing business n Nevada for some years, and that we should be entitled o the benefits of the act; that the citizen of no state or erritory was in any wise interfered with, in going from ne state to another at will and immediately thereafter vailing himself of the rights to locate and own mining ands, and that within six months he could enjoy the rivileges of the act referred to. He replied that he ad no alternative under the wording of the act.

Accordingly, on Jan. 20, 1914, Senator Newlands inroduced a measure in the Senate which was favorably eported upon by the Committee on Public Lands and hen lost sight of. Later Senator Pittman introduced n identical measure that was similarly lost in comnittee. After a wait of another two years, the matter as again taken up with Senator Henderson, of Nevada, and through his personal attention the same bill was made to reappear as Senate Bill No. 26, which passed the Senate, on Feb. 5 last, through the joint efforts of the Senators from Nevada. This measure is now before the Committee on Public Lands in the House. It is earnestly hoped that all who may be interested will prevail upon their friends in Congress to get the bill before the House at an early date and secure its passage, to afford relief that should be forthcoming to corporations engaged in developing mines in the Western states.

JOHN T. REID.

Lovelock, Nev., June 29, 1918.

Trimountain's Copper Sheet

The article under the above title, published in the *Journal* for May 22, might lead one astray if unacquainted with the occurrence of mass copper in the Michigan copper country, in that it refers to that district as one "where mass copper abounds and is found in sizes ranging from small nuggets to large slabs weighing as much as 525 lb."

Doubtless the weight referred to should have been tons instead of pounds, and probably refers to the remarkable occurrence of this type of mineral deposit, which was uncovered in the old Minesota mine, now the Michigan, in 1856. That mass is described in some of the earlier editions of Stevens' "Copper Handbook," and is said to have been 12½ ft. x 18½ ft x 46 ft. long, and to have weighed 527 tons. Another fact brought out is the labor which was required to cut it into pieces small enough to hoist through the shaft. The combined efforts of 20 men were expended for a period of 15 months in the work. Native copper is extremely tough, and cutting such masses of it by hand with hammer and chisel presented tasks which remind one of the patient toil which produced the pyramids. Even modern methods are not as rapid as might be desired, as the miner who cuts a groove two square feet in area through a mass, by means of a chisel in a pneumatic riveting hammer, has accomplished a good day's work.

A few further notes on this subject may be of general interest. Although there can be no question of the profitableness of extracting mass copper once it has been disclosed by development operations of regular mining work, it might be noted that the mines which have depended upon the occurrence of mass for a livelihood have generally been failures. Moreover, the one great mine of the district, Calumet & Hecla, has never obtained revenue worth mentioning from mass copper. This point is emphasized in order to correct the tendency of strangers to overvalue the occurrence of large masses of practically pure copper, in comparison with the usual copper rock of the district, carrying 1%, more or less, of metallic copper. From the miners' standpoint, a vein of uniform copper content is much preferable to the occurrence of sporadic masses; and the financial performance of the various mines certainly upholds the miners' judgment in this particular. The economic value of this type of deposit is, however, of prime importance in those few mines where it forms a sweetener in a comparatively lean lode, and in cases it may be the factor which determines the dividend status of a mine.

ARTHUR C. VIVIAN.

Hancock, Mich., July 9, 1918.

Events and Economics of the War

The superior strategy of Foch was revealed in the mighty counter blow struck against the Marne salient during the week, completely surprising the Germans, while their efforts were concentrated in an assault on Rheims; attacking the enemy on three sides, the Allies drove in their right flank from seven to ten miles and also pushed them back over the Marne; Chateau Thierry was recaptured, and the German forces in the entire salient were threatened with envelopment; large numbers of prisoners and guns were taken; British forces in the north captured Meteren and also advanced near Villers-Bretonneux. Czech mutinies are reported to be spreading in Bohemia and Hungary. The Cunarder "Carpathia" was sunk by torpedo on July 17, five of the crew being lost. Honduras declared war on Germany on July 22.

On this side of the water, a German submarine shelled and burned a tugboat and sank three barges off Orleans, Mass., on July 19, the raider being finally driven under by seaplanes, after it had dropped four shells on the mainland. The U. S. armored cruiser "San Diego," of 13,680 tons, built in 1902, was sunk on July 19 off Fire Island, N. Y., probably by a mine. Four lightless nights a week, beginning July 24, were ordered by the Fuel Administrator. Seizure of certain metal firms by the Alien Property Custodian was announced on July 22, chief among them being L. Vogelstein & Co. and Beer, Sondheimer & Co., Inc., of New York.

Palmer Seizes Becker Steel Co.

Taking over by the Government of the German-owned Becker Steel Co. of America, with a plant at Charleston, W. Va., and offices in New York, was announced on July 18 by A. Mitchell Palmer, Alien Property Custodian. With the company American manufacturers will obtain a secret process for the production of "high-speed" steel, heretofore held exclusively by the Germans.

In the course of investigating the company's affairs, it was discovered that Adolph J. Becker, vice president, had bought and shipped to Germany in 1916, on the merchant submarine "Deutschland," 33,075 lb. of tungsten. The funds to make the purchase, it was found, had been supplied by Becker's brother, Reinhold Becker, of Germany, one of the real owners of the Becker Steel Co. Becker said that, in addition to the tungsten, he bought 22,050 lb. of ferrovanadium for $25,654. This he was unable to ship and later sold at a profit of $6000.

A new directorate for the company has been appointed by the Alien Property Custodian. The members are William H. English, vice president of the Empire Trust Co., who will be chairman; A. M. Sawtelle, a mining engineer of 5 Beekman St., New York; Paul T. Brady, of the Westinghouse Electric and Manufacturing Co.; George Dix, of the Midvale Steel and Ordnance Co.; W. A. McCorkle, president of the Citizens National Bank of Charleston, W. Va.; Royal H. Weller, of 31 Nassau St., New York, and W. E. Hilton, of Charleston, W. Va.

Gold Mining Classed as Essential

Gold mining has been listed as an essential industry, the War Industries Board announced on July 19, and all reasonable priority of material and supplies used in gold production will be given. The action was taken on request of the Treasury Department. The decision was interpreted by an official of the Priorities Committee to mean that every possible assistance would be given the gold mines in obtaining necessary materials.

Solving an Anthracite Labor Problem

To maintain production of anthracite, the industry has agreed to pay $150 to the nearest relative of an employee whose death was caused by an accident in a colliery and, in addition, has directed that the grievance committee and mine foreman elect six representatives of the colliery to attend the funeral. This plan, it is thought, will do away with the usual custom of all employees quitting work, thereby closing the mine, with its attendant crippling of the industry, for one or more days, and loss in output. The new rule has already gone into effect.

This plan of funeral attendance, it is said by the officials, appeals to the mine workers, as it was prepared by James Matthews, president of District No. 9, United Mine Workers, and adopted by the Anthracite Conciliation Board. It was also agreed by the operators that the wages of the six representatives shall be paid while the latter are in attendance at funerals.

Date Set for Sale of Koppel Plant

All the property, interests and assets of the Orenstein-Arthur Koppel Co. are to be sold at public sale by the Alien Property Custodian at 3 o'clock in the afternoon of Aug. 15, at the company's central office building, at Koppel, Penn. The property to be sold includes everything owned by the Orenstein & Koppel-Arthur Koppel Aktiengesellschafft, registered in Pennsylvania as the Orenstein-Arthur Koppel Co.; the Koppel Land Co.; the Beaver Connecting R. R. Co.; the Koppel Water Co.; the Pennsylvania Car and Manufacturing Co.; the Universal Railway Products Co.; and the Koppel Sales Company.

No bid will be received for the property and assets, which are to be offered in one parcel, unless the person offering to bid deposits with the Alien Property Custodian, or his representative, a check for $50,000 certified by an acceptable bank. The property will be sold only to American citizens and companies properly incorporated within this country and in no part controlled by enemies. The right has been reserved to name a minimum price prior to the sale. The successful bidder will be required to pay 25% of the purchase price in cash at once and the balance within 90 days.

It is provided that the purchaser shall assume all leases, carry out all contracts for purchase of supplies, fill all orders and sell and deliver all materials contracted for previous to the sale. The latter is made by authority under the Trading with the Enemy Act.

Bar Mexicans From Border Coal Mines

It was recently stated in the press that the Department of Labor on July 6 had refused requests of bituminous coal operators of Arizona to modify emigration restrictions so as to permit the importation of Mexican labor to work in the Arizona coal mines. This is interpreted by *Coal Age* to refer to certain Arizona corporations mining coal outside that state, presumably in New Mexico. Mexicans will be admitted only for farming, railroad labor and lignite mining. As to this, the journal mentioned further comments:

"In the south of Texas is a large body of cannel, with lignite near by, and this cannel is probably included under lignite in the classification of the Department of Labor, for the basis of the order of the emigration officials is really not the character of the industry but the question whether on the entrance of Mexicans into that industry they will compete with American labor."

Chlorine Distribution Now Regulated

Owing to the shortage of chlorine in the United States, the War Industries Board, with the approval of the President, has passed a resolution taking over control of the production and distribution of the gas, according to an announcement made on July 16. For the present, however, the board is doing no more than allocate the product, under the direction of H. G. Carrell, chief of the alkali and chlorine section. Chlorine has a wide range of uses, the most important from the present Government point of view being in the manufacture of gas shells and in carbon tetrachloride, which is the basis of one of the most effective smoke screens and also of the best fire extinguishers. One of the most important commercial uses of chlorine is in the bleaching of paper and various cloth fabrics.

Steel Needs Rechecked

The actual steel needs of the United States and Allied governments for the last six months of 1918 will approximate 21,000,000 tons. The greatest production in the history of the industry for the same period is recorded as only 16,500,000 tons. To make up this shortage the War Industries Board is considering means for increasing mill capacity. The steel tonnage required was determined by a careful rechecking made by the governments and agencies concerned, at the request of the director of steel supply. The revision showed no lessening of war demands. All non-war industries consuming steel will be required to submit to the director sworn inventories of stocks on hand. The Government is prepared, it is said, to commandeer any surplus stocks, should it become necessary to do sô.

Despite the demands made upon the domestic iron and steel industry to supply material for the Government's construction program, close coördination between all interests resulted in the shipment abroad of iron and steel and manufactures thereof, in the fiscal year ended June 30, valued at not less than $1,000,000,000.

Ruling on Copper Concentrates

Owing to some uncertainty regarding the application of the restriction imposed by the War Trade Board upon the importation of copper ore, the board has, by a new ruling, No. 169, altered the original one to read that hereafter no licenses will be issued for the importation of copper concentrates containing less than 60% of copper, except for shipments from Cuba, Canada, and Mexico. All outstanding licenses for the importation of copper concentrates containing less than 60% of copper have been revoked as to shipments from abroad after July 20, 1918, except from the three countries specified, from which copper ore may be imported.

This restriction, the board has announced, is not to be construed as affecting the importation from any non-enemy country of copper matte or blister copper or copper concentrates containing 60% or more of copper. The purpose of the new ruling, as of the former one, is to bring about the ocean transportation of copper in a concentrated form, rather than as the bulkier ore.

English Channel Tunnel Urged

Strong support for the English Channel tunnel scheme from the French and Italian delegates was voiced at the International Parliamentary Conference held in London on July 5. A resolution in favor of constructing the tunnel was carried unanimously.

It was estimated by the sponsors of the resolution that the passenger traffic from France alone would be 3,000,000 persons annually, instead of the 100,000 that traveled by steamer before the war. The probable passenger and freight traffic between Great Britain and the Continent was figured at a profit of £1,118,000, or 7% on the tunnel company's capital of £16,000,000.

The tunnel, which should be completed within five years of its beginning, would be worked, ventilated, and pumped by electricity supplied from a power station in Kent, possibly 10 miles or more inland. It was suggested that the tunnel should be maintained under the authority of the War Office, and a dip in the level of the rails forming a water lock, by which it could, in case of emergency, be flooded from floor to roof for a mile, would be under the control of the commandants at Dover Castle and the neighboring forts. Against the danger from enemy submarines, depth bombs or mines, the tunnel would be protected by a covering of the chalk bed of the Channel of a minimum thickness of 100 ft. The water depth at any vulnerable point would be no less than 180 feet.

Warning that all business firms in the United States should strike from their mailing lists names that have been placed upon the Enemy Trading List was given on July 18 by the Post Office Department at the request of the Censorship Board.

Resales of steel made by manufacturers who are on the preference list for steel supply, without the approval of J. Leonard Replogle, director of steel supply of the War Industries Board, will result in the dropping of such manufacturers from the preference list, the board announces, and will prevent their obtaining further priority assistance.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Chemists and Jewelers at Odds Over Platinum

A defence of the American Chemical Society's platinum campaign was made by Dr. Charles H. Herty at the hearing on that metal before the House Ways and Means Committee recently. The society's propaganda to induce American women to discourage the use of platinum in jewelry and to arouse citizens to the need of conserving it was bitterly assailed by Meyer D. Rothschild and others, representing the jewelry trade, as a tissue of "half truths and misrepresentations." Jewelers are said to regard the campaign as an effort to injure their business, inasmuch as it is the permanent disuse of platinum that is aimed at.

Dr. Herty criticized in no uncertain terms the "insufficiency and the inadequacy of the measures taken" in commandeering platinum. His position is that no platinum ought to be where it can be taxed and that all of it now in the hands of dealers should be put in the vaults of the sub-treasuries of the United States. He told the committee that he does not think it necessary for the Government to call in platinum articles from individuals. "I think," he said, "if the Government made it known, each loyal citizen would hold on to the platinum, without expense to the Government, until it is needed." Dr. Herty made it particularly clear that he thought that jewelers' stocks should be commandeered and paid for on an equitable basis. He also said that any chemist who sells his platinum to any one other than the Government would be just as unpatriotic as any jeweler.

Members of the committee expressed the keenest desire to know why the War Industries Board called for only 75% of the platinum in the face of a recommendation, which the jewelers say they made, that all unmanufactured platinum be commandeered. Representative Oldfield said: "It seems to me that the place for the jewelers' lobby work would be with Mr. Baruch and the War Industries Board. It seems to me that they have got by with it, whether right or wrong."

In the course of the running discussion, Representative Rainey said:

> In the last two years, since the Russian supply has been shut off, we have been getting some supplies from Colombia, but on account of the fact that we have diplomatic difficulties with Colombia that supply may not come in the future. . . . Leaving out the Colombian supply, in the year 1916 we received in the United States from all sources 16,462 oz. of manufactured crude platinum. It is just as important to our Allies to have platinum as it is for us. In 1916, although we were not at war, our Allies were purchasing their explosives in this country, and in 1916 of crude platinum we took from England and France 15,282 oz. in order to manufacture the explosives which we were sending and other war material, which left us with only 1180 oz. that we got from all other sources. In 1915 both England and France had stopped the manufacture of platinum jewelry entirely and were conserving platinum. In that year we secured of the manufactured platinum, ingots and bars which, I presume, is the refined platinum, 12,248 ounces.
>
> We got none of that from Colombia, but we did take from England and France 11,482 oz., leaving only 766 oz. that we got from all other sources. We were at war in 1917 ourselves, and leaving out the Colombian supply of crude platinum we only received 3001 oz., of which we took from our Allies, England and France, 2236 oz.—at that time both of them were conserving platinum and had stopped the manufacture of platinum jewelry—leaving only 765 oz. that we got from all other sources. Of ingots and refined platinum in 1917 we brought in altogether 4170 oz. Of course, none of that was from Colombia. Three thousand two hundred and seventy-five ounces came from England and France, and from all other sources we only got 895 oz. In other words, with the Colombian supply shut off, if we had not succeeded in getting platinum from our Allies during these two years that they were conserving platinum, we would not have had any platinum to carry on this war, which leads us to the conclusion that in carrying on this war, in so far as the manufacture of war material is concerned, England and France have been wise in their policy of conserving platinum and that we are not entitled to any of the credit.

Work on Sulphur for Chemical Alliance

Charged by the War Industries Board with an important part of the work of allocating sulphur materials, the Chemical Alliance already is deep in the enormous work that it has undertaken. The committee to have charge of the work is known as the Committee on Production-Distribution-Control of sulphur materials. It is composed of A. D. Ledoux, chairman; W. D. Huntington, and C. G. Wilson. In addition to the allocation of brimstone, the committee is charged with a similar duty with regard to pyrites and coal brasses.

Butte Trouble Involves Copper Price

Since the matters involved in the labor controversy at Butte cannot be dissociated from the question of the price of copper, the entire question has been turned over to the War Industries Board by the National War Labor Board, to which it had first been referred. The Metal Mine Workers' Union of Butte alleges discrimination against union miners by the Anaconda Copper Mining Co. and other companies in the Silver Bow Association. Wage questions also are in dispute.

Graphite Crucible Imports Restricted

All licenses for the importation of graphite crucibles have been revoked by the War Trade Board as to ocean shipments after July 15. No further licenses will be granted for the remainder of the calendar year. A significant feature of the announcement is that the War Trade Board formally makes the following statement: "Imports of graphite already are prohibited, the result of this restriction having been to develop an adequate supply of graphite within the country." This statement has given great hope to Alabama producers, and is interpreted as meaning that the War Trade Board finally has come to their view, which is that graphite for all needs can be produced in this country.

Mining in "No Man's Land"*

By Capt. H. D. Trounce

Our work in the Flanders trenches was almost entirely confined to mining. As soon as the Germans had been halted in their drive in August, 1914, they entrenched themselves, and wherever the trenches of the Allies were within 100 yards of their own they proceeded to start mining across "No Man's Land." Early in 1915 they exploded a large number of mines underneath the Allied trenches. The French and British immediately organized tunneling or mining companies and proceeded to countermine. During 1915 they were mostly engaged on the defensive in these operations below ground, but toward the end of 1915 and in 1916 and 1917 the Allies succeeded in reversing the state of affairs and were active with offensive mining.

When I reached the trenches early in the first week of January, 1916, the British company I was with had succeeded in sinking a number of shafts (not, however, without having several of them destroyed by the enemy during their construction) and had driven a number of galleries well over toward the Hun lines. Our trenches here opposite Fromelles averaged from 80 to 150 yards apart. On account of shallow water level, we averaged a depth of about 25 ft. below the surface, and only by constant pumping with hand pumps were we able to keep up the progress in our galleries. The soil was generally a blue plastic clay. At intervals we would strike running sand, and when this happened we usually found it wise to abandon the drive and start new workings. At the outset many of our tunnels also were destroyed by enemy "blows," but we succeeded in putting in quite an elaborate system in the course of time. The sector we were operating on had a frontage of approximately half a mile, and on this front we had about 16 shafts. From the shafts we drove a complete system of defensive galleries. Our main galleries were about 5½ ft. by 2½ to 3 ft. in cross section; branch galleries about 4½ ft. by 2½ ft. and with listening galleries or "rabbit holes," were usually in the form of a Y from the end of branch galleries and these were used principally for listening purposes.

Can Detect Enemy Easily if Working in Chalk or Flint

There is a marked difference between mining in clay and chalk. Later on in the Vimy Ridge area we had considerable mining in chalk. In clay it was possible for the Germans and ourselves to tunnel to within a few feet of each other before we could hear any sound of mining; and elaborate precautions were taken to insure silence. In chalk it is possible to hear from much longer distances, especially where the chalk contained any amount of flint.

To insure silent working in the clay we would use grafting tools instead of shovels. No nails were used in the timbering, all sets being wedged with sand bags. Blankets were hung in the end of galleries to deaden the noise. As we approached nearer to the enemy, the men working in advanced tunnels would have to use canvas shoes or work in their socks. No talking was allowed. Every precaution was taken to insure silent work. As the life of every one in the galleries depended on this, the work was conducted almost noiselessly. When we reached within striking distance of the enemy, we would build a charge chamber and load it with guncotton, connecting up with detonators and a double set of leads to the charge, and at the right moment fire these charges from the trench above by means of blasting machines. From this clay soil and at a depth of from 20 to 25 ft., we would blow craters 60 or 70 ft. wide with a small charge of 600 or 700 lbs. of guncotton. As a matter of fact, when we met the Hun below ground under "No Man's Land" we would endeavor to fire "camouflets," that is, a charge calculated to destroy enemy galleries but not to break the surface of the ground. We would usually carry on our work until we heard the Germans talking. When you can hear the enemy talking in clay you can bet they are pretty close. On some occasions we have in this way fired our mines when within three or four feet of enemy mines. In March, 1916, we broke into a German gallery and had a fight with them underground.

Mining Work at Depth of 150 Feet

Trench mining in clay is much more dangerous than in chalk, on account of the fact I have mentioned—the difficulty of hearing operations until one is almost on top of them. In the chalk country further south, in the Vimy Ridge trenches and the Somme area, we were mining at much greater depths. Some of our mines were 150 ft. deep, and after the battle of the Somme we found the Germans at Fricourt had a mine system 200 ft. deep. For these chalk mines we used a different and much stronger high explosive than guncotton. With the British, we used individual mine charges as large as 100,000 lb. These would blow cone-shaped craters several hundred feet in diameter and well over 100 ft. deep. Some idea of the terrific force of these mines can be obtained when you compare the bursting charge of the Mills bomb, which contains 4 oz., or ¼ lb., of ammonal, with the single mine charges of 100,000 lb., or 400,000 times that amount. You cannot see a hand bomb, like the Mills, burst without having some respect for its destructive qualities—particularly if you are close up.

Nearly all of our work on these Flanders mines was done by hand. At times our galleries and tunnels would be half full of water, and it required constant pumping, day and night, to carry on the operations. Hand water pumps and hand air pumps were used. Vertical shafts were sunk in this clay, usually of case timber, and light pit-prop sets were used for the galleries. All the dirt was handled in sand bags from the face, and brought out from the main galleries on rubber-tired mine cars and hoisted to the surface by windlasses. The sand bags were used for reveting and repairing trenches, which are being continually destroyed by enemy fire and action of the weather, and the surplus bags were emptied at night into shell holes and old mine craters.

We were fortunate, in our work below ground, in not losing more men than we did, but it required constant and careful listening to avoid casualties. We could distinguish in time the nature of the sounds of the enemy miners when charging their mines, as distinct from everyday work, and mighty useful it was that we could do so. When we suspected the enemy were about to fire one of their mines, we would warn the infantry and have them withdraw any of their men who were on guard on top at threatened points. Sometimes they would keep us guessing, and would hold their mines, just as we did ours, for several days, or even a week or two before firing them. The fact that mining is going on between the trenches is easily established after several weeks' work, but every effort is made to conceal the exact location of the galleries.

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*Reprinted from "The Castle," published at Camp A. A. Humphreys, Virginia.

Although it was our business as engineers to carry on the work we were responsible for, we would occasionally find time to do what we called "strafe the Hun," which, interpreted, means to open fire on them and their trenches with any weapon that was handy. On top at the time we were using the Vickers machine gun, the Lewis automatic rifle, hand grenades and several kinds and weights of trench mortars and a number of hand bombs. The Mills hand bomb had not yet been issued, but we threw a number of other varieties, from the old handle bombs with cloth streamers attached to guide their flight, to the cricket-ball bomb with a quick match which is lit from a brassard on your arm. Bomb throwing in 1916 was not the comparatively safe amusement that it is now. We also made up a number of bombs with different kinds of jam cans, filling them with pieces of shrapnel, iron, nails, any old thing with a kick, using powder and a small piece of fuse. Many accidents happened because of these crude methods. Our first trench mortars were made of pieces of cast-iron pipe. The trench mortar fellows would always use a long lanyard and carefully take cover themselves before they fired the mortars; in fact, so often did the mortar gun itself burst, that the invariable question when any trench mortar landed in the trench, was, "Whose is it; ours or theirs?" At the very best of times and with the scientific development of trench mortars, it is not a very healthy branch of the service. When trench mortar officers came snooping around the trenches in order to find a place to set up their guns, we would invariably refer them to desirable sites at least a hundred yards distant from any of our mine shafts. Like the "gas merchants," trench mortar batteries are more popular when they give you a wide berth.

Chilean Currency and Exchange

The establishment of a printing plant in the capital of Chile for the manufacture of the state's own banknotes recalls the marked improvement that has of late years taken place in the value of the paper peso, states the *Economist.* The unit of value in Chile is the gold peso, valued at $0.365 U. S. currency, but the circulating unit is the paper peso. In March, 1914, this note was worth no more than 19 or 20c. U. S. currency, and, at the end of June, 1915, its value was 16.1c. By the end of the same month of the following year, the value had risen to 18.7c., advancing in September, 1916, to 21.7c. Thereafter the rise continued to be fairly steady, and the explanation of the advance is found in the fact that the value of Chilean exports is considerably in excess of the country's imports, with the result that there is an over-supply of foreign credits and only a slight demand for foreign bills of exchange. The fluctuation in the value of money has long proved an obstacle in the economic advance of Chile. The exports of the country are customarily paid for in gold, but labor is paid in paper.

The working classes are sufficiently intelligent to realize—or, at least, to suppose—that the capitalists reap the benefit of the instability in the currency. This fact explains the political unrest that manifests itself at not infrequent intervals, and the many reconstructions of the Ministry. The recent official recognition of dollar exchange as a means of making international payments, through the adoption of a plan whereby part of the export duties on nitrate of soda shipped from Chile to the United States may be paid in approved 90-day sight bills on New York drawn in United States dollars, is expected to have important results. Until recently, export duties were payable only in gold and in sterling bills drawn on London. It may be remembered that the whole subject of exchange received the careful attention of, and was very fully discussed in all its aspects by, the Pan-American Financial Conference that met in Washington in 1915. The adoption of the dollar exchange for Latin America was one of the first practical results of that assembly.

The significance of the new regulations to the United States may be recognized when it is known that since the war the exports of Chilean nitrate to the United States have trebled in volume, and last year the value was put at $60,000,000. The first sale of nitrate in dollars took place in Valparaiso early in 1916; and soon afterward the first sale of tin concentrate was also contracted in dollars. A number of locally represented American companies then gave instructions that all quotations henceforth were to be made only in dollars and not in pounds, pesos, marks, or francs. The movement to establish regular trading in dollar exchange in South America has thus been consistently progressive.

Exploiting Dalmatian Bauxite Deposits

The *Board of Trade Journal* publishes the following extract from *Die Zeit* (Vienna, Austria):

> The war has brought Dalmatia a source of wealth in the exploitation of the rich deposits of bauxite. These ores are not far inferior to the French, as they yield 25 to 30% of pure aluminum. The German aluminum factories have had to fall back on Austrian bauxite. Bauxite has been obtained for years past in the northern islands of Dalmatia, but on the mainland not until October, 1916, when mining began near Sebenico. At present the work is confined to the neighborhood of Drnis. The mines further inland are not yet worked, owing to transport difficulties. There are rich deposits near Trau.
>
> An aluminum industry might well be developed in the country by means of the existing water power, especially the falls of the Cetina. Coal is also to be found. Herzegovina, which also possesses coal fields, is especially rich in bauxite. At present bauxite is being mined by a German firm and the Bauxite Co. in Vienna.

Carlos E. Restrebo, former president of the United States of Colombia, was recently quoted by the *Evening Post* as denying the reports that Colombia had taken steps to make platinum a government monopoly to prevent its exportation to this country. The reported action was supposed to be in retaliation for the failure of the U. S. Senate to ratify the treaty between the two republics, under the terms of which the United States was to pay Colombia $25,000,000.

Remember the Comfort Fund of the 27th Engineers.

Editorials

Zinc in the Second Quarter, 1918

LAST week we reported our statistics of the production of zinc in the second quarter of 1918, the stocks on hand at the end of the quarter, the number of retorts in operation, etc. The figures were about what was expected in the industry, reflecting, as they did, the consummation of developments that had begun in the first quarter. Thus there was a further closing of plants and a further contraction of production. But most satisfactory was a substantial reduction in the stocks on hand. The comparative figures for the two quarters of 1918 are as follows.

	First Quarter	Second Quarter
Production in short tons:		
Distilled	125,572	117,512
Electrolytic	8,096	9,404
Total	133,668	126,916
Stock at end of quarter:		
At works	(*a*)	43,149
Elsewhere	(*a*)	2,932
Total	64,443	46,081
Total number of retorts	198,894	196,580
Number retorts in use	124,072	110,956

(*a*) Not segregated in reports.

The reported stocks as of Apr. 1 and July 1, respectively, include only what was in producers' hands, either at their works or held elsewhere.

During the second quarter of 1918 four more plants became idle, some of them, perhaps, to be abandoned. Among these was the historic Glendale works of the Edgar Zinc Co. Almost all of the zinc smelteries of the country were operated at reduced capacity, in some cases at less than 40%. At the midyear there were only three plants being operated at full capacity, two of these small ones. Naturally, in each of these cases there were special reasons that permitted a scale of operations superior to that of the average of the industry. The great zinc smelteries of the country, without exception, had a large number of furnaces either cold or on dead-fire.

In the aggregate, only about 60% of the retorts of the United States were in use on July 1. This figure may not be just right, for some smelters may not have reported furnaces at work in redistilling. But, anyhow, it is manifest that even after the elimination of the mushroom plants of 1915-17, there is a very large proportion of idle capacity among smelters who are producing and intend to remain in the business. Some fear has been expressed lest the closing of smelteries would make it hard to get enough spelter to meet a sudden increase in demand. That is not a fear that is to be lightly disregarded, but the danger is rather on the side of personnel than on that of physical capacity. The statistics show the existence of ample capacity among those works that are still in operation, but their working forces have become disorganized. The labor situation will probably improve after completion of the harvesting of crops, but even at the best it is likely to continue troublesome.

The Position of the Gold Miners

THE unhappy position in which the gold miners find themselves need not be reviewed at length. Rather should we direct attention solely to the problem of amelioration. Everybody is agreed that something should be done, but nobody has been able to suggest anything very effective.

The War Industries Board, at the request of the Secretary of the Treasury, has already declared gold mining to be an essential industry, to be granted reasonable priorities in its requirements for material, etc. This is helpful, but is far from being a cure.

Congress might also be helpful in exempting gold miners from military service and exempting the industry from taxation. The levying of a war-profits tax on a gold-mining company is a painful joke. Not only are there no war profits, but soon there will be no profits at all. Exemption from taxation would be important, however, in removing the check upon prospecting. A company that has been spending its money for years in the hope of striking a bonanza cannot feel any enthusiasm over good luck in developing a bonanza in 1917 or 1918 and having to pay 80% in taxes on the profits realized in one year, which may, in truth, be only the deferred profits of many years. Many would figure that it would be far better not to hunt for bonanzas. The exemption from taxation would be, therefore, the removal of a check on gold mining, even if it were not a stimulus to it.

In this connection we must think how to define gold mining. There is no question that the Rand, Black Hills, Mother Lode and Alaska mines are gold mines pure and simple. A great deal of gold is derived from such mines as Anaconda and United Verde, but nobody would class them as anything other than copper mines. But how about such mines as those of the Comstock, in which gold and silver, or gold and something else, are nearly equal elements of value?

When we go beyond the helps that have been suggested above, most of the expedients for aiding the gold miners that have been proposed are dodges of the main point. The price for gold is not fixed. Commodities are exchanged for a certain quantity of gold, and it does not matter whether that be expressed in ounces, dollars, or pounds sterling. Any change in the basis of exchange would be like a modification of the yardstick. A decree that the yard should be henceforth 72 in. long, instead of 36 in., would not induce anybody to part with twice as much cotton cloth for the same money.

So far the financiers of the Allied countries have kept gold from going to a premium. It is doubtful if they can maintain their position. As Hennen Jennings has conclusively pointed out, the total quantity of gold in the world is now a dangerously small percentage of the indebtedness that is payable in gold. As soon as a debtor wants gold and finds he cannot readily obtain it, he may bid for it, and gold will then be at a premium. If it be admitted that this is likely to happen, and if it be desired to get all the new gold that is possible in order possibly to avert it, a bonus on new production would not be uneconomic, providing the Government held and could continue to hold all the gold existing. Any bonus it might pay for new gold might then be chargeable to war expense.

But we fear that such a project would be impracticable, if not chimerical. What would prevent dishonest miners, or quasi-miners, from buying gold as jewelry or plate, or as coin and bullion in foreign countries, and clandestinely delivering it as new gold? A general premium for gold would be quickly established.

Gold miners may properly feel the pinch of conditions now affecting them, and may reasonably cry for assistance, but beyond the relatively trifling things that the Administration and Congress may do to help, the problem is one for the determination of international financiers. The question really at issue is the maintenance of the gold basis.

Construction and Uses of Chimneys

NO APOLOGY is necessary in drawing attention to the article on notable chimneys on another page of this issue. The paper was originally intended for the Annual Smelting Number, published last week; but the extensive space occupied by the numerous full-page illustrations made this impossible without excluding a great deal of technical matter of more vital importance, although possibly of less general interest.

The chimney, even in its primitive form, is comparatively recent. The excavations at Pompeii and elsewhere disclose the fact that chimneys were unknown to ancient architects. In early English times there were still no chimneys, and fires were built in a pit in the middle of the rooms; and all that was done to abate the smoke nuisance was to provide a hole in the roof directly above, through which the fumes escaped. Conflagrations were common, and this probably led to the introduction of the curfew bell ordinance by William the Conqueror —a statute which insisted that all fires were to be extinguished at a certain hour every evening. Chimneys were probably introduced about the thirteenth century, but, as in many other phases of human endeavor, practically all the progress in theory, design, and construction has been achieved during the last hundred years.

A chimney has two main functions. It removes and disseminates—at a sufficient height to obviate or minimize danger or discomfort to individuals, or damage to crops—the waste products of combustion. It also provides the air supply on the hearth needed to insure satisfactory burning of the fuel.

Tall chimneys are not erected—as a number of people no doubt suppose—merely to break existing records for height, but to achieve a definite result. In calculating the various dimensions it is necessary to take into consideration the temperature and composition of the gases, the altitude above sea level, and various other factors, including the resistance to gas flow caused by the unevenness of the inner surface of the chimney.

In the matter of cheap production of draft, the chimney has wide application. In point of efficiency, however, it has its limitations; and preference may well be given, in certain instances, to the substitution of mechanical means for inducing draft. With regard to the disposal of solid matter, its position is being challenged by the Cottrell system of electrical precipitation whereby a recovery of a valuable byproduct is often achieved, in addition to the complete or almost complete elimination of the solid matter that forms fume and smoke. The adoption of the baghouse in this connection involves the imperative use of fans before filtration and their optional use afterward; but the availability and value of the chimney for the dispersal of the gases resulting after baghouse separation are sometimes overlooked.

Whatever the advance made in methods to eliminate fume or smoke, or to recover byproducts, it is doubtful whether one result will be the superseding of the tall chimney as an economical and satisfactory means of inducing draft and dispersing gases, and as a subsidiary to the efficient operation of an electrical system of precipitation or filtration in a baghouse.

Price for Copper in 1917

THE official reports of companies selling about 1,084,000,000 lb. of electrolytic copper in 1917 show that they realized an average of 26.13c. per lb. If we could have reports from all of the companies, it is probable that the average realization might be a little higher, for we may assume that the Anaconda copper and other metal sold through the Anaconda agency, which is not reported, fetched as much as the 26.366c. per lb. that was got by Inspiration. Lake Superior companies producing 204,546,500 lb. received an average of 28.124c. per pound.

The higher price received by the Lake companies is explained by their failure to participate in the huge sale to the Allies in the latter part of 1916 to the same extent as the electrolytic producers. Consequently, while the latter were filling great contracts during the first half of 1917 at 25c. per lb., other producers were able to take advantage of the higher prices created by the market having become unbalanced.

These chaotic conditions, together with others equally irregular that arose during the summer and fall of 1917, in connection with the fixing of price by the American Government, preclude any close comparisons. The selling of about 45,000,000 lb. by producers jointly to the Government at 16⅔c. early in 1917 is also a factor, although a minor one, that enters into consideration. Amid all this chaos any discrimination among the figures reported by the several companies, as to whether they represent gross prices or net prices, is next to impossible, and, anyhow, is relatively inconsequential. In point of fact, a great deal more copper was actually sold on the basis of net cash, New York, than ever before. The foreign business had previously resolved itself to that basis, and with the fixation of the price of 23½c. in September the old terms of "delivered, 30 days" in domestic business disappeared.

Conditions being as they were, any comparison between the price actually realized and the quotational average is meaningless. The most surprising thing is that they agree even within 1.05c. per lb., the quotational average being about that much higher than the actual average for the sale of about 1,100,000,000 lb. of copper. Both figures tell the same story in one respect, however; viz., the price for copper in 1917 was only about the same as in 1916, and in both years was only about 30% higher than what was realized in 1906-07, a period of industrial expansion. The claim of copper producers that the prices they have received have been far less extravagant than those created by war conditions for many other commodities is clearly well founded.

COPPER SALES IN 1917 BY ELECTROLYTIC PRODUCERS

Company	Pounds	Proceeds	Average Price, Cents			
Chino Copper Co..........	79,636,235	$20,554,112	25.81	(*a*)		(*k*)
East Butte Copper Min. Co.	20,013,900	5,095,539	25.460	(*c*)		(*g*)
Inspiration Consolidated...	80,566,982	21,242,217	26.366	(*b*)		(*g*)
Kennecott Copper Corp....	56,904,650	15,372,765	27.015	(*a*)	(*h*)	(*j*)
Magma Copper Co.........	10,148,632	2,681,573	26.423	(*b*)		(*g*)
Miami Copper Co..........	30,905,706	9,009,152	29.150	(*d*)		(*h*)
Nevada Consolidated......	82,040,508	21,207,471	25.85	(*c*)	(*g*)	(*k*)
North Butte Mining Co....	21,087,513	5,730,742	27.176	(*c*)		(*i*)
Old Dominion Cop. Min. Co.	32,365,795	8,385,977	25.91	(*b*)		(*g*)
Phelps Dodge Corporation..	290,522,569	77,482,369	26.67	(*c*)		
Ray Consolidated.........	88,582,649	22,944,678	25.902	(*a*)	(*g*)	(*k*)
Shattuck Arizona Cop. Co...	14,775,391	4,183,947	28.317	(*d*)		(*i*)
U. S. Sm., Ref. & Min. Co...	29,043,242	7,900,051	27.201	(*f*)		(*g*)
United Verde Copper Co...	51,664,098	14,115,601	27.302	(*f*)		(*h*)
Utah Copper Co...........	195,837,111	47,364,421	24.186	(*a*)		(*g*)
Totals..................	1,084,094,981	$283,270,615	26.130			
E. & M. J. average......			27.180			

(*a*) Uncertain what price represents; not stated in report. (*b*) Probably net cash price, New York. (*c*) Net cash price, f. o. b., New York or Atlantic seaboard. (*d*) Average gross price. (*f*) Probably gross price. (*g*) Represents net 1917 production. (*h*) Represents copper delivered and less than 1917 production. (*i*) Represents copper delivered and in excess of 1917 production. (*j*) Price includes adjustments on 1916 deliveries. (*k*) Price of copper sold during 1917 applied to entire production for that year; the company reports lower proceeds on account of carrying some unsold metal at the nominal price of 13½c. per pound.

COPPER SALES IN 1917 BY LAKE COMPANIES

Company	Pounds	Proceeds	Average Price, Cents
Ahmeek Mining Co................	19,299,590	$5,180,901	26.84
Allouez Mining Co................	7,339,288	2,051,297	27.95
Calumet & Hecla Mining Co........	59,527,902	16,900,576	28.39
Centennial Copper Mining Co.......	1,684,642	454,123	26.96
Copper Range Co..................	45,043,301	12,943,157	28.735
Franklin Mining Co...............	3,155,574	843,797	26.74
Isle Royale Copper Co............	10,236,619	2,750,627	26.87
La Salle Copper Co...............	1,546,978	440,151	28.45
Mass Cons. Mining Co.............	3,984,616	1,045,502	26.238
Mohawk Mining Co.................	12,313,887	3,440,253	27.94
Osceola Cons. Mining Co..........	12,383,918	3,453,758	27.89
Quincy Mining Co.................	22,195,577	6,348,605	28.605
Superior Copper Co...............	1,597,914	469,721	29.39
Victoria Copper Mining Co........	1,195,918	343,508	28.723
White Pine Copper Co.............	3,040,776	860,523	28.30
Totals...........................	204,546,500	57,526,499	28.124

PRODUCTION, SALES AND PRICE FOR COPPER FOR 12 YEARS (*a*)

Year	Total Production, Pounds	Pounds Reported	Average Realized, Cents	Quotational Average, Cents
1905	219,000,000	82,372,955	15.597	15.699
1906	224,071,000	113,411,645	19.146	19.616
1907	220,317,041	66,316,025	18.043	20.661
1908	222,267,444	125,949,248	13.348	13.424
1909	226,602,134	136,005,773	13.221	13.335
1910	221,400,864	126,710,763	12.96	13.039
1911	216,412,867	135,329,098	12.657	12.634
1912	1,228,333,298	552,155,308	15.841	16.341
1913	1,406,448,665	658,533,402	15.222	15.269
1914	1,342,634,206	566,687,750	13.458	13.602 (*b*)
1915	1,411,652,418	619,832,987	17.299	17.275
1916	2,300,000,000	1,217,014,743	25.710	27.202
1917	2,350,240,606	1,084,094,981	26.130	27.180

(*a*) Up to 1912 the figures represent Lake copper production and sales, but few of the producers of electrolytic making detailed reports in that time. Beginning with 1912, the figures represent electrolytic copper only. The figures for "pounds reported" and "average realized" do not include the United Metals Selling Co. (Anaconda), which does not publish these details. However, it is a reasonable assumption that its results were not very different from those of the other companies, for John D. Ryan has stated that in the 10 years ending with 1913 his companies sold 5,560,000,000 lb. of copper at an average of 14.82c., delivered to the buyers in Europe and America. This would be equivalent to 14.62@ 14.67c., net cash, New York. During the same 10-year period, Phelps, Dodge & Co., reported an average of 14.56c. per lb., net cash, New York, actually realized. The arithmetical mean of the quotational averages for electrolytic copper in this period is 15.06 cents.

(*b*) Average for nine months. No quotations in August, September and October. However, the bulk of the copper sold in 1914 was disposed of before and after those months; wherefore the comparison on the nine months' basis is approximately correct.

BY THE WAY

The engineers of the country will no longer have any excuse to emit tales of woe respecting the disfavor of fortune toward them. The income tax returns for 1916, compared with the number of persons engaged in the several occupations as shown by the census for 1910, exhibit the engineers (civil, mining, etc.) as leading the list. There were 6628 income-tax returns from this class, which was a little more than 61% of the total listed in the class. Insurance agents came next, with a representation of 28%. Then came brokers, with 20%; lawyers, with 19%, and mine owners, with 18%. Here we will stop. Shall we deduce that it is better to be a mining engineer than a mine owner?

A certain mining community in Australia was noted for the predominance of Cornishmen among its population, all of whom were ardent chapel-goers on Sunday, although their speech when working underground during the week tended to veil the religion that emerged on the seventh day. It happened that the local preacher was taken ill, and it became necessary to find a substitute. Most of the miners had, at some stage of their careers, indulged in rhetorical outburst at religious revivals or other times; and there was much discussion as to who should fill the pulpit on the following Sunday. Finally it was found that almost unanimous choice had fallen upon one of their number—Ned Trevanion by name—who had gained some notoriety by the ease and fluency with which either profanity or religion came to the tip of his tongue, as occasion demanded. He was cautioned to be careful and not to let his enthusiasm get the better of him; and he carefully prepared a series of notes for the forthcoming discourse, in which the terrors of hell were portrayed with the same emphasis as the alternative joys of heaven. When Sunday came, the tin chapel was filled to overflowing. A sympathetic congregation listened with appreciation to Ned's discourse, although his particular friends noted with apprehension that he was paying less and less attention to his notes and drawing more and more from his imagination. In the midst of a flowery description of the principal city of paradise he bethought himself of a mention of that emblem of all true rural success—a brass band. "An' down the street, paved with gold," he shouted, with an enthusiasm that gathered momentum at each word, "there comes a gert band, playing bootiful moosic. None of yer penny tin whistles, *but bloody gert trumpets.*"

The use of the title "captain" to those in charge of mining work seems to have originated in Cornwall. An incident in this connection is related as having happened after the visit of a man-of-war to a Cornish port, not far distant from an important tin-mining district. The captain of the warship was seen ashore, in imposing uniform, by a couple of miners, one of whom was doubtful as to the naval officer's rank. " 'Oo is ut, Jan?" he said, in a stage whisper. "Cap'n Trewhella," replied his friend. " 'Ow, 'cap'n'?" insisted Jan. " 'Ee's cap'n of thicky gert hugeous ship," he was informed. "Aw! Now I zee. I thought 'er wasn't a real cap'n."

NEW PUBLICATIONS

Northwest Mines Handbook. By Sidney Norman. Pp. 366; 5¾ x 9½; illus. $5. Published by Sidney Norman, Mohawk Bldg., Spokane, Washington.

The first of what is expected to be a series of yearly volumes covering minute details concerning 1600 mining properties in Idaho, Washington, Oregon and British Columbia. Information is well indexed, and the book is a valuable one for reference purposes.

Poor's Manual of Industrials for 1918. Ninth Annual Number. Pp. CL plus 2735; 6 x 9. $10. Poor's Manual Co., New York.

The regular annual volume of this well-known manual, which covers manufacturing, mining and miscellaneous companies, has just been issued, the information being revised to April, 1918. The general arrangement and data appear to be the same as in previous editions, but a new feature is the insertion of complete information regarding the present income tax on industrial securities, stating whether the companies assume a 4% tax, a 2% tax, or no tax at all. We have always found this manual to be most useful for reference.

Sulphuric Acid Handbook. By Thomas J. Sullivan. Pp. 140. 5 x 7¼; leather. $2.50. McGraw-Hill Book Co., Inc.

The psychological moment has been chosen for the appearance of this book on sulphuric acid, which comes out at a time when maximum efforts are being made to stimulate production of the "king of acids." Much has been written on the subject, but the useful information is so scattered that it is not readily obtained. With this in mind, the author has confined himself largely to numerical data and tables generally adapted to American practice, omitting obsolete matter. The new standard specific gravity tables for sulphuric, nitric and hydrochloric acids are given and the methods of preparing them described. Other subjects included are hydrometers, acid calculations, boiling and melting points, analysis, flanges and flange fittings, cast and wrought pipe and lead pipe, as well as miscellaneous tables.

Oil-Storage Tanks and Reservoirs, with a Brief Discussion of Losses of Oil in Storage and Methods of Prevention. By C. P. Bowie. Pp. 76; illus. Bull. 155, U. S. Geological Survey, Washington, D. C.

This bulletin gives a general outline of the usual practice in designing and erecting tanks and reservoirs for oil storage. A complete set of specifications, with a detailed drawing, for a 55,000-gal. steel tank is given and discussed. The accessory equipment, such as swing pipes, stairways, explosion doors and relief valves, is touched upon, and wooden and steel roofs are described. Concrete-lined reservoirs are covered by presenting specifications and drawings of a reservoir 488 ft. in diameter and 25 ft. deep. Data on costs of tanks and reservoirs are given. Losses of oil by seepage and evaporation, and the prevention of such losses by means of water-seal tops, sprinkling and burying the tanks, are discussed.

Preliminary Report on a Part of the Pyrites Deposits of Georgia. By H. K. Shearer and J. P. D. Hull. Pp. 229; illus.; cloth. Bull. 33, Geological Survey of Georgia, Atlanta, Georgia.

An incomplete account of the pyrites deposits of Georgia published to help and encourage those engaged or interested in supplying the urgent need for the mineral at the present time. A second report is to be published at a later date, in which the technical and scientific aspects of the matter will be dealt with in greater detail. The present volume gives an interesting résumé of the occurrence, production, and imports of pyrites; also a list of sulphuric-acid plants in Georgia, which shows that the state produces nearly half a million tons per annum. The geologic features of the deposits are discussed and descriptions of the resources of the various properties follow; also details of the surface and underground equipment installed or contemplated. Flow sheets are given, showing methods of concentrating the pyrites.

The Mines Hand Book: A Manual of the Mining Industry of the World. By Walter Harvey Weed. Pp. 1896; 6 x 8½; cloth; illus. Vol. 13, 1918; supplementing former editions. $10. Published by W. H. Weed, 29 Broadway, New York.

The latest edition of this useful handbook has some marked improvements over former issues. The most important change is in the new arrangement of mining companies according to their geographical situation, instead of in alphabetical order, as hitherto. This rearrangement makes it possible to see how thoroughly each mining district has been covered by the author. A 46-page index, on colored paper to facilitate it use, has been added of necessity. Another new feature is a series of maps of the more important mining districts. As in former editions, there are also included a glossary of technical terms, a chapter on mineralogy, statistics of metal production and prices, and a list of obsolete securities and corporations. A list of state geologists and mine inspectors has been substituted for the long list of mining-company officials appearing in former issues. On the whole, Vol. 13 of the handbook is the best yet produced and a valuable aid to all who are interested in metal mining.

Mining Engineers' Handbook. Robert Peele, editor-in-chief, First Edition. Pp. 2375; 4¼ x 7¼; leather; illustrated. $5. John Wiley & Sons, Inc., New York.

Much credit is due the author for the service rendered the mining profession in the production of his new handbook, which fills what has been a noticeable gap in the list of technical works of reference, such as Trautwine and Kent. Written by a staff of specialists, whose names for the most part are guarantees of the work performed, the book is a valuable addition to the library of every mining man. Among those who have contributed the 44 sections of the book are: J. R. Finlay, W. Y. Westervelt, Robert H. Richards, James F. Kemp, H. V. Winchell, George S. Rice, Reno H. Sales, D. W. Brunton and H. P. Gillette. A valuable feature of the book is the bibliography that accompanies each section, which feature itself makes the volume worth having. If any fault may be found with a work of this sort on brief acquaintance, it is that it covers a field that some may consider too wide. It may be thought that the sections on metallurgy might better have been omitted and that various other parts duplicate to greater or less extent the work of existing handbooks. These, however, are minor points compared with the excellence of the work as a whole. The value of handbooks in general depends largely on the skill and care with which they are indexed, and it is apparent that the same thoroughness that is evidenced in the planning of the "Mining Engineers' Handbook" was also exercised in the preparation of the index.

Report of the Ninth Annual Meeting Held at Ottawa Nov. 27-28, 1917. Pp. 282; illus. Canada Commission of Conservation, Ottawa, Canada.

Mining and Concentration of Carnotite Ores. Karl L. Kithil and John A. Davis. Pp. 89; illus. Bull. 103, U. S. Bureau of Mines, Washington, D. C.

Onaping Map-Area. By W. H. Collins. Pp. 157; illus. Memoir 95. Canada Department of Mines, Geological Survey Branch, Ottawa, Canada.

Timiskaming County, Quebec. By M. E. Wilson. Pp. 197, illus. Memoir 103. Canada Department of Mines, Geological Survey Branch, Ottawa, Canada.

Bibliography and Index of Wyoming Geology, 1823-1916. By Gladys G. Bovee. Pp. 130. Bull. 17. L. W. Trumbull, State Geologist, Cheyenne, Wyoming.

Petroleum in 1916. By John D. Northrop. Mineral Resources of the United States, 1916-17. Part II. Pp. 207; illus. U. S. Geological Survey, Washington, D. C.

Contributions to the Mineralogy of Black Lake Area, Quebec. By Eugene Poitevin and R. P. D. Graham. Pp. 103; illus. Museum Bull. 27. Canada Department of Mines, Geological Survey Branch, Ottawa, Canada.

Personals

Have You Contributed to the Association of the 27th Engineers?

B. L. Thane, managing director of the Alaska Castineau Mining Co., is in New York.

A. B. Shepherd, of Pittsburgh, has been visiting the mines operated by the Jones & Laughlin interests on the Mesabi range.

Franklin Wheaton Smith has returned to Bisbee, Ariz., after an inspection of the Rival mine, at Steeple Rock, New Mexico.

W. P. Schumacher, superintendent of the Santa Barbara unit of the American Smelters Securities Co., is inspecting that property.

A. H. Brown has been appointed manager of the Hudson Bay and Dome Lake mines of Ontario in succession to **Douglas A. Mutch.**

William N. Fink has returned to Cusihuiriachic, Chihuahua, Mex., and taken over the management of the Cusi-Mexicana Mining Co. property.

J. W. Bennie, general manager of the Shannon Copper Co., Clifton, Ariz., is at the Yeager Canyon property recently acquired by that company.

A. C. Metz, superintendent of the Reforma mine, near Monclova, Coahuila, Mex., has entered the service. The work of this property is now being supervised by **S. F. Shaw.**

T. J. Harwood, manager of the Schumacher mine, Schumacher, Ont., has left Canada for the South, operations at the mine having been much curtailed for the present.

George Cannon, superintendent of the Brunt mine at Mountain Iron, Minn., for M. A. Hanna & Co., has been appointed assistant general manager of the company at Duluth.

A. G. Diampre, formerly manager of the Peterson Lake Mining Co., of Cobalt, has been appointed manager of the Associated Goldfields of Larder Lake, in the Kirkland Lake district of Ontario.

Guy C. Riddell, consulting metallurgical engineer for the U. S. Tariff Commission, is back in Washington from the West, where he has been looking into certain war-metal activities during the last month.

D. H. MacDougall has resigned his position as general manager of the Dominion Steel Corp., of Sydney, N. S., and has been appointed president of the Nova Scotia Steel and Coal Co., succeeding **F. H. Crockard,** who has resigned.

Oliver W. Krull, formerly of the metallurgical staff of the Chino Copper Co. and later associated with the mining department of the Cia Minera de Peñoles, at Ojuela, Durango, Mex., is now superintendent of the latter company's lead smeltery and white-arsenic plant at Mapimi, Durango.

H. S. Buck, vice president and general manager of the American Zinc Products Co., also of the Fort Smith Spelter Co., has resigned both of these positions. Mr. Buck had entire charge of building and operating the Fort Smith Spelter Co. since its organization in March, 1916. During October, 1917, the Fort Smith company purchased the Western Tin Plate Co.'s plant at Greencastle, Ind., and the conversion of the plant into a zinc rolling mill, now operating as the American Zinc Products Co., was supervised by Mr. Buck. Mr. Buck has not announced his future plans.

Obituary

Richard Inch, recorder of Tuolumne County, Calif., for the last 20 years, died at Sonora, Calif., on July 3, aged 65 years.

Byron E. Janes, mining engineer and graduate of the University of California, was killed on July 10 at El Tigre mine, in Sonora, Mexico.

Sydney W. Shattuck, a metallurgist and manager of the Shattuck Chemical Co. of Denver, Colo., died suddenly in Denver on June 24. He was 32 years old.

E. B. Hawkins, who has been identified with the development of the Mesabi range, died recently at Duluth, Minn., aged 54 years. He came to Minnesota 30 years ago as representative of the contracting firm of Drake & Stratton, of which he later became vice president. The Hawkins mine at Nashwauk, Minn., was named after him. Mr. Hawkins was prominent politically and was State Senator at the time of his death.

Societies

American Zinc Institute. The program arranged for the meeting to be held at the Statler Hotel, St. Louis, Mo., on July 29 and 30, is as follows: July 29—10 a.m., registration of representatives; 2:30 p.m., address of welcome by the president of the St. Louis Chamber of Commerce; reply by F. C. Wallower, manager of Golden Rod Mining Co., Joplin, Mo.; outline of plans and purpose of meeting by Victor Rakowsky, chairman; appointing of committees; addresses: "Benefits To Be Derived from Close Coöperation of Zinc Smelting and Mining Interests in Helping Win the War," by W. R. Ingalls, editor, "Engineering and Mining Journal"; "World's Zinc Resources and Their Political Control," by C. E. Siebenthal, U. S. Geological Survey, Washington, D. C. At 8 p.m. there will be a dinner on the Statler roof, with Victor Rakowsky as toastmaster. A patriotic address will be made by Charles T. Orr, president of the Athletic Mining and Smelting Co., Webb City, Mo., followed by after-dinner talks. At the session at 10 a. m. on July 30, there will be the following addresses: "New Uses of Zinc," by A. P. Cobb, vice president of New Jersey Zinc Co., New York; "The Value of Experimental Work in Developing New Uses of Zinc and Zinc Products," by Dr. John Johnston, National Research Council, Washington, D. C.; "Zinc Mining and Production in Western States," by J. L. Bruce, manager of Butte & Superior Mining Co., Butte, Mont.; "Zinc Mining and Production in Southeastern States," by J. N. Houser, vice president of American Zinc, Lead and Smelting Co., St. Louis, Mo.; "Sheet-Zinc Industry in United States and Benefits of Coöperation Between Mining and Smelting Interests," by E. H. Wolff, president of Illinois Zinc Co., Peoria, Ill.; "Zinc Mining and Production in Missouri-Kansas-Oklahoma and Arkansas," by Otto Ruhl, consulting engineer, Joplin, Mo. In the afternoon at 1:30 o'clock there will be two addresses: "Zinc Mining and Production in Wisconsin," by W. N. Smith, manager of Vinegar Hill Zinc Co., Platteville, Wis.; and "Zinc Mining and Production in Eastern States." This will be followed by the report of the committee on organization, the registration of permanent members, reports of other committees and the election of permanent officers.

American Institute of Mining Engineers will hold its annual summer meeting from Sept. 1 to Sept. 6 inclusive, in Colorado. The program is summarized as follows: Sunday, Sept. 1—Registration at temporary headquarters, Brown Palace Hotel, Denver. Monday, Sept. 2—Technical session at 9 a. m.; automobile trip at 11 a. m. to ferroalloy plants near Denver and other points of interest in the city, followed by a trip through the mountain parks west of Denver; luncheon at 1 p. m. at Hosa Lodge, Gennessee Park, Lookout Mountain; technical session at 4.30 p. m.; dinner at 7 p. m. at the Country Club. Tuesday, Sept. 3—Entrain at Denver at 8.15 a. m. for Colorado Springs; technical session at 11 a. m. at permanent registration headquarters at Broadmoor Hotel; luncheon at 1 p. m. at Broadmoor Hotel; technical session at 2 p. m.; reception and dance at 8.30 p. m. Wednesday, Sept. 4—All-day trip to Cripple Creek district, with visits to Portland, Golden Cycle, Vindicator, Cresson, and other properties, followed by a technical session in the evening. Thursday, Sept. 5—Auto trip at 8 a. m. to Pikes Peak; visit to Golden Cycle mill at 2 p. m.; technical session afternoon and evening. Friday, Sept. 6—Excursion at 8.30 a. m. to Pueblo; luncheon at 12.30 p. m. at Minnequa steel works, Pueblo; technical session at 4 p. m.; banquet at Broadmoor Hotel, Colorado Springs, at 7.30 p. m. On account of the abandonment of the Colorado Midland Ry., it may be necessary to alter the plans for the trip to Leadville. An optional trip will be arranged if considered advisable. Preparations for the entertainment of the ladies at Denver have not yet been fully completed. At Colorado Springs the ladies will be entertained by a committee headed by Mrs. Spencer Penrose, and a special trip to Glen Eyrie Park will be arranged for them. The arrangement committee at Denver will include Dave G. Miller, Frank Bulkeley and George E. Collins; finance committee at Denver, T. B. Stearns, Richard A. Parker and T. B. Burbridge; entertainment committee at Denver, F. H. Bostwick, F. E. Shepard, B. P. Morse, J. G. Perry and Howland Bancroft. The Colorado Springs committees are as follows: Registration committee, Loring C. Lennox, Horace F. Lunt and J. M. Tippett; finance committee, A. E. Carlton, Spencer Penrose, George M. Taylor and A. L. Bloomfield; arrangement and entertainment committee, George M. Taylor, A. L. Bloomfield, J. D. Hawkins, Thomas B. Crowe, A. E. Carlton, E. P. Arthur and Etienne A. Ritter.

Industrial News

E. J. Albert, for the last five years manager of the mining and power department of the Canadian Allis-Chalmers, Ltd., Toronto, has resigned to accept the position of sales manager of the Thwing Instrument Co., of Philadelphia.

Case Manufacturing Corporation was incorporated on June 26, 1918, at Denver, Colo. The new company has been granted the exclusive right to manufacture the Case oil burner, and will also build oil-fired furnaces, motor blowers and other allied products; it will also deal in metallurgical clay goods and specialties for assayers. The Case oil burner was marketed until recently by the Denver Fire Clay Co. on a royalty basis. Officers of the new concern are: Mrs. W. W. Case, Sr., president; Fred McL. Strout, vice president; Theodore W. Muckle, treasurer; and Seth Parlin, secretary. The firm is ready to submit quotations on any special type of furnace desired.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum—Preparing Aluminous Abrasives. Lewis E. Saunders and Ray Hill White, Niagara Falls, N. Y., assignors to Norton Co., Worcester, Mass. (U. S. No. 1,269,222; June 11, 1918.)

Aluminum—Producing Crystalline Alumina. Ray Hill White, Niagara Falls, N. Y., assignor to Norton Company, Worcester, Mass. (U. S. No. 1,269,141; June 11, 1918.)

Aluminum—Process of Purifying Aluminous Materials. Lewis E. Saunders, Niagara Falls, N. Y., assignor to Norton Company, Worcester, Mass. (U. S. No. 1,269,223-1,269,224; June 11, 1918.)

Borax—Method of Separating Borates From their Gangue. Herbert W. Faulkner, Ryan, Calif., assignor to Pacific Coast Borax Co., Reno, Nev. (U. S. No. 1,269,170; June 11, 1918.)

Concentrator, Mineral. Charles O. Michaelsen and William P. Michaelsen, Minneapolis, Minn., assignors to Michaelsen Machinery Co. (U. S. No. 1,269,198; June 11, 1918.)

Electrolytic Starting-Sheet Suspender. Henry S. Montgomery and Henry A. Tobelmann, Ajo, Ariz. (U. S. No. 1,269,485; June 11, 1918.)

Electrolytic Tank, for Electrochemical Reactions. Edward Henry Hamilton, Trail, B. C., assignor to the Consolidated Mining and Smelting Co. of Canada, Ltd., Toronto, Ont. Canada. (U. S. No. 1,269,078; June 11, 1918.)

Ore Dressing—Process of and Apparatus for Concentrating Ores. Cedric Judson Beatty Armstrong, Cobalt, Ont., Canada, assignor to Metals Recovery Co., Augusta, Me. (U. S. No. 1,269,150; June 11, 1918.)

Ore Dressing—Process of Concentrating Ores. John M. Callow, Salt Lake City, Utah, assignor to Metals Recovery Co., Augusta, Me. (U. S. No. 1,269,157; June 11, 1918.)

Phosphorus, Process for Making Alloys of. Lewis A. Jeffs, Salt Lake City, Utah. (U. S. No. 1,268,849; June 11, 1918.)

Rock Drill—Percussive Rock-Drilling Apparatus. Richard Henry Adams, Cobalt, Ont., Canada. (U. S. No. 1,269,147; June 11, 1918.)

Zinc, Lead—Continuous Process for Recovering Lead or Zinc from their Ores or from Slag as Metal Fumes. Friedrich Ohlmer, Griesheim, near Frankfort-on-the-Main, Germany. (U. S. No. 1,269,110; June 11, 1918.)

Alloy of Soft Metal and Method of Making. William L. Rice, Reading, Penn., assignor of one-half to Peter S. Braucher, Reading, Penn. (U. S. No. 1,269,000; June 11, 1918.)

Editorial Correspondence

SALT LAKE CITY—July 15

An Increase in Wages of 50c. a day has been granted by the American Smelting and Refining Co. in this section, and also by Utah Copper Co. As has before been mentioned, employees of the Garfield smeltery of the A. S. & R. have been asking an increase of $1 a day. The example of the smelting company and the Utah Copper will probably be followed by mines throughout the state. Capt. Charles T. Connell, Federal mediator of labor troubles, is expected in Salt Lake in the immediate future, to go into matters concerning the labor situation here.

Utah Mine Operators through the Utah Chapter of the American Mining Congress have sent a letter to the War Industries Board, asking for an increase in the price of metals.

Tintic District Shipments for the first half of 1918 amounted to 4547 cars of ore, as compared to 5500 cars for the same period in 1917. The tonnage is about 227,530 tons, of an estimated value of $6,000,000. This year there have been 40 shippers; the year preceding there were 49. In considering the tonnage of the camp this year, in comparison with the output of the first six months of 1917, it is to be noted that last year much more lower-grade ore was shipped. Only the best grade of ore has been shipped this year, and the falling off has been general throughout the district, and has not been due to curtailment on the part of any one property.

Three Bingham Properties are involved in a question of apex, Utah Consolidated, Utah Apex, and Bingham Metal and Tunnel. The Utah Consolidated a short time ago brought suit against the Tintic Mining and Development for ore extracted from the Yampa claims in Bingham, the amount of damages asked being $202,500, or three times the value of the ore extracted, in this case $67,500. The large new deposit opened at depth in the Utah Apex is claimed by the Utah Consolidated to apex in its ground, the latter company setting forth that the limestone bedding in this part of the Utah Apex is a continuation of the limestone bedding of the Yampa claim just mentioned. The Utah Apex is said to have added considerably to its reserves from the new body, and present net monthly earnings are given at from $75,000 to $100,000, also largely from the new find. The workings of the Utah Consolidated and those of the Utah Metal and Tunnel come together at a certain point, and the two companies are reported to have found themselves working at different levels in the same bedding.

BISBEE, ARIZ.—July 11

Two Hundred and Thirty-nine Suits, aggregating $5,465,000, as damages alleged to have been sustained through the deportation from the Bisbee-Warren district, July 12, 1917, were filed in the district court of Cochise County in behalf of the 1186 miners and their sympathizers deported at that time. W. B. Cleary, one of the deportees, at present at Chicago as one of the counsel for the I. W. W., and F. C. Struckmeyer of Pheonix, are attorneys for the plaintiffs. All except Cleary ask for from [illegible] to $12,500 actual damages and [illegible] to $12,500 additional punitive damages. Cleary alleges actual damages of [illegible] and punitive damages of $50,000 additional. It is predicted that between [illegible] and [illegible] suits will be filed before the expiration of the time limit.

DULUTH, MINN.—July 16

Recent Increase in Freight Rates on iron ore from the Minnesota ranges to the Duluth, Two Harbors, and Superior docks from [illegible] to $1 per ton means an increased revenue for the state. The tonnage this year will be about the same as 1917, which was [illegible]. Up to the time the new rate went into effect about [illegible] tons of ore had been forwarded at the [illegible] rate. Additional shipments this season are estimated at [illegible] tons, which will yield the transportation companies $1 per ton, as they will probably receive about [illegible] for their services. A 5% tax on this income means $2,000,000 revenue for the state, which is an increase of $650,000 over the amount paid by the carriers in 1917. The roads transporting the ore are the Great Northern, Duluth, Missabe & Northern, and the Duluth & Iron Range for the Mesabi and Vermilion ranges and the Soo and Northern Pacific for the Cuyuna range.

Active Iron-Mining Conditions were revealed in the annual report of the Great Northern Iron Ore trustees for the year 1917. Receipts for 12 months were $4,499,593. The royalties under the new leases made to the M. A. Hanna and Jones and Laughlin interests were $1,637,051. From the old leases there was turned over to the trustees $505,505. The Arthur Iron Mining Co. earned $308,772; stock pile shipments came to $646,502, and miscellaneous receipts were reported at $1,901,763. Total expenditures amounted to $255,279, leaving net earnings of the properties at $4,744,314, or the equivalent of $3 per share on the 1,500,000 shares. Dividends for 1917 amounted to $2,250,000. The report also states that the company has disposed of all of its developed properties and has withdrawn from active mining. The trustees still have under their control a number of undeveloped properties, which they will develop or lease. Royalties range from 55c. to $1.50 per ton.

HOUGHTON, MICH.—July 16

Cornishmen in the Copper Country have made exceptional records as good citizens and miners. Before the draft went into force in England many miners came here from Cornwall. When the first call came after the United States got into the war, volunteers were numerous. About 250 Canadian and British subjects who still remain in the district and are keeping out of the war are men with dependent families, who might secure exemption if they were citizens of the United States, but they are included in the demands of the British draft. This further exodus of 250 British subjects who will enter the war with the Canadian regiments is certain to have its effect on the production of copper.

JOPLIN, MO.—July 15

Demonstration of a Zinc-Soldering Acid that may increase the use of zinc was made before mine operators and business men at the Chamber of Commerce in Joplin on July 12. The acid was discovered by Oliver Greenstreet, of Baxter Springs. At the demonstration, tinners were called in from leading Joplin business firms, and they used the acid without previous knowledge concerning it and pronounced it all that could be desired. Great heat is not required, and zinc sheets were soldered to copper, tin and galvanized iron successfully, and to other zinc sheets. An attempt will be made by the Chamber of Commerce to help finance the acid, and make its use general.

Interest in Manganese Fields near Batesville, Ark., is growing in this district, and many mining men have gone from here to investigate, some of them investing. Three of the largest of the zinc-producing companies represented locally have obtained tracts of land there and will develop them. D. D. Adams, president of the Adams-Hicks Mining Co., at Joplin, owns several thousand acres of what he thinks to be manganese-bearing land, and he believes that district today is just about what the Oklahoma section of the local zinc district was three years ago.

TORONTO—July 13

Porcupine Mine Operators are anxiously looking for some definite assistance to the gold-mining industry from the Canadian Government in view of the unfavorable conditions created by the war, especially as regards labor shortage. They are encouraged in the hope that some remedial action will soon be taken, by the recent request of Sir Thomas White, Finance Minister, that the companies would make a definite recommendation as to what they consider the most feasible form in which aid could be given.

Returning Prospectors from the new gold area south of Lake Alitibi, in the Province of Quebec, report that a number of good gold discoveries have been made there during the last few weeks. The rock formation consists of schists with porphyry intrusions, and gold has in some instances been found to occur freely in well-mineralized quartz which bears similar characteristics to the surface outcropping in the Porcupine district. The Crown Reserve, La Rose Consolidated, Aladdin and other mining companies have interests in the district.

VICTORIA, B. C.—July 15

As a Result of Representations of the mine operators of the Kootenay district of British Columbia, it is expected that the Dominion government will appoint a royal commission to investigate the schedule of charges at the Trail smeltery of the Consolidated Mining and Smelting Co. of Canada. The committee appointed by the Associated Boards of Trade of eastern British Columbia to make the inquiry finds that the $3000 granted by the federal authorities is insufficient to meet the expense, and that, without the power to take sworn testimony, it would be handicapped in its work. The best way out of the dilemma is for the Ottawa government to provide a commission backed by a grant of approximately $10,000 and clothed with power to make the fullest possible investigation. Meanwhile O. R. Whittaker, mining engineer, of Denver, Colo., who was responsible for a report of similar character in Colorado, has been retained and, presumably, is awaiting instructions. It is thought likely, though no official announcement has been made, that the Dominion government will accede to the wishes of the operators. The federal administration has set aside $400,000 as a bounty on zinc production. The mine owners assert that, as the Trail smeltery is the only Canadian plant engaged in this work and equipped to do it, the financial support will go to it alone, and that it is not likely to aid them, as that company can obtain all the zinc ore it can take care of from its own mines. In their opinion it should have been provided that the bounty was to be paid on the contents of the zinc ore mined, the same to be fixed by assay. On the other hand, it is maintained for the company that its large investment in an electrolytic plant, without which the refractory ores of southern British Columbia could not be handled satisfactorily, entitled it to the support of the government.

Marked Interest in Oil Prospecting in British Columbia is manifest. Had it not been for the untimely death of B. T. Rogers, of Vancouver, B. C., the sinking of a test hole at Burnaby, where there are oil seepages, would have continued. The Empire Oil and Natural Gas Co., Ltd., has drilled about 400 ft. at Aldergrove, B. C., the latest log showing a sandy shale. Two companies have been organized at Vancouver, the Boundary Bay Oil Company, Ltd., and the Burnaby Oil Co., Ltd. The former intends to drill an area at Boundary Bay and the latter to carry out work at Vancouver Heights. The possibilities of Graham Island, of the Queen Charlotte group, also are engaging attention. It is understood that the Geological Survey station purposes this summer to make a thorough examination of the Fraser Valley to establish at what point a drill would be most likely to strike oil in commercial quantities.

Search for Platinum in British Columbia is to be vigorously prosecuted this summer. The Department of Mines, Ottawa, purposes to purchase two additional drills, and will operate on placer ground with a view to the establishment of platinum values in British Columbia. In the event of the mineral being found, energetic work in its recovery is to be inaugurated by the owner without delay. It is not expected that the government will demand a monetary return for the development of privately held property believed to contain platinum, because of the need of this mineral for munition purposes and the consequent necessity of giving the miners every possible encouragement to produce it.

The Mining News

ARIZONA

Cochise County

COPPER QUEEN (Bisbee)—New Cochise shaft down nearly 1500 ft., but has cut no ore and little water.

DENN-ARIZONA (Bisbee)—Mining on 1400 and 1500 levels and on 1600 level, where sulphides have been cut.

KEYSTONE (Johnson)—Installing new machinery.

PEABODY (Johnson)—New machinery installed.

CALUMET & ARIZONA (Warren)—Smeltery production during June amounted to 7,250,000 lb. of copper, of which 4,232,000 lb. was available for Calumet & Arizona.

Maricopa County

EYRICH (Phoenix)—Cut station on 300 level and drifting on vein of quartz hematite carrying gold.

DRAGON (Wickenburg)—Machinery has been received and is to be be erected at once.

Mohave County

GOLD ROAD (Goldroad)—New 300-ton crushing plant in operation.

ALCYONE (Kingman)—Shaft down over 200 ft. in rock.

GEORGE WASHINGTON (Kingman)—Mill to be put into operation soon.

HACKBERRY (Kingman)—Machinery installed.

RED LION (Kingman)—Shaft down 125 ft. and has cut oxidized vein matter and quartz.

WALNUT CREEK (Kingman)—Tunnel now driven over 300 feet.

MOHAWK CENTRAL (Oatman)—Diamond drilling completed.

TOM REED (Oatman)—Aztec shaft now 150 ft. below 525 level and will be sunk 30 ft. further for a sump and ore pocket. Drifting east on Bald Eagle vein.

Pima County

BLACK BOSS (Ajo)—Property sold and renamed Submarine to be opened soon.

BULLION BAR (Ajo) Has installed machinery. Operations to begin at once.

NEW CORNELIA (Ajo)—June production was 4,212,000 lb. of copper. Excavation started for experimental mill.

Pinal County

KELVIN SULTANA (Kelvin)—Has leased large tract of land on Gila River to Arizona Hercules Copper Company.

RAY KELVIN (Kelvin)—In addition to development work on its own ground, company is prospecting the Last Chance or Nieman-Elder group north of Kelvin.

TROY ARIZONA (Kelvin)—Operations to be resumed soon under direction of J. C. Devine.

U. S. VANADIUM (Kelvin)—Five new Wilfley tables installed in mill operated under lease by the Allied Metals Corpn., of Denver.

FORTUNA CONSOLIDATED (Superior) Diamond drilling.

QUEEN CREEK (Superior)—Shaft now down 720 ft.

Santa Cruz County

ARIZONA CONSOLIDATED (Nogales) —To sink 500 ft. shaft on El Paso group near old Mowry mine.

HARDSHELL (Patagonia) — Mill in operation and handling about 100 tons daily. Drill being used to prospect property.

Yuma County

MOLEIN-ARIZONA (Yuma) — Sinking two-compartment shaft. Compressor installed.

Yavapai County

BIG LEDGE (Huron)—Good progress made in drifting at Henrietta mine, with good ore showing on 300 level and lower grade on 450 level..

BLACK DIAMOND (Walker)—To build concentration and flotation mill. J. Irwin, Prescott, is superintendent.

ARKANSAS

Independence County

BLUE RIDGE (Cushman)—To develop and equip with washing plants.

HOLY SMOKE (Cushman) — Shipping first car of manganese ore this week.

LUCKY DEVIL (Cushman)—Under operation by J. C. Shepherd and associates and producing 100 tons chunk manganese per week. Development proving up large body of medium-grade manganese ore.

PAGE (Cushman)—Operated by Stanley Hanford. Making heavy tonnage high-grade ore. Development proving up good body of ore.

CALIFORNIA

Plumas County

DIVING APPARATUS is again being used in placer mining on the middle fork of Feather River. The divers send up the gravel, which is washed on the surface.

ENGELS COPPER (Engelmine)—Flotation plant operating regularly. Recent contract for construction of 70 new houses of late designs and modern equipment has been let.

Shasta County

BULLY HILL (Winthrop)—Flotation plant nearing completion and expected to be in operation by end of the summer. Old smeltery building used for housing the machinery. Large tonnage high-grade copper ore shipped daily to Mammoth smeltery at Kennett. High-grade ore disclosed at 1000-ft. depth in Anchor claim.

Siskiyou County

GROUSE SPRINGS (Hazel)—Shaft has cut high-grade ore at 18 ft.

Trinity County

PACIFIC DREDGE (Carrville)—To be closed down. Heavy gravel and boulders encountered.

ESTABROOK DREDGE (Trinity Center) —To haul 1200 tons machinery to be used in dredge construction from Delta station by trucks.

COLORADO

Boulder County

COMMONWEALTH (Boulder)—Secured control of Big Six, St. Elmo, and McKenzie properties in the Nederland district. Recent development at Big Six opened several promising shoots of tungsten ore. New mining equipment installed at St. Elmo and developing in progress. McKenzie tunnel to be advanced 500 ft. Construction of new mill contemplated. M. De Champlaign is manager.

YELLOW PINE (Boulder)—Ground below sixth level being developed under lease by Pherson & Saunders. A 300-foot winze is being unwatered and drifts are to be driven on lower levels. Trial shipments have been made.

BELCHER (Cardinal)—Being developed under lease by Todd, Dunston & Swearingen. Machine drills installed and air piped from Caribou mine.

CONGER CHIEF (Cardinal)—New compressor plant being installed, and working force to be increased.

Clear Creek County

CHARTER OAK (Idaho Springs)—To be developed under W. H. Maxton. Shaft cleaned out and retimbered.

Lake County

DOLD (Leadville)—To install machinery at Newell shaft and mine manganese ore. New compressor, drills and hoist have been purchased.

Saguache County

EAGLE (Bonanza)—Shaft being unwatered. To be reopened and developed under D. C. Kelso. Considerable milling ore available.

KAPI (Bonanza)—During June advanced Maybelle Tunnel 89 ft. to total distance of 982 ft. from portal.

San Juan County

EARLY BIRD (Animas Forks)—Development work, progressing under the management of C. B. Blitzke.

HIGHLAND MARY (Howardsville)—Being developed and operated by J. H. Slattery. Mill in operation under superintendence of Louis Bastian.

ST. PAUL (Red Mountain)—Copper ore blocked out. Louis Shaffer and Edward Green are operators.

SUMMIT COPPER (Red Mountain)—Raising from Koehler tunnel to connect with lower level of Carbon Lake shaft. John Kennedy, of Ouray, is manager.

BUFFALO BOY (Silverton)—Being unwatered preparatory to resumption of development. Edward Haas is superintendent.

CALADONIAN MINING (Silverton)—To take over properties formerly known as Peerless-San Juan group. Mine and mill have been placed in operating condition. Charles McMillan is superintendent of the mill and D. W. Fleming is general manager.

COMING WONDER (Silverton)—Silver-lead ore shipments made from development by William Palmquist and associates.

MAYFLOWER (Silverton)—Being developed by J. H. Slattery and associates under lease. New compressor plant installed and trial shipments made to Durango smeltery. Alex Gillis is superintendent.

MEARS-WILFLEY (Silverton) — Mill, which treats tailing from Silver Lake Basin, being overhauled to operate soon.

SAILOR BOY (Silverton)—To be reopened under lease by Ed Lewis and W. A. Triplett soon. Trial shipments have been made to Durango smeltery.

UNITED STATES (Silverton) — Now free from litigation, and to be reopened and developed by E. C. Condit.

San Miguel County

SHIPMENTS FROM TELLURIDE during June were: Tomboy, 13 cars to Durango and 32 cars to Leadville; Smuggler-Union and Black Bear, 6 to Durango and 43 to Pueblo; total, 94 cars of concentrate. This is 30 cars less than for the same month last year, but does not represent a reduction in the output, which is actually larger than ever before in the history of the camp. Reduction in concentrate is due to the fact that the Liberty Bell Gold Mining Co. is reducing everything to bullion and is shipping by express.

ALTA (Ophir)—New air compressor and other equipment to be installed soon. Building recently destroyed by fire to be rebuilt.

SUFFOLK (Ophir)—Mill in operation and treating ore from the Suffolk and Favorite mines. James Real is manager.

Summit County

CLIMAX MOLYBDENUM (Climax)—To increase present 500-ton mill to 1000 tons. To install Otis elevator in shaft.

KANSAS

Joplin District

C. M. MITCHELL (Baxter Springs)—To build 200-ton mill and to purchase sludge and slime cables, boilers, crushers, and compressor. Buck Shelton is superintendent.

C. E. PHILLIPS (Baxter Springs)—To build 150-ton mill and to purchase sludge and slime tables, ore cars, drills, engine and boiler.

O. C. HAMILTON (Galena)—To build 200-ton mill. Requires crushers, ore cars, sludge and slime tables and compressors.

LUCKY JIM (Galena)—To remodel 200-ton mill and will purchase sludge and slime tables, crushers, compressors and drills. O. C. Hamilton is superintendent.

MIAMI-TEXAS (Treece) — Purchased mill in Webb City camp, and will move to lease northwest of Treece about Aug. 1. W. N. Walling, Bowie, Tex., is president.

PHOENIX (Treece)—To remodel 200-ton mill.

CRESCENT (Waco, Mo.)—Building 250-ton mill on lease southwest of Waco. Oil engines to be used for power. Lawrence E. Smith, of Kansas City, is president.

IDAHO

Shoshone County

SHERMAN DEVELOPMENT (Burke)—To repair old tunnel at Union mine and extend same to cut oreshoot.

NATIONAL COPPER (Mullan)—Has added to force. To sink winze from 1500 level to determine orebody.

MICHIGAN

Copper District

FEDERAL (Calumet)— Hauling 12-ton boiler to property, preparatory to sinking shaft in the pit, now 50 ft. deep.

MOHAWK (Gay)—A 100-ft. shaft is being sunk at mill. Drift will be driven to secure water supply from Lake Superior for the stamp mill. Present supply of water from Tobacco River inadequate.

AHMEEK (Kearsarge)—Fire broke out in crosscut on 1200 level July 15. No. 3 and No. 4 shafts have been sealed.

MINNESOTA

Cuyuna Range

CUYUNA DULUTH (Ironton)—To lower working level 80 ft. Shipping stockpile from Mille Lacs mine, and steam shovel will later be moved to Cuyuna-Duluth property.

Mesabi Range

CARSON LAKE (Hibbing)—Shaft sunk by Oliver Iron Mining Co. has reached solid ground after a year's work through quicksand at depth of 140 ft. Work to be rushed to 200 level, where station will be cut and pumps installed. Shaft to be concreted.

PILOT (Mountain Iron)—One steam shovel stripping overburden; ore to be mined by milling process. Operated by M. A. Hanna Co.

WACOOTAH (Mountain Iron). — One shovel stripping, but no ore this season.

COLUMBIA (Virginia)—Officially reported that no work will be done this year.

MISSOURI

Joplin District

FRANK STARKWEATHER (Duenweg)—To rebuild 150-ton mill burned down on June 27. To purchase sludge and slime tables, drills, boilers and ore cars. Frank Starkweather, of Webb City, is superintendent.

VACATION (Duenweg)—To build 200-ton mill and will purchase sludge and slime tables, ore cars, compressors and crushers.

STARK CITY (Stark City)—New 200-ton mill completed.

GEORGE BALL (Waco)—To build 150-ton mill and will purchase sludge and slime tables, crushers, jigs, compressors and concentrators.

MONTANA

Jefferson County

AMALGAMATED SILVER MINES ([illegible])—Silver ore coming from 250-ft. shaft to be shipped.

LEGAL TENDER (Clancy)—Silver property taken over by new corporation and will be operated.

Silver Bow County

BOSTON AND MONTANA (Butte)—Drifting on Elkhorn vein has cut ore on foot and hanging wall. Expect to cut [illegible] soon.

NEVADA

Clark County

GOODSPRINGS DISTRICT—Shipments of zinc and lead ore and concentrates are increasing. Yellow Pine Mining Co. is largest producer. Others shipping are [illegible] & [illegible], Goodsprings Anchor Co., [illegible] Gold Mining Co., Bullion Mining Co., Goodsprings Mining Co. and various lessees.

Esmeralda County

ATLANTA (Goldfield)—Principal development work on [illegible] level.

GOLDFIELD CONSOLIDATED (Goldfield)—Milling plant treating oxidized ores and tailings. Position of wire-rope excavator to be changed to reach another section of tailings pond. Some gold-copper ore being treated by flotation.

KEWANAS (Goldfield)—Good assays obtained from crosscut on 840 level. Development work progressing satisfactorily.

RED HILL FLORENCE (Goldfield)—Regular shipments of good-grade ore being made to Western Ore Purchasing Co., at Hazen.

SILVER PICK (Goldfield)—Good ore opened at depth of 640 feet.

Lyon County

NEVADA DOUGLAS (Ludwig)—Regular shipments good-grade copper ore being made to Mason Valley Co. smeltery at Thompson. Leaching plant operations discontinued.

BLUESTONE MINING AND SMELTING (Yerington)—Recently sold by J. R. DeLamar to Dominion Reduction Co., of Canada. Flotation plant now treating 400 tons daily of low-grade sulphide ore. Capacity to be increased. Large shipments ore made to Thompson smeltery.

YERINGTON CONSOLIDATED (Yerington)—Development work being done. Property lies between Mason Valley mine and Bluestone mine.

Mineral County

RICH SILVER STRIKE made recently four miles west of Mina. Oreshoot is in quartz vein, several feet wide, and carries a large quantity of silver chloride and some galena.

CINNABAR DISCOVERY made recently in Pilot Range east of Mina. Group of 14 claims sold recently to Tonopah men and development work will begin at once.

BELLEVILLE TAILINGS (Belleville)—Tailings dumps of old mills have been retreated at a good profit, and leaching plant now closed down.

NEVADA GOLD MINES (Luning)—Development work on Carbonate group west of Kinkaid station progressing with satisfactory results. Large tonnage of lead-silver ore carrying gold being opened. Larger hoist to be installed and shaft sunk to greater depth. James Houghton is superintendent.

Nye County

NEVADA CINNABAR (Ione)—Leased by L. L. Legg and Fred L. Davis who have begun work. Furnace fired up, and to be worked continuously.

MANHATTAN CONSOLIDATED (Manhattan)—Water troubles on fifth level necessitated putting crew at work on upper levels.

UNION AMALGAMATED (Manhattan)—To cut station and drift upon completion of shaft.

WHITE CAPS (Manhattan)—A new stope has been started from second level in hanging wall of orebody which shows good ore. W. L. Taylor is superintendent.

NORTH STAR (Tonopah)—Development work progressing satisfactorily. Ore found along fault line on 850 level.

TONOPAH EXTENSION (Tonopah)—Development work adding steadily to ore reserves.

WEST END CONSOLIDATION (Tonopah)—Development work being done on Ohio oreshoot.

OKLAHOMA

Joplin District

PRAIRIE (Commerce)—Operations have again been started after sinking shaft to water.

MAURICE (Douthat)—To build 300-ton concentration plant. To purchase sludge and slime tables, crushers, boilers and compressors.

MAXINE (Picher) — Completed power plant and to start erection 500-ton mill soon.

OTTAWA METAL (Picher)—To build 175-ton mill. Expect to purchase engine, jigs, boilers, crushers, compressors and ore cars.

PICHER LEAD (Picher)—To begin construction of 200-ton mill soon. Expect to purchase sludge and slime tables, ore cars, engine, drills and compressors. George Potter is superintendent.

RED GRANITE (Spavinaw)—To build mill at estimated cost of $25,000. To purchase crushers, engine, boilers and ore cars. W. E. Hudson, Tulsa, is superintendent.

COSMOS (St. Louis, Okla.)—To erect 300-ton mill. Property formerly known as Lucky Tiger.

UTAH

Beaver County

BEAVER COPPER (Milford)—Winze being sunk below 200 level to follow copper ore.

Box Elder County

OGDEN PORTLAND CEMENT (Brigham City)—To recover potash contained in cement dust. Cotrell apparatus probably to be installed.

Juab County

TINTIC DRAIN TUNNEL (Eureka)—Tunnel in over 7000 ft.

Piute County

CHAMBERLAIN POTASH (Marysvale)—Mill treating alunite ore from Florence and White Hills.

DEER TRAIL (Marysvale)—Mill operating and producing concentrates. New orebodies of direct shipping grade opened in deeper parts of mine.

FLORENCE (Marysvale)—New mill to treat alunite and produce potassium sulphate expected to begin operation about Sept. 1.

Salt Lake County

OHIO COPPER (Bingham)—First two units of new flotation mill treating 1200 tons daily and making 74% recovery. Third unit in operation, but not yet running with complete smoothness.

WOODLAWN (Salt Lake)—Big Cottonwood property has nearly completed tunnel. Stringers of copper showing at 865 feet.

Summit County

PARK CITY SHIPMENTS for week ended July 6 amounted to 1644 tons, of an approximate value of $85,000. Shippers were Judge Mining and Smelting, Silver King Coalition, and Daly West.

IOWA COPPER (Park City)—Water in shaft eliminated and drifting resumed.

NAILDRIVER (Park City)—Vein opened on 900 level being prospected by drift on 700 level. Crosscut being driven on 600 level for same vein.

ONTARIO (Park City)—Not to drift on 2000 level but to follow ore downward, and later possibly connect with shaft. Pumping equipment taking care of water on lower levels.

Tooele County

WESTERN UTAH COPPER (Gold Hill)—To build 100-ton mill to treat copper ore from Calaveras group owned by company. Mill to be at Salt Springs.

WOODMAN (Gold Hill)—Frankie mine has cut copper ore in raise from main tunnel. Same vein expected within short distance below tunnel.

CANADA

British Columbia

BRITANNIA (Britannia Beach)—Mill handling about 2300 tons per day. Has opened Mammoth Bluff as a quarry.

MONITOR (Three Forks)—Ore on dump awaiting shipment.

SUNLOCH (Vancouver)—Building spur from property to tramway at Jordon River, and will ship ore to Tacoma smeltery.

CORK-PROVINCE (Kaslo) — Operating mill and two shifts of miners.

ROCHER DE BOULE (Tramville)—Vein of high-grade ore cut in raise 160 ft. above main level. Mill is to be built to treat lower-grade ores.

Ontario

TECK HUGHES (Cobalt)—To close property until conditions become normal.

LAKE SHORE (Kirkland Lake)—Mill operated 96% of running time during May.

SAVAGE (Cobalt)—To be reopened.

AFRICA

Belgian Congo

UNION MINIERE DU HAUT KATANGA (Elizabethville)—Produced in June 3,505,315 lb. copper.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsan)—June cleanings $144,000.

The Market Report

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence	July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence
18	4.7530	99⅝	48$\frac{13}{16}$	22	4.7530	99⅝	48$\frac{13}{16}$
19	4.7530	99⅝	48$\frac{13}{16}$	23	4.7530	99⅝	48$\frac{13}{16}$
20	4.7530	99⅝	48$\frac{13}{16}$	24	4.7530	99⅝	48$\frac{13}{16}$

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
July	Electrolytic	Spot.	N. Y.	St. L.	St. L.
18	*26	†	8.05	7.75	8.35 @ 8.40
19	*26	†	8.05	7.75	8.35 @ 8.40
20	*26	†	8.05	7.75	8.35 @ 8.40
22	*26	†	8.05	7.75	8.25 @ 8.35
23	*26	†	8.05	7.75	8.22½ @ 8.27½
24	*26	†	8.05	7.75	8.22½ @ 8.27½

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead	Zinc
	Standard		Electrolytic				
July	Spot	3 Mos.		Spot	3 Mos.	Spot	Spot
18	122	122	137	368	368	29½	54
19	122	122	137	368	368	29½	54
20	...	...	...	...	...	...	.
22	122	122	137	373	373	29½	54
23	122	122	137	377½	377½	29½	54
24	122	122	137	380	380	29½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515.: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23 3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—July 24, 1918

None of the markets exhibited any features of particular interest this week.

Copper—There is nothing special to report. Producers are talking about the forthcoming meeting in Washington and the prospects of an advance to 27½c. Consumers report inability to keep their plants in operation at full capacity, owing to shortage of labor. Some large consumers are able to operate only at the rate of 75 per cent.

Copper Sheets are not quoted, as there is a wide diversity in prices of different dealers. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots.

Tin—Business is very light. There is no stock of spot tin available in this market. Banka tin for shipment from Batavia is worth 93c.; and in San Francisco 96c. would be asked, and in New York, $1. Straits tin was quoted from Singapore on the 18th and 19th at £363, c.i.f., London; on the 22d at £369; on the 23d at £373; and on the 25th at £377.

Lead—There continued to be a large inquiry, which producers were unable to supply. Japan still wanted to buy lead.

Zinc—The market was very dull, with offers at lower figures in the latter part of the week.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Sheets are 42c. per lb. for 18 gage and heavier. Price established June 1 and continues to Sept. 1.

Antimony—There were some transactions at 13¼c., but, speaking generally, the market was dead. We quote spot at 13¼ c., and futures at 11¾@12c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted $1.50@1.75 per pound.

Nickel—Market quotation is 40@45c. per pound.

Quicksilver—Quiet at $125@127½. San Francisco reports, by telegraph, $117, firm.

Gold, Silver and Platinum

Gold—During the last fiscal year, it is reported from Washington, imports of gold into the United States showed a great decrease, compared with the previous year. For the last fiscal year gold imports amounted to $124,000,000; for the previous year they totaled $977,000,000. Gold exports for the last fiscal year amounted to $191,000,000, against $292,000,000 in 1917. In 1918 silver imports amounted to $70,000,000, against $35,000,000 in 1917, and silver exports increased from $78,000,000 in 1917 to $139,000,000 in 1918.

Silver—Market situation remains unchanged, with quotations stabilized at 48$\frac{13}{16}$d. in London and 99⅝c. in New York.

China banks are still buyers, owing to rise in Chinese exchange rate, but find it difficult to obtain supplies in competition with government buying by the U. S. and England. There seems to be a question whether silver will be allowed to be exported if purchased at a price in excess of the Government price.

Mexican dollars at New York: July 18, 77; July 19, 77; July 20, 77; July 22, 77; July 23, 77; July 24, 77.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., July 20—Blende, per ton, high, $77.10; basis 60% zinc, premium, $75; Class B, $60@65; prime western, $52.50@47.50; calamine, basis 40% zinc, $37.50@25. Average selling prices: Blende, $54.47; calamine, $34.38; all ores, $53.46 per ton.

Lead, high, $103.50; basis 80% Pb, $100; average selling price, all grades of lead, $98.10 per ton.

Shipments the week: Blende, 9685; calamine, 509; lead, 1365 tons. Value, all ores the week, $678,950.

Very weak buying, with a cut of $1.50 per ton in blende prices, marked the trading at the beginning of the week, but heavy buying orders on Thursday strengthened the market at the week end. Buying of premium blende has been slack for three weeks. There are indications of a possible rupture in the new system of grading and allocating sales. Producers of zinc ore having no lead object to the ruling that they must put 0.5% to 1% lead into all ore not taken by buyers at premium prices, and claim they can obtain a better average all around price selling on Class B basis. This much lead would put the blende with lead in the prime western class. Buyers of the Class B grade require 0.3% or less of lead. One objection of producers of no-lead blende is that in adding lead it holds on the jigs and affects subsequent sales with an overburden of lead. Another is that with a production of 160 tons, and an allotment of 40% premium, the sale of 64 tons at $75 brings $4800 and 96 tons at $50 brings another $4800, a total of $9600, though the whole lot can be sold as Class B at $65, or a total of $10,400, a net loss of $800, if sold by allotment, or $5 per ton, against the sale of the entire lot as Class B blende.

Platteville, Wis., July 20—Blende, basis 60% zinc, highest price reported paid for premium grade was $74 per ton, and quotations ranged down to $52.50 per ton base. For high-lead blende, one car blende, sold the week previous but settled for this week, brought $75.40, which is the highest price paid here since the Government schedule of price became effective. Lead ore, basis 80% lead, $90 per ton base. Shipments reported for the week were 2115 tons blende, 349 tons galena, and 653 tons sulphur ore, for the year to date the figures are 72,740 tons blende, 4200 tons galena, and 28,826 tons sulphur ore. During the week 2626 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Ore of 40% grade quoted at $1.40 per unit, f.o.b., California, with other grades at the usual differential.

Manganese Ore—Unchanged.

Molybdenum Ore—Sales of high-grade molybdenite reported at about $1 per lb. of molybdenum sulphide in ore containing 90% or over.

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight. Tonnage is extremely difficult to obtain. Domestic pyrites is selling at prices ranging from 20 to 25c. per unit, f.o.b. mine, according to delivery basis.

Tungsten Ore—The market was active, with prices ranging from $18.50 to $23.50 per unit. High-grade ores almost free from impurities are quoted at from $22.50 to $23.50 per unit; low-grade ores containing impurities are quoted at $18.50 to $20 on the basis of 60% or over.

Charles Hardy under date of July 23 reports the following:

"The demand for high-grade tungsten is exceeding the supply at the present moment. As a matter of fact, wolframite free from impurities is not to be had in the New York market. Buyers have been compelled reluctantly to take material which contained up to 1% of tin and pay for it $22.50 per unit, material that was formerly never bought by these concerns. Material free from all impurities would probably command readily $24 and even slightly above. On the other hand, there is quite a quantity of tungsten ore available, running high in tin and copper, and the market for this off-grade tungsten has not undergone a change. The scheelite position remains strong. Some of the Western producers are fully sold for the remainder of the year. Others are holding for price of $24.50 at the mine, which in these days of high freights, long duration of journey and consequent loss of interest is equal to $25.50 a unit delivered mill in the East."

Iron Trade Review

PITTSBURGH—July 23

The War Industries Board has announced that the steel requirements for the present half year are 20,000,000 to 21,000,000 net tons, though the industry has never produced more than 16,500,000 net tons in a half year. The estimate of requirements includes the various Government orders and the steel needed to supply the commercial industries that are recognized as helpful, being included in the preference list. Information is lacking as to how the latter items were made up, as the Government does not buy material for agricultural implement works, public utilities and like uses. A question is raised whether the various Government departments have not overstated their own requirements, not as to the total tonnage but as to the amount they will actually be able to utilize by the end of the year. In the steel trade there is a suspicion that some of the estimates are too high. Attention is also called to the fact that the 16,500,000 net tons mentioned as maximum production does not conform with official statistics showing 30,557,818 gross tons, or 34,200,000 net tons, though with steel ingot production at 43,500,000 gross tons a year, during June the rate of finished steel production would make about 36,000,000 net tons a year.

Steel supplies are not reaching clear through the preference list, and there is practically nothing left over in any line to constitute Class D material, which may be shipped, under permit, for purposes not on the preference list. Though the fact that the Government is not taking large tonnages of some descriptions of finished product would suggest that there ought to be a surplus in these lines, the fact is that they have had their steel supply cut down, in the interest of the manufacture of shell steel, plates, and similar requirements. The plate mills are running full, producing half a million net tons a month, and shell steel is being produced in about the same proportion. The tin-plate mills are making new production records. Rod, sheet and merchant bar mills are operating at an average of about 60% of capacity.

The Institute announces a revision of its report of ingot production in June, one of the companies reporting having originally understated its output by 46,516 tons. With the correction, it appears that the rate of ingot production in June was 43,500,000 gross tons a year. Since the low production of January, each month has recorded a successive improvement, and hopes are entertained that when the hot weather is over still heavier outputs will be secured. The chief difficulty is shortage of scrap and poor quality of what is available. There is an ample supply of pig iron to operate the steel works, if at the same time they had their normal supply of scrap, but somewhat more pig iron could be used in the circumstances. Blast furnaces are not operating at capacity, estimated on the basis of 1916 production with allowance of new furnaces since built, but perhaps output is restricted by absence of the large quantities of scrap that were used in the blast furnaces in 1916. Coke supplies are believed to be sufficient, and the coke situation is constantly improving with the completion of additional byproduct ovens.

Pig Iron—There is a little talk of buying for 1919, but buying does not count for anything, as deliveries are regulated by the War Industries Board, irrespective of purchases. For prompt delivery there is no activity. Furnaces are overshipping on some contracts and shipping nothing on others. The market is practically nominal, being quotable at the set limits: Bessemer, [illegible]; basic $32; foundry $33; malleable, [illegible]; forge, $32, f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40, and somewhat less from six detached furnaces near by.

Steel—Small-discard steel shipments are to be subject to permit, but the War Industries Board intimates it will be fairly liberal. Small lots are being sold to consumers whose operations are represented in the preference list. Sheet bars are now allocated according to a definite system in order to produce uniform operations at the different sheet mills, the tin-plate mills having first been given an absolutely full supply. Hardly any billets are moving. Prices remain at the Government limits: $47.50 for billets, $51 for sheet bars and small billets, $50 for slabs and $57 for rods.

Ferroalloys—The market is quiet with most consumers fairly well stocked. Prices remain at $250 for 70% ferromanganese, delivered, with $4 a unit for extra manganese, and at $75 for 16-19% spiegeleisen, f.o.b. furnace.

Coke—The Clairton byproduct plant is producing more coke, but the whole 640 ovens of the first batch may not be operating full until late in the year. The American Steel and Wire Co.'s new 180-oven plant at Cleveland is now running practically full, and the 208-oven plant at Lorain of the National Tube Co. is warming up. Connellsville coke production is increasing a trifle. Government prices on Connellsville coke remain at $6 for furnace, $7 for foundry, $7.30 for crushed over ¾-in., $5 for crushed under ¾-in., and $3 for breeze.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1916	New York 1917	New York 1918	London 1916	London 1917	London 1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010		30.000	40.110	.....
Aug.	66.083	85.407		31.498	43.418	.....
Sept.	68.515	100.740		32.584	50.920	.....
Oct.	67.855	87.332		32.361	44.324	.....
Nov.	71.604	85.891		34.192	43.584	.....
Dec.	75.765	85.960		36.410	43.052	.....
Year	65.661	81.417		31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1917	New York Electrolytic 1918	London Standard 1917	London Standard 1918	London Electrolytic 1917	London Electrolytic 1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620		128.409	.....	140.409	.....
Aug.	25.380		122.391	.....	137.000	.....
Sept.	25.073		117.500	.....	135.250	.....
Oct.	23.500		110.000	.....	125.000	.....
Nov.	23.500		110.000	.....	125.000	.....
Dec.	23.500		110.000	.....	125.000	.....
Year	27.180		124.892	.....	138.401	.....

Tin	New York 1917	New York 1918	London 1917	London 1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	.....	242.181	.....
August	62.681	.....	243.978	.....
September	61.542	.....	244.038	.....
October	61.851	.....	247.467	.....
November	74.740	.....	274.943	.....
December	87.120	.....	298.556	.....
Av. year	61.802	.....	237.563	.....

(a) No average computed.

Lead	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	[illegible]	9.158	[illegible]	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710		10.644	.....	30.500	.....
August	10.594		10.518	.....	30.500	.....
September	8.680		8.611	.....	30.500	.....
October	6.710		6.650	.....	30.500	.....
November	6.249		6.187	.....	30.500	.....
December	6.375		6.312	.....	30.500	.....
Year	8.787		8.721	.....	30.500	.....

Spelter	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	[illegible]	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643		8.473	.....	54.000	.....
August	8.360		8.190		54.000	.....
September	8.136		7.966		54.000	.....
October	7.983		7.813		54.000	.....
November	7.847		7.672		54.000	.....
December	7.685		7.510		54.000	.....
Year	8.901		8.813		52.413	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer* 1917	Bessemer* 1918	Basic* 1917	Basic* 1918	No. 2 Foundry 1917	No. 2 Foundry 1918
January	[illegible]	$37.25	$30.95	$33.95	$30.95	$33.95
February	[illegible]	37.25	30.95	33.95	30.95	33.95
March	[illegible]	37.25	33.49	33.95	35.91	33.95
April	[illegible]	36.15	38.90	32.95	40.06	33.95
May	[illegible]	36.20	[illegible]	33.00	43.60	34.00
June	[illegible]	[illegible]	[illegible]	[illegible]	50.11	34.16
July	[illegible]		[illegible]		53.95	
August	[illegible]		[illegible]		53.95	
September	[illegible]		[illegible]		48.58	
October	[illegible]		[illegible]		33.95	
November	[illegible]		[illegible]		33.95	
December	[illegible]		[illegible]		33.95	
Year	[illegible]		[illegible]		$40.83	

* As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	July 23
Alaska Gold M.	3⅜
Alaska Juneau	2
Am.Sm.&Ref.,com.	76¾
Am. Sm. & Ref., pf.	105
Am. Sm. Sec., pf., A	87
Am. Zinc	18¼
Am. Zinc, pf.	50½
Anaconda	65
Batopilas Min	1¼
Bethlehem Steel	‡81
Bethlehem Steel, pf.	‡88¼
Butte & Superior	29⅛
Butte Cop. & Zinc	11½
Cerro de Pasco	34¼
Chile Cop.	16¼
Chino	39¼
Colo.Fuel & Iron	44¾
Crucible Steel	65¾
Crucible Steel, pf.	90¾
Dome Mines	8⅜
Federal M. & S.	10⅛
Federal M. & S., pf.	33
Great Nor., ore ctf.	31½
Greene Cananea	43
Gulf States Steel	83½
Homestake	71
Inspiration Con.	52⅛
InternationalNickel	30¾
Kennecott	33¼
Lackawanna Steel	82½
Mexican Petrol	98
Miami Copper	29½
Nat'l Lead, com.	58½
National Lead, pf.	101
Nev. Consol.	19¾
Ontario Min	10⅝
Ray Con	23½
RepublicI.&S.,com.	90⅛
Republic I. & S., pf.	101
Sloss-Sheffield	61
Tennessee C. & C.	19
U. S. Steel, com.	104⅞
U. S. Steel, pf.	111½
Utah Copper	80⅛
Va. Iron C. & C.	70

BOSTON CURB*	July 23
Alaska Mines Corp.	.12
Boston Ely	.75
Boston & Mont.	.52
Butte & Lon'n Dev.	.15
Calaveras	.50
Calumet-Corbin	‡.01
Chief Con.	2½
Cortez	05
Crown Reserve	15
Crystal Cop.	.22
Eagle & Blue Bell	2⅜
Gila Copper	‡17
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	19
Mexican Metals	46
Mines of America	1⅛
Mojave Tungsten	09
Nat. Zinc & Lead	15
Nevada-Douglas	50
New Baltic	90
New Cornelia	18¼
Oneco	20
Pacific Mines	‡ 35
Rex Cons	07
Yukon Gold	.90

TORONTO*	July 19
Adanac	‡ 08½
Bailey	‡ 03
Beaver Con.	23
Chambers Ferland	‡ 12
Coniagas	2.75
Hargraves	.04
La Rose	‡ 35
Peterson Lake	‡ 09½
Temiskaming	.30½
Wettlaufer-Lor.	‡ 04
Davidson	‡ 35
Dome Exten.	09
Dome Lake	‡ 14
Hollinger	‡4 60
McIntyre	1 31
Newray	‡.15
Porcu. Crown	.13
Teck-Hughes	13
Vipond	.12
West Dome	.08

BOSTON EXCH.*	July 23
Adventure	‡.50
Ahmeek	76¾
Algomah	‡.15
Allouez	50¾
Ariz. Com., ctfs.	14¼
Arnold	‡.20
Bingham Mines	‡9¾
Bonanza	‡.15
Butte-Balaklava	‡.25
Calumet & Ariz.	‡68
Calumet & Hecla	460
Centennial	‡12½
Copper Range	‡48
Daly West	‡1¾
Davis-Daly	6¾
East Butte	9⅝
Franklin	‡4¼
Granby	‡75
Hancock	6
Hedley	‡12
Helvetia	‡.15
Indiana	.40
Isle Royale	27
Keweenaw	1¼
Lake	‡5¼
La Salle	‡2½
Mason Valley	‡3½
Mass	5⅜
Mayflower	2¾
Michigan	2½
Mohawk	58
New Arcadian	1¾
New Idria	‡14
North Butte	14⅞
North Lake	‡.65
Ojibway	‡.60
Old Dominion	‡42
Osceola	51½
Quincy	‡69
St. Mary's M. L.	‡50
Santa Fe	‡.65
Seneca	‡10½
Shannon	‡4¼
Shattuck-Ariz	‡15½
So. Lake	‡1⅜
So. Utah	.18
Superior	‡4¾
Superior & Bost.	‡2 1/16
Trinity	‡3½
Tuolumne	‡1 1/16
U. S. Smelting	42⅜
U. S. Smelt'g, pf.	44
Utah Apex	2 1/16
Utah Con.	‡9¾
Utah Metal	2
Victoria	‡2½
Winona	‡1½
Wolverine	‡28
Wyandot	‡.50

SAN FRAN.*	July 22
Alta	.03
Andes	.05
Best & Belcher	.03
Caledonia	‡.03
Challenge Con	.03
Confidence	.04
Con. Virginia	.31
Gould & Curry	.01
Hale & Norcross	‡.01
Jacket-Cr. Pt.	.07
Mexican	.24
Occidental	‡.51
Ophir	.11
Overman	.02
Savage	.03
Sierra Nevada	.09
Union Con.	.39
Utah Con.	.01
Belmont	2.75
Jim Butler	.58
MacNamara	.32
Midway	.04
Mont.-Tonopah	.10
North Star	.06
Rescue Eula	.08
West End Con.	1.05
Atlanta	.05
Booth	.03
Comb. Frac.	‡.02
Florence	.12
Jumbo Extension	.12
Kewanas	.04
Nevada Hills	.01
Nevada Packard	.27
Round Mountain	‡.18
Silver Pick	.03
White Caps	.31
Big Jim	‡.75
United Eastern	3.00

N. Y. CURB July 23

Big Ledge	1¼
Butte & N. Y.	‡.75
Butte Detroit	11
Caledonia	48
Calumet & Jerome	1¼
Can. Cop. Corpn	1⅜
Carlisle	‡2
Cashboy	[illegible]
Con. Ariz. Sm.	1⅞
Con. Coppermines	‡5⅞
Con. Nev.-Utah	[illegible]
Emma Con.	20
First Nat. Cop.	2
Goldfield Con.	28
Goldfield Merger	04
Greenmonster	⅜
Hecla Min	4⅜
Howe Sound	2¾
Jerome Verde	‡.50
Kerr Lake	5⅛
Louisiana	‡.50
Magma	‡32
Majestic	20
Marsh	‡.05
McKinley-Dar-Sa.	.40
Milford	‡.75
Mohican	.06
Mother Lode	.37
N. Y. & Hond.	‡12½
Nipissing Mines	‡8.65
Nixon Nevada	.45
Ohio Cop.	1¼
Rawley	‡2½
Ray Hercules	4¼
Richmond	‡.56
Rochester Mines	.38
St. Joseph Lead	14¼
Standard S. L.	
Stewart	.17
Success	‡.10
Tonopah	2⅞
Tonopah Ex.	1¾
Tribullion	1⅛
Troy Arizona	.15
United Cop.	‡⅛
United Verde Ext.	35½
United Zinc	1⅛
Utica Mines	‡.08

* Bid prices. † Closing prices. ‡ Last Quotations.

Engineering and Mining Journal

August 3, 1918

Volume 106 Number 5

A MODERN ROAD IN THE DESERT

The Southwest Copper Field

BY J. R. FINLAY*

Statistics show the immense importance of the oval of territory within which are included many of the greatest copper mines. The general characteristics of the section and the climatic variation in mountain, valley, and plain are defined; geologic aspects are described and several theories propounded, and the comparative ethnology of Mexican and American and the economic results of the admixture of races occurring in this region are discussed, with interesting conclusions.

THE greatest copper-producing region of the world may be described as a rough oval of about 40,000 square miles, measuring about 330 miles north and south and 165 miles east and west. Its most easterly extremity is at the Chino mine, near Santa Rita, New Mexico; its most westerly, at Ajo, Ariz.; its most northerly point is Jerome, Ariz., and its most southerly, Nacozari, Mexico. In New Mexico are the districts of Santa Rita and Burro Mountains; in Old Mexico, those of Nacozari and Cananea; in Arizona, those of Bisbee, Ray, Globe, Clifton, Jerome, Ajo, and a number of smaller ones. Thus, much the greater part of the field lies in Arizona, and, as nearly as may be estimated, this area produced 27% of the world's output of copper in 1917, 36% of the production of the two Americas, and an amount equal to 47% of that of the United States. Its actual production is shown in the table on the following page.

The tables do not give an exact comparison of the field under discussion with the other subdivisions of the world, because the whole of Mexico is included, and only a part of that country may properly be considered to be in this field. It is rarely possible for such data to be accurate in all respects; but, with the above explanation, the figures will serve their purpose. They are compiled from statistics published in the *Engineering and Mining Journal*, Jan. 12, 1918.

This vast copper region deserves more than a passing description. Geographically it bears considerable resemblance to Spain and Morocco, corresponding fairly well to those countries in latitude and with regard to bordering ocean; and, therefore, to a large extent in climate and physical appearance. The central part is in latitude 32° N. and is about 180 miles from the Gulf of California. The region is arid to semi-arid, the rainfall varying from 6 or 8 in. annually at Ajo to 16 or 18 in. at Globe. The climate naturally varies according to differences of altitude, the local topography, which influences rainfall and winds, and, to a minor extent, to difference of latitude. The altitude is from 2000 ft. at Ajo to 6000 ft. at Cananea. A rough average of the whole may be found at Cochise, situated in latitude 32° N. at an elevation of 4250 ft. Here the mean temperature for the year 1916 was 60..5° F., with a maximum of 102° in July and a minimum of 6° in December. The normal precipitation is 11.78 in., but it probably varies in different years between 8' and 16 inches.

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The latitude is sub-tropical, and, of course, the district is decidedly warmer than that of the more populous parts of the country; but popular fancy exaggerates the difference. Even Yuma, which is outside this area, practically at sea level, near the mouth of the Colorado River, and celebrated as the "hottest place in the world," or something to that effect, has not even an average tropical heat. The mean for 1916 was only 69.2°, the temperature varying between 110° and 20°. The hottest month, August, had a mean of 86.5°. At the Prescott Dry Farm, at an elevation of 5008 ft., the temperature varied in 1916 between 95° and 7°. At Phœnix, elevation 1108 ft., the extremes were 111° in June and 24° in December, indicating, as compared with Prescott, a difference in the extremes of temperature of about 16° for 3900 ft. of elevation.

TABLE OF COPPER OUTPUT IN POUNDS

State	1914	1915	1916	1917
Arizona....	387,978,000	444,089,000	692,630,000	692,924,000
New Mexico...	64,339,000	75,515,000	83,013,000	101,952,000
Old Mexico....	80,000,000	67,000,000	112,000,000	90,000,000
Totals	532,317,000	586,604,000	887,643,000	884,876,000
Total United States	1,158,582,000	1,423,698,000	1,942,776,000	1,888,396,000
Total Western Hemisphere....	1,479,800,000	1,797,959,000	2,429,749,000	2,392,144,000
Total world.	2,050,000,000	2,388,540,000	3,099,602,000	3,114,475,000

PERCENTAGE PRODUCED BY ARIZONA, NEW MEXICO AND OLD MEXICO

	1914	1915	1916	1917
Of the United States.	45	41	45 7	47.0
Of the Western Hemisphere	36	33	36.5	36.2
Of the world	26	26	28 6	27.8

PERCENTAGE OF WORLD OUTPUT PRODUCED IN WESTERN HEMISPHERE

1914	1915	1916	1917
72.2	75.2	78 4	77

The rainfall comes regularly in two rainy seasons: a winter season, culminating usually in January or February; and a summer season, in July and August. There are usually about five months in each of which the precipitation is one inch or over; in the other seven months the fall is scant. Thus, at Cochise in 1916 the total for the year was 14.69 in., of which 12.99 in., or 89%, fell in the five months of January, July, August, September and October, the other seven months having only 1.70 in, or 11 per cent.

The record of climatic observations at Cochise is given in the twenty-seventh annual report of the agricultural experiment station of the University of Arizona, for 1916, and is shown in the table.

F. L. Ransome, certainly one of the most brilliant of geological writers, has followed the classic example of Cæsar with regard to Gaul by dividing Arizona into three parts—the plateau region, the mountain region, and the desert region. Though the boundaries are in places somewhat indistinct, in general the division is an apt and a true one.

The mines are practically all in the central or mountain belt; but since the conditions of life, in these days of swift and improving transportation, are influenced by the region as a whole, as well as by the immediate local surroundings of the inhabitants, it is not inappropriate to take note of the climate and aspect of the three belts. One cannot but be impressed by the variety of scenes, and perhaps surprised at the inaccuracies of his geography. That was my experience. Having traveled extensively in the United States, sometimes upward of 40,000 miles a year, I had fallen into the conceit of assuming that I knew the country. Travel had become a bore, and I had even come to feel interested only when I could get off the train; and I looked out of the windows solely because there was nothing else to do. Probably many like myself get into a rut of preoccupation and fail in a similar way to get satisfaction out of their opportunity, or through the necessity of travel. To find a place interesting is to be interested. Many mining men are of broad intelligence, able to take a big place in the world's affairs, as Mr. Hoover has, but I think there are many who see little in a mining country except the mines.

TEMPERATURE AND PRECIPITATION—SOUTHWEST COPPER FIELD.

Month	Temperature, Degrees Maximum	Temperature, Degrees Minimum	Temperature, Degrees Mean	Precipitation, Inches
January	71	14	45.2	2.20
February	80	18	51.0	0.48
March	86	28	56.3	0.63
April	89	29	58.6	0.08
May	95	37	64.6	0.28
June	101	42	76.2	0.00
July	102	58	78 0	3.78
August	97	56	75.2	4.10
September	91	43	70.8	1.55
October	86	32	60.7	1.36
November	85	22	49.5	0.00
December	74	6	40.1	0.23
Year	102	6	60.5	14.69
Normal				11.78

There is also a good deal of literature published by fanciful persons who make their product a caricature of local color. From such "authorities" one gains impressions that the unusual is the usual. To quote my own experience once more, I had gained the impression, somehow, that Arizona was a monotonous expanse of dusty desert, sparsely covered with greasewood and grotesque cacti, relieved only by an occasional sandy wash where there would be streams if there were any water, and by lonely bare mountains well scorched by the sun. There are such stretches in Arizona, but they serve only to help give the state some of its variety and interest.

NORTHERN ARIZONA PLATEAU LAND

The great Coconino plateau of northern Arizona is said to contain the largest reserve of uncut pine timber in the United States. Above it rise the San Francisco peaks, volcanoes recently extinct, nearly 13,000 ft. high and nearly always covered with snow. Flagstaff, a lumbering town at their base, at an altitude of 6900 ft., has a climate like Minnesota. The mean average temperature is only 44°. Its precipitation is greater than that of any place along the California coast south of San Francisco; greater, I believe, than at San Francisco. Government records, not mere rumors, show temperatures as low as 25° below zero, such as are not felt n New York once in a lifetime. This plateau is not a small part of the region, but a very large part, lying immediately north of the mining districts. The U. S. Geological Survey (guidebooks of the Western United States, Santa Fé Route, Bull. 613, a most interesting and instructive volume, by the way) has this to say:

> From Isleta, an Indian pueblo on the Rio Grande, which lows into the Gulf of Mexico, the railway begins its long ourney across the interesting plateau country, which, with ts bordering areas, extends almost to the Colorado River, which flows into the Pacific. This vast area of high, nearly evel country lies between the rugged and generally higher ranges of the Rocky Mountains on the north and the alternating short ranges and deserts of the lower-lying north nd of the Mexican plateau to the south.
>
> This is a land of varied landscapes, rocks and people. n places the plains and cliffs are vividly colored by natural pigments of red and vermilion. The rocks of the plateau re surmounted by two large volcanic piles, which stand far bove the general level of the plain and which were master olcanoes in but comparatively recent time—Mount Taylor n the east and the San Francisco Mountains on the west. From the immensely thick and almost horizontal sediments hat compose most of the mass of the plateau, layer after ayer has been eroded away over wide areas, leaving remants of harder strata which make picturesque hills and alleys and expose fossil forests which long ago were buried n the sediments of which these strata are made. Erosion as also carved many canyons, notably the majestic Grand Canyon of the Colorado.
>
> Here and there in the rocky cliffs and canyons are the resent and former communal homes of the aboriginal peoles, whose arts and religious ceremonies partly lift the eil of the past and reveal glimpses of the earlier stages of he human culture. These vast expanses were long ago he abode of aboriginal tribes; later they were explored and ominated by the mounted Spanish *conquistadores;* and nally they have been made accessible to all by the comfortble railway of today. The plateau country and its aproaches, in all their aspects—geologic, ethnologic and hisorical—form a region which will hold the attention of all assers-by in whom there exists a spark of appreciation for triking natural phenomena and significant human events.

I quote further from the publications of the U. S. Geological Survey (Professional Paper 98-K, by F. L. Ransome) to get a broader description:

> The plateau region, which has an area of about 45,000 quare miles in Arizona, occupies the northeastern part of he state and drains generally northward through the Little Colorado and smaller streams into the Grand Canyon. The eneral altitude of this region, which is a part of the great Colorado Plateau, ranges from 7000 to over 8500 ft. As Dutton graphically states:
>
> "Its strata are very nearly horizontal, and, with the exeption of the Cataract Canyon and some of its tributaries, ot deeply scored. Low mesas, gently rolling and usually lad with an ample growth of pine, pinon, and cedar; broad nd shallow valleys, yellow with sand or gray with sage, epeat themselves over the entire area."
>
> Here and there the Kaibab limestone (Pennsylvanian, late Carboniferous), the prevalent surface rock, is covered by ows of basalt or bears erosion remnants of younger strata; nd above it, north of Flagstaff, rise the lofty extinct volanoes of the San Francisco Mountains.
>
> The southwestern limit of the plateau traverses in a genral southeasterly direction from the Grand Wash Cliffs, ear the eastern border of Nevada, to the New Mexico line, few miles northeast of Clifton. This boundary along much f its course is a single bold escarpment 2000 ft. or more n height; but elsewhere it is less definite and less simple, wing to a distribution of the total difference in relief mong a series of great topographic steps, or to local acumulations of volcanic rocks, especially basalt. In general, he outer or lower line of cliffs separates nearly horizontal nd undisturbed strata on the northeast from faulted and ilted beds on the southeast; and locally, as along the Grand Wash Cliffs, this line is itself a fault scarp, more or less modified by erosion.
>
> The Grand Wash cliffs rise precipitously 3000 ft. or more bove the plains to the west. According to Lee, pre-Camrian granite is exposed at their base and the Redwall limetone forms their crest and the floor of the adjacent plateau. About 45 miles east of the Music Mountains a second giganic step, that of the Aubrey cliffs north of Seligman, carries the geologic section nearly to the top of the Kaibab limestone, which forms the surface of the Coconino Plateau, south of the Grand Canyon. South of the Music Mountains there is another ample terrace in the ascent from the valleys of the mountain region to the Colorado Plateau—that of the Truxton Plateau. This bench, which lies between the Cottonwood and Aquarius Cliffs to the west and Yampai Cliffs and Juniper Mountains to the northeast, is described by Lee as a granitic peneplain partly covered with volcanic rocks.
>
> South of Ash Fork the continuity of the plateau escarpment is interrupted by flows of basalt that poured down from the plateau to the valley of the Verde, forming a slope that has been utilized by the Santa Fé, Prescott & Phœnix Ry. between Ash Fork and Jerome Junction. East of this railway and north of Jerome the edge of the plateau is in general a scarp (part of the Aubrey Cliffs of Gilbert) over 2000 ft. in total height, with deep reëntrants and bold pinnacled promontories.

Ransome does not stop to say that the view from the mining town of Jerome—itself perched on a steep escarpment 2000 ft. above the valley—across the broad Verde Valley to these red cliffs, topped by a dark line of forest, all surmounted by the towering San Francisco peaks, is nearly, if not quite, as impressive as the Grand Canyon itself.

> East of Camp Verde a thick series of basaltic flows, with associated tuffs, has covered the edges of the nearly horizontal sedimentary rocks; but these beds appear again at the head of Fossil Creek and continue eastward past Payson in the great southward-facing cliff that marks the descent of about 2000 ft. from the Mogollon Mesa to the Tonto Basin. From Fort Apache eastward to the New Mexico line, the plateau boundary becomes less distinct. Erosion has partly destroyed its continuity, and vast accumulations of volcanic rock have obscured the original plateau surface.
>
> The second topographic division, the mountain region, which adjoins the plateau region on the southwest, is essentially a broad zone of short and nearly parallel mountain ranges, among which are the Dragon, Chiricahua, Whetstone, Pinaleno, Galiuro, Santa Catalina, Pinal, Superstition and Mazatzal (and many others), extending diagonally across the state from the southeast corner to Colorado River. The width of the zone may be taken as from 70 to 150 miles, but its southwest boundary is not susceptible of precise demarcation. Few of the individual ranges exceed 50 miles in length or 8000 ft. in altitude. Their general trend is almost northwest, but near the Mexican border it becomes more nearly north, and the mountain zone as a whole coalesces with a belt of north and south ranges that extends through New Mexico, thus swinging around the plateau region and bordering it on the east also.
>
> Most of these ranges consist mainly of quartzites and limestones of Paleozoic or earlier age, resting with conspicuous unconformity upon granitic, gneissic and schistose rocks. All these rocks are cut by later intrusives, especially by diabasic and monzonitic rocks, and are partly covered by flows of lava. Structurally these ranges are characterized by the dominant part played by faulting as compared with folding. The great copper deposits of Arizona, so far as they are known, are all, except that of Ajo, within this mountainous zone.

I have quoted these descriptions more fully, especially in the case of the plateau region, than would at first seem relevant to a discussion of the mines, none of which are found in that area. But the contrast of the two areas is of great interest to the mining man because it shows so clearly that the mountain region, in which the mines occur, is a pronounced zone of weakness in the earth's crust. The plateau is like a great floe of arctic ice, through which cracks run at occasional intervals, but on the whole it is solid and uniform. The mountain region resembles a fringe of hummocks bordering the floe, in which great blocks have been broken and tilted, some portions sloping far down below the general level and others jutting their angular edges above it. At three different epochs since the Paleozoic age has this rupturing taken place, and each time igneous molten rock has been squeezed up between and through cracks in the unstable blocks. These huge fragments are parts of the same massive plateau. The hummocks, of course, have been attacked by erosion, and the spaces between are filled with the débris which is still migrating slowly into the hollows.

The ore deposits, in all cases, are caused by gases or solutions escaping from the cooling igneous masses, carrying metals which they are able to dissolve while the heat and pressure are great enough, and depositing them when they lose some of their heat and pressure. This occurs when the gases escape into the inclosing rocks, or into such upper portions of the igneous masses themselves as may have already cooled. The relation between this action and the lines of structural weakness in the earth's crust is a simple and definite one, when broadly considered, and well worth noting. It is seldom that such a relationship is so clearly expressed in the surface topography as it is in the examples noted. Although this belt is described properly as the mountain region, its average elevation is considerably lower than that of the adjoining plateau, the loftiest peaks being little, if any, higher than the plateau summit. The average altitude is probably between 4000 and 5000 ft. The drainage is nearly all westward through the Gila and its tributaries, although a considerable area in southeastern Arizona and northern Sonora drains into the Yaqui River. All the drainage of the mining region goes finally to the Gulf of California.

TALUS SLOPE FROM A GREAT FAULT BLOCK

Only on the higher summits will the Easterner see vegetation that looks familiar, with pines and junipers in abundance. The lower slopes and broad valleys take on varying aspects. Here, grassy plains and slopes littered with yellow gourds and interspersed with scattered live oaks; there, similar stretches clothed with a variety of thorny bushes, mesquites and greasewood; elsewhere, rocky knobs covered with ocatillas, palo verde and cholla—the most formidable and picturesque of the cactus family. Bare hills are made to look still more barren by weird forests of towering sahuaros—the giant cactus. Yuccas, in considerable variety, are found almost everywhere, with Joshua trees, Spanish bayonets, and soapweeds. Here and there one may see cottonwoods, black willows, hackberries, mountain ash, madrona, sycamore, black oak, manzanito, cherry, squawberry, ironwood, box elder, walnut, sage brush, and many others. The vegetation, of course, is not nearly so abundant, but seems quite as varied as in the well-watered countries of the east and north—so varied, so highly characteristic, and so well adapted to soil and climate that it adds materially to the scenic wealth of the United States.

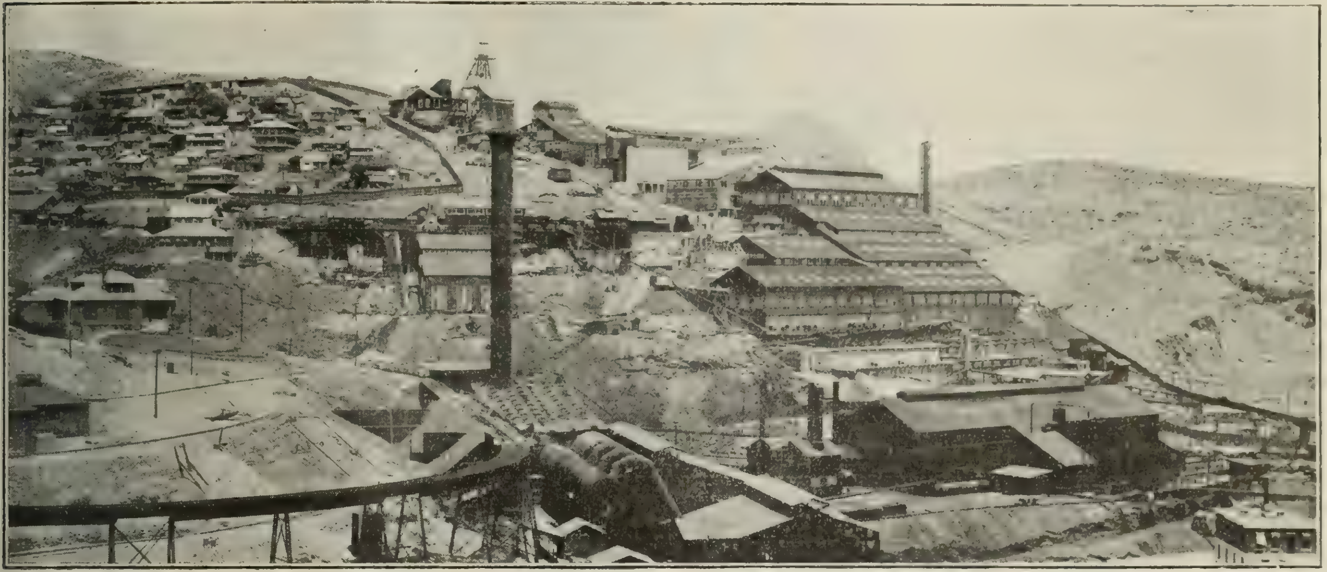
"Adjoining the mountain region on the southwest," to quote Ransome again, "is the third topographic division, the desert region, which also contains many short ranges of mountains of prevalent northwesterly trend. In this region, however, most of the ranges are separated by broad desert plains, underlain by fluviatile and lacustrine deposits of late geologic age, or by undulating granitic lowlands partly covered with gravels and flows of lava. The boundary between the mountain and desert regions is, as previously stated, indefinite, but may provisionally be taken as a curved line extending from Nogales, on the Mexican frontier, past Tucson and Phœnix to Needles, at the California line."

Ransome might have added that this territory is lower, has been generally stripped by erosion of the Paleozoic sediments that may once have covered it, and is characterized by a vegetation more emphatically desert-like than that of the mountain region. The giant cactus, the creosote bush, the cholla, the barrel cactus, the palo verde and similar weird and strange plants are found everywhere. Familiar vegetation has almost vanished, and the average white man feels himself to be in a strange land.

The striking feature of desert topography—and this is true of the mountain region to almost the same extent—is the interminable talus slopes, made up of rock fragments that have cracked off the fault blocks or volcanic piles which form the projecting heights and been carried into the lowlands by the gushes of water from occasional cloudbursts. Geologists have given considerable study to this phenomenon. It is a mistake to suppose that sedimentary beds are necessarily deposited in water. Desert regions generally are areas of deposition, and the streams are too feeble to carry onward all the débris that is offered them. Sometimes there are no permanent streams at all; many desert regions are enclosed basins with no outlet to the sea.

In both mountain and desert belts in Arizona, faults of recent geologic age have often formed lakes by interrupting the flow of streams. These lakes have been filled up in all cases, I believe, and the streams have surmounted or cut through the obstruction and resumed their erosion. The Roosevelt dam is merely the artificial replacement of a natural dam which had been thus cut through; and the new lake fills merely a part of an old one. In some of the depressions, the talus accumulations are surprisingly deep, attributable, no doubt, to recent faulting. The Miami Copper Co. drilled a hole 2000 ft. deep into the so-called Gila conglomerate, merely a talus accumulation of Quaternary age, without reaching the bottom. This depression is thus much deeper than any present channel of erosion, and indicates a great change of level in the geological yesterday.

Here again is a fact, seemingly irrelevant to our main subject, but really important. These great accumulations of talus, or wash, occupy the larger part of the area both of the mountain and desert regions. The loosely compacted mass of angular and subangular fragments contains at every level abundant pore space, which enables it to fill an exceedingly valuable role in the conservation of the water supply. The occasional heavy rains pour floods from the mountains, which spread out over the talus slopes and playas. A large part sinks readily through the porous mass and reaches a level where its flow is impeded and often permanently stopped by barriers on the underlying rock surface. At the same time, this water is effectively protected from evaporation, and the lower portion of the accumulations is a succession of reservoirs of good water, which is utilized for mining, milling, and smelting plants as well as for towns, agriculture, and railroads. Thus the Gila conglomerate at Miami, already mentioned, furnishes water for the Miami and Inspiration mining companies. Part of the supply comes from the Old Dominion mine, the workings of which extend out under the conglomerate, and as a consequence are undesirably wet; but the heavy pumping consequently made necessary does not go entirely uncompensated, for the water is transferred to the Miami for use in that company's plants. The mines and town of Ajo are absolutely dependent on such a supply, as well as the large towns of Douglas and Tucson, with the various industries that support them. Many a valley is dotted with ranches which would not be there except for these talus reservoirs.



A MILL AND SMELTERY, SHOWING TOPOGRAPHICAL ADAPTABILITY OF ARIZONA, MORENCI, ARIZONA

In still another respect this feature promotes human occupation. If erosion were in control of the surface of such a region, its fault-block mountains would be rough surfaces of hard rock, trenched with tortuous ravines and deep canyons, destitute of soil, and, in the long droughts, ten times more parched and unwatered than they actually are. As a matter of fact, the depressions are pretty well filled up in long gentle slopes, which support vast areas of good soil, besides rendering the country infinitely more accessible than it otherwise would be. The railroads are not forced to follow crooked canyons cut in hard rock, but are able to dodge around the ends of the detached mountain uplifts and traverse the country in fairly straight courses and easy grades over the desert-made talus.

In many places the upper, and, possibly, the lower portions of the wash are hardened by a lime cement, the exact origin of which is not exactly clear to me. Perhaps it is lime derived from the weathering of the feldspars in the granitic or volcanic detritus and spread over the surface by the flow of water after the heavy but intermittent rains, the lime taken into solution being precipitated by evaporation or by some other cause before it has traveled far, the flow of water not being abundant or persistent enough to carry it into a permanent stream and thus out of the country. However this may be, the process has evidently a considerable effect on the topography of the wash in those extensive areas which are now being eroded instead of being built up. Tracts hardened by caliche are more resistant and tend to stand out in the form of low ridges, domes, or mesas. The caliche supports a rather scanty soil except in places favorable for the accumulation of dust. Wherever this caliche is exposed and strewn over the surface—for instance, in grading for streets and houses—it presents the forlorn and desolate appearance of old mortar.

POPULATION AND ETHNOLOGY

I have already remarked that Arizona is geographically somewhat like Spain and Morocco, more particularly the latter. The configuration of the land is different in some respects, but the effect of the sun, the ocean, and the major air currents seems to be almost exactly the same. This similarity is expressed to the eye in a resemblance of landscape, vegetation and even in human life and arts. The northern strip of Africa is a frontier for dark-skinned races, which fill the tropical regions of the south. The white races of Europe have at intervals for thousands of years attempted to establish themselves on this border, but with no lasting success. The dark-skinned population has always swallowed up the white immigrants, or invaders. At times the races of Africa have been superior in arts and organization to the Europeans and have surged over and occupied the Mediterranean islands and the tips of the Spanish and Italian peninsulas, to be expelled again, leaving only minor after-effects on the population.

The copper fields of Arizona are in just such an ethnographic borderland. To the south is the dark-skinned Mexican race, upon which the Spaniards impressed their language and some of their arts, but not their color or their racial characteristics. To the north, in the colder plateaus, the white-American stock is rapidly swamping all racial competition and the Indian and Mexican population is already reduced to isolated fragments which have progressively less and less influence on their white neighbors. In the mountain and desert regions there is a racial deadlock. The organizing, industrial, and developing impulse comes from the white invaders, but there is no assurance that they will ever overwhelm the natives with their numbers.

The Mexicans resist absorption in a variety of ways. Though most of them speak or understand English, it is not their familiar tongue. Even in the schools, where all the teaching is in English, the Mexican children set themselves apart from the white children and immediately fall into Spanish. This language is invariably spoken in the household, even by those Mexicans who speak English so perfectly that one might imagine they knew no other tongue. This difference of language, added to difference of color, helps to perpetuate difference in habit and point of view; and all these things tend to restrain social intercourse between the two races. Industrially, the inhabitants of the region are not on the same level. The Mexicans do not produce anything like the same number of business leaders, professional men, engineers, or trained mechanics. They are, therefore, less highly organized, and their group efficiency is far lower; for it is group efficiency that promotes productivity.

AMERICAN AND MEXICAN METHODS

The difference between the Mexicans and the whites in this respect is generally expressed in a difference of wages. When such a difference is imposed upon individuals who do the same work as white men there is an apparent injustice which leads to dissatisfaction. I would not like to try to arbitrate the difficulties which arise under such a state of affairs. A thousand Americans in a mine may produce twice as much from it as a thousand Mexicans, yet each American shoveler may not load any more cars than each Mexican shoveler. If the American shoveler is paid twice as much as the Mexican shoveler receives, the latter is not likely to see the justice of it. I can see no line of argument that seems likely to convince him; the question is too abstruse.

I am satisfied, however, that the laws of trade will inevitably impose a difference of wages. A mining organization of a thousand men, all Mexicans from the directors to the mule drivers, would almost certainly involve itself in mistakes of organization and engineering. I should expect that a white organization of the same number would avoid enough of those mistakes to enable it to produce twice as much ore with no greater effort. The result, in a competitive business, is bound to be the defeat and destruction of the Mexican organization. Only one thing can save it, and that is a willingness on the part of its members to accept low enough wages to allow the product to be sold at the price their competitor is willing to accept.

The actuality, so far as the mines are concerned, is a compromise. The Mexicans do not compete with the whites in finance, organization, management, or engineering; probably avoiding thereby the severe consequences of defeat. They do furnish a large part of the common labor; and the laborers, though not paid as much as white men, do undoubtedly reap some benefit from the organizing ability of the whites, because they get much higher wages than when they work under Mexican employers. In some places they are paid the same as white men.

It is easy to see, on the other hand, how the Anglo-Saxon imagination has been impressed by the sight of a Mediterranean civilization in an environment that is natural to it. Both the Spaniards and the Moors inherited much from the Romans, Phœnicians, and the predecessors of those peoples. Their architecture and their agriculture were developed to combat a blazing sun and long droughts. The word "rival" is a reminiscence of ancient quarrels over water rights. The fig, the olive, the orange, the date, and the grape are natural neighbors of the live oak, the yucca, the cactus, and the creosote bush. The massive walls of stone or mud, covered with stucco; the flat roofs, inner courts and gardens protected from wind and dust; the heavy porticos, or *portales*, refuges from the fierce sun—all are so natural under such an environment that they seem inevitable. Several different races have invented them independently. The architecture of the Pueblos and Aztecs bears a strong resemblance both in form and material to that of Morocco, Sicily, Syria, and Persia.

The Americans have brought with them an architecture inherited from the rainy climate of northern Europe and the eastern United States; steep roofs to shed the rain, many windows to make the most of the scanty light, spreading lawns and stately trees outside the house to serve as grateful reminders of aboriginal meadows and forests. They have brought, also, many appliances for heating, lighting, cooking and communication—products of their mechanical skill which are useful everywhere. But in many respects the north European forms do not fit in with the southwestern environment, and they are being rapidly modified under the guidance of experience, and with the growth of wealth, education, and good taste, to conform with standards which long human use has shown to be appropriate. In other words, the Yankees are learning much from the Mexicans.

Mining and Concentration of Carnotite

"Mining and Concentration of Carnotite Ores" is the title of Bulletin 103, recently issued by the Bureau of Mines, Department of the Interior, the authors being Karl L. Kithil and John A. Davis.

In a review of the investigations on radium by the Bureau of Mines, Van. H. Manning, director, stated that in 1912 the Bureau of Mines had its attention called to the value of the carnotite ore of Colorado and Utah as a source of radium and to the need of investigations and remedial suggestions to prevent waste of low-grade carnotite, to assure the miner a better price for his product, and to insure the profitable recovery of the highest possible proportion of the radium in the ore.

The carnotite deposits are situated on public lands and constitute the largest known supplies of radium ore in the world. Fortunately the Bureau was able to interest the late Dr. James Douglas, of New York City, and Dr. Howard A. Kelly, of Baltimore, Md., who wished to procure a supply of radium for use in the treatment of cancer. The suggestion was made that they form a radium institute. Accordingly, the National Radium Institute was incorporated for the purpose of studying the best methods of producing uranium, vanadium, and radium, and of the mining and concentration of ores from which these products may be obtained for use in radium therapy.

Subsequently, at the suggestion of the institute, a coöperative agreement was made under which the Bureau of Mines undertook to provide the services of skilled chemists and mineral technologists for the supervision of the mining and concentrating of the carnotite, and the National Radium Institute agreed to furnish the necessary funds for mining and concentrating a sufficient supply of ore and for recovering from it the radium, uranium, and vanadium. Under this agreement a radium-recovery plant was built in Denver, Colo., which began operations in June, 1914; and, when it stopped work in January, 1917, about 8½ grams of radium had been recovered. The cost, under the methods devised by the Bureau of Mines, was only about one-third the current price for radium. In addition, methods of saving the uranium and vanadium in the ores and of obtaining the metals in a pure state were perfected.

The agreement between the National Radium Institute and the Bureau of Mines expired in 1916. As a result of the work under this agreement, the Bureau of Mines has been able not only to demonstrate that radium can be produced at a cost much less than the selling price, but it also has been able to show how losses in mining and concentrating carnotite can be prevented, and resources conserved. Finally, for an expenditure of less than $38,000, the Bureau has received as its share of the results of the coöperative agreement more than $180,000 worth of radium.

The work of the Denver plant was discussed in Bureau of Mines Bulletin 104, "Extraction and Recovery of Radium, Uranium, and Vanadium from Carnotite." In the present bulletin K. L. Kithil, mineral technologist, and J. A. Davis, assistant mining engineer, describe the methods used in mining and concentrating the carnotite treated at Denver. As the workable carnotite deposits of Colorado and Utah, though lying near the surface, are relatively small, vary greatly in richness, and are extremely irregular in distribution, methods such as are ordinarily used for prospecting and mining shallow deposits must be modified. Also, it is necessary to examine the ore carefully, sort it closely, and frequently test its radium content with the electroscope. Finally, the carnotite deposits are mostly in an arid region, where water is scarce, so that dry rather than wet methods of concentration must be practiced. Hence the authors have given detailed information in regard to many operations that might receive little notice in an account of the mining of most metals, but the presentation of these facts in regard to carnotite is necessary because of their bearing on profitable mining and concentration, the utilization of low-grade ore, and the prevention of waste.

Treatment Charges for Molybdenite

According to the schedule of prices drawn up by the Canadian Department of Mines for the milling of molybdenite ores and concentrates, delivered f.o.b. testing plant, Ottawa, concentrates will be made on the following terms:

1. On assay returns from samples dried at 212°.
2. Moisture will be deducted.
3. The treatment charge to be $5.65 per ton of 2000 lb. of crude ore.
4. Credit will be given for molybdenite only. No allowance made for molybdite or wulfenite.
5. Recoveries of molybdenite per ton of 2000 lb. dry ore delivered railway siding, mines branch testing laboratories, Ottawa:

For molybdenite ores containing—

A. Between 0.5% and 1% inclusive for 70% of the total molybdenite content.

B. Between 1.1% and 1.5% inclusive for 78% of the total molybdenite content.

C. Between 1.51% and 2.0% inclusive for 84% of the total molybdenite content.

D. Between 2.1% and 2.4% inclusive for 87% of the total molybdenite content.

E. Between 2.51% and 3.0% inclusive for 90% of the total molybdenite content.

F. Above 3% for 92% of the total molybdenite content.

The Moore-Edmands Process of precipitating gold from cyanide solutions by means of pulverized charcoal is being adopted at the Riverina South gold mine, Western Australia, and is also being tried out in South Africa.

War Efforts at the Trail Smeltery And Refinery

One of the informative features of the discussion which took place at the Annual Northwest Mining Convention held at Revelstoke, B. C., from July 9 to 12, was S. G. Blaylock's address on "The Part Played in the War by the Trail Smeltery." Having held the position of assistant general manager of the Consolidated Mining and Smelting Co., and owing to his high standing in British Columbia mining circles, his observations were listened to with profound attention.

Mr. Blaylock said that no better illustration of the work done for the British Empire by the company could be given than a rough account of the zinc industry. One of the problems to be solved was how to separate the zinc from the lead in ores; and, although this matter had received close attention, and endless experiments had been made, when the war broke out the company was making only half a ton of zinc a day. The Germans had a strangle hold on high-grade zinc, and, in fact, on all other grades.

To quote Mr. Blaylock:

"The Imperial Munitions Board was in dire need of high-grade zinc, which was selling at from 35 to 45c. per lb., when obtainable at all. The supply appeared to be cornered by the Germans, and it was on this account that the company agreed to build a plant, based on experimental work, to make 20 tons of zinc a day, at a price of 15c. per lb.—less than one-half of the current price. This was rapidly followed by demands for a larger and a still larger production, but at the same price. Before the plant could be designed and orders placed, preliminary quotations on many things were doubled.

"The plant required proved to be more extensive than was originally estimated. The price of sulphuric acid was prohibitive, necessitating the installation of a sulphuric-acid plant. Many other difficulties arose and were overcome, and finally the plant was completed and in operation. Hundreds of difficulties which did not develop in the small experimental unit were encountered when the big plant was started. These were met and surmounted by the incessant work of those in charge. It would be extremely difficult to give the right credit to the proper persons.

"Some of the main points of the process as carried out are the counter-current leaching, the neutral solution by addition of an excess of ore (in other words, a double leach); the thorough purification of solution; the development of suitable pumps and air lifts for handling solids and solutions; the proper content of the electrolytic tanks to prevent the breaking up of the electrolysis and the formation of hydrogen; the keeping down of the volatile, and the development of efficient melting furnaces. Much work has been done on the residues, and we feel that we soon will be in a position to treat these successfully, the trouble to date being to get the zinc in these tails sufficiently low to allow of their profitable treatment for lead and silver.

"The government aided in financing the company to the extent of lending about 30% of the money necessary to build the plant. This money, however, was merely a loan, and has to be repaid in full. A bounty was also promised and has been extended, which would insure a price 2c. per lb. better than the price of Prime Western spelter, unless the price of this grade was 9c. per pound."

It will be seen that the starting of this electrolytic plant at Trail, B. C., together with the one established almost simultaneously at Anaconda, Mont., had a strong bearing, and probably was the determining factor in finally releasing the long-maintained German hold on high-grade zinc.

Mr. Blaylock, continuing, said that, in order to insure the greatest possible output of lead for the Imperial Munitions Board, the company took all the customs ore offered until the board notified it that no more could be handled. To accommodate this customs ore (which had increased from less than 30 tons a day when the metal markets were low at the start of the war, to over 200 tons a day when metal prices were high, immediately prior to the cancellation of the contract by the Munitions Board) it was necessary to curtail shipments from the company's own properties to a minimum, thus losing the advantage of the high price of lead, but contributing greatly to the ultimate winning of the war.

In enumerating some of the calls made on the company during the crisis Mr. Blaylock said:

"The Consolidated was also requested to build a refinery for the production of copper; and, though comparatively small, the erection and operation of this refinery, together with the necessary converter plant, was a large undertaking for a company which had lost so many of its best employees, who had answered the country's call for men to go overseas."

Cost Comparison of Canadian And United States Copper Refining

In connection with a recent report containing an estimate of cost for the construction of an electrolytic copper refinery in Canada, J. E. McAllister stated, before the Canadian Munition Resources Commission, that whereas the cost of refining copper at this hypothetical plant had worked out to $13 a ton, the New Jersey plants were doing the same work for $8 a ton. This discrepancy was due almost entirely to the fact that the cost figures of the Canadian plant were based on a capacity of only 50,000 tons of copper annually, whereas the cost figures for the American plants were the result of operations on a scale of 100,000 to 150,000 tons annually. Mr. McAllister was of the opinion, however, that a Canadian plant of the same capacity as the American plants would not be able to refine for the same cost, $8 a ton, because there were other factors which assisted the American plants and which could not be expected in connection with a Canadian refinery for some time. These included a highly organized and trained staff, cheap and rapid transportation of all raw materials and supplies, and a better labor market. It was true that the American plants were not securing their electric power for as low a figure as the Canadian refinery could expect from the Niagara power companies, but this advantage would be more than offset by the items mentioned above; and McAllister did not consider that a Canadian plant under the most favorable circumstances and with a capacity of 150,000 tons a year could refine copper for much less than $10 a ton.

Filter Adjustments at Packard Mill At Rochester, Nevada

BY F. DEAN BRADLEY[*]

Difficulties that arose in operating a continuous filter at the Nevada Packard mill at Rochester, Nev., were solved in simple ways. A mechanical sampler and a mixer for repulping the tails were added to the filter, the number of washes was increased and a home-made nozzle was made at small expense for spraying the wash solutions.

THIS article is not intended as a criticism of the filter mentioned. Certain difficulties arose in connection with the efficient handling of tailings at the mill of the Nevada Packard Mines Co., at Rochester, Nev., while I was in charge of the plant, and they were largely overcome by the changes here described. Since the filtration of slimes has become one of the important factors in the successful operation of most metallurgical plants, it is believed the experiences related may be of benefit in other cases.

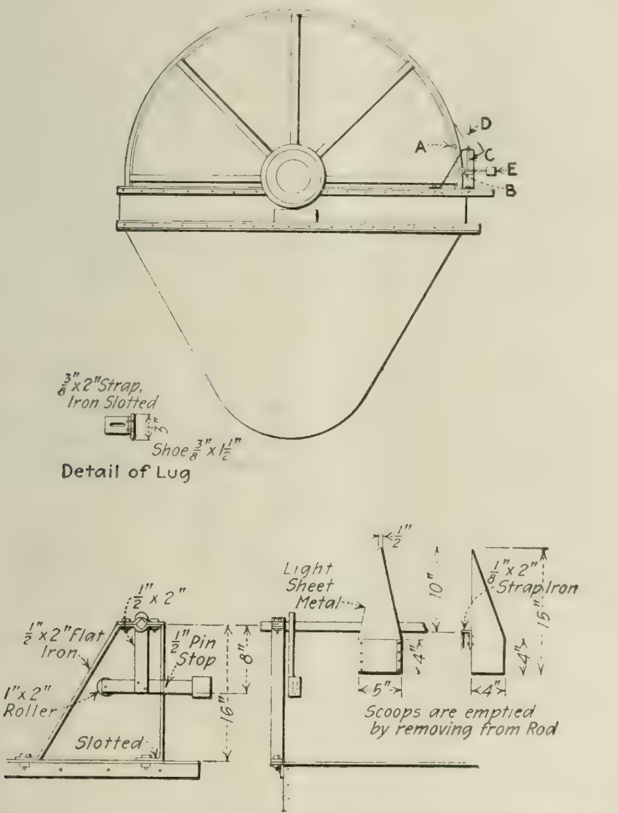


FIG. 1. DETAILS OF MECHANICAL TAILINGS SAMPLER ATTACHED TO OLIVER FILTER

The Packard mill has been thoroughly described in previous issues of the technical press, and it will not be necessary here to give details on other than the filtration end. Briefly, the material treated is an oxidized silver ore, finely ground in ball and tube mills, direct-treated with cyanide, agitated and settled by Dorr machinery and led from the last thickener to an Oliver continuous filter. The tailings from there are discharged to a belt conveyor and thence to the dump.

At the time our tests began, we were experiencing one of the coldest winters in years. Any excess wash on the filter meant a high moisture content in the tails, resulting in a wet, slimy product that would freeze on the conveyor belt, ball up the rollers with ice and completely block the conveying machinery. It was therefore essential that no water be wasted or allowed to run down on the conveyor side. At the same time, the dissolved loss was running high, and yet we could not add excess wash on the reverse side of the filter because of building up the solutions too rapidly.

HAND SAMPLING OF TAILS GAVE ERRATIC RESULTS

During this time the tailings samples were taken by hand, supposedly at regular intervals; and, though all carried more silver than they should have, the assay results were erratic, and showed the extraction to be varying from fairly good to a very low percentage.

Another troubling feature was the blocking of the conveyor when the attendant was engaged at other work. When this happened, there was nothing to be done but to shut off the feed and allow the pulp to bank up in the thickeners. After several occurrences of this kind, the difficulty of properly washing and settling becomes apparent.

One trouble with the filter itself was the leaking of the packing glands around the agitator shaft. The pulp thus lost was valuable for its dissolved content; furthermore, it froze as it struck the floor and made a huge ice pond around the base of the filter, which had to be chopped out whenever access to the drains was necessary. This was at first thought to be the result of eccentricity in the agitator shaft, which had been sprung previously; but after a new shaft was installed and the bearings had been realigned and packed so that the shaft ran perfectly true, the packing continued to be cut out and so cause leakage.

One of the operators suggested that he had seen rubber gaskets used in the oil fields where packing in pumps would not hold. It was decided to try this, and accordingly several gaskets were made to fit the stuffing boxes, the material being obtained from old diaphragms taken from the diaphragm pumps. The trouble was overcome at once. Later a rubber packing manufactured by one of the rubber products companies was secured, and it worked satisfactorily. Incidentally, while mentioning the change in the agitator shaft, it may not be amiss to state that no provision is made for the removal of this part without taking out the filter drum itself—a big undertaking, and an almost impossible task in a confined space. We found it necessary to cut a manhole at one end of the tank to get it in place. It is suggested that this could be easily done by the manufacturers and greatly improve the machine at small cost.

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Though most of the changes were carried on at the same time, the first duty was to ascertain where we stood in the matter of extraction. From experience I knew it was impossible for the two men who operated the entire mill to be on hand at the regular periods set for sampling, and in numerous cases I had seen enough samples taken to make up for the lost intervals. Some method of automatic sampling was necessary, and the simple mechanical device presented in Fig. 1 was the result of a few days' study.

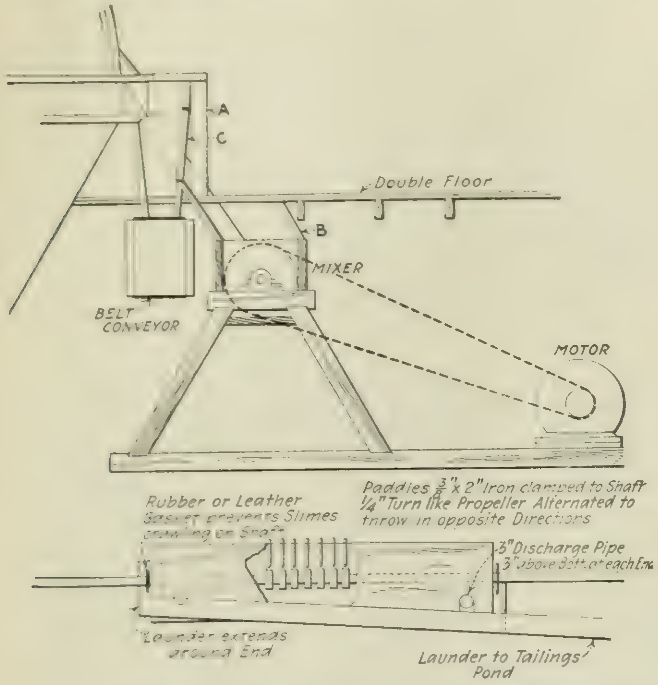
A
C
Double Floor
B
MIXER
BELT CONVEYOR
MOTOR
Rubber or Leather Gasket prevents Slimes crawling on Shaft
Paddies 3/8" x 2" Iron clamped to Shaft 1/4" Turn like Propeller Alternated to throw in opposite Directions
3" Discharge Pipe 3" above Bott. at each End
Launder extends around End
Launder to Tailings Pond

FIG. 2. MIXER USED FOR REPULPING FILTERED CAKE FROM OLIVER FILTER

In this, the trip lug, *A*, attached to the filter drum, engages the roller, *B*, pushes back the suspended lever, *C*, which operates the square shaft supporting the scoop, *D*, thus turning the point of the scoop into the drum and the filtered cake. When the lug passes, releasing the lever, the weight, *E*, returns the mechanism to the original position. The size of the sample can be regulated by lengthening or shortening the face of the lug so as to increase or decrease the contact, or more scoops may be used. The filter running at seven revolutions per hour just filled the sample pockets once a shift, when using a 2-in. lug face and discharging a ½-in. cake.

To overcome the troubles from the conveyor and to use more wash water on the filter, we took up the idea of a mixer to repulp the filtered cake. This would enable us to wet the tailings as much as necessary and to discharge them as a flowing pulp rather than a heavy cake, which gave us considerable trouble from freezing as it was discharged, piling up at the end of the belt even when a steady stream of water was played on the pile. A mechanism shown in Fig. 2, consisting of a long rectangular box, a screw conveyor and a shaft extending through packing glands to a pulley belted to the conveyor drive, was bought and installed at the end of the conveyor at first to overcome this tendency to pile up. This worked well for a couple of days until the packing glands wore out, after which it made matters worse than before. It had been the experience of the several men engaged in this work, that glands and stuffing boxes in machines handling gritty material, whether they be pumps, agitators or mixers, soon cut out under the action of the pulp.

Working with this prejudice, we undertook to devise a mixer that would eliminate the glands and packing and to install it so that it could be used as an auxiliary when the conveyor was not in commission. As may readily be seen from Fig. 2, all material used in its construction was obtainable at the mine or mill except the shaft, which latter could probably be found in the scrap pile of any old property. The box was 2 x 8 ft. in the clear and contained 20 paddles. The shaft was $2\frac{7}{16}$ in. in diameter and was set with three outboard bearings and passed through holes in the ends of the box which gave ample clearance. The advantage of this arrangement over that having packing glands and bearings on the mixing box is obvious. The paddles were run at 220 r.p.m. and the power consumed was between one and two horsepower.

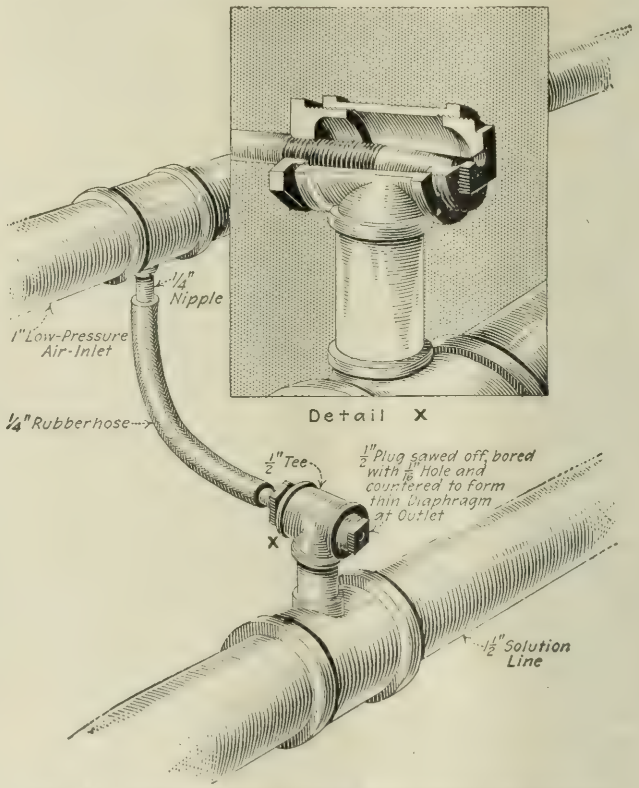
1/4" Nipple
1" Low-Pressure Air-Inlet
1/4" Rubberhose
Detail X
1/2" Tee
1/2" Plug sawed off, bored with 1/16" Hole and countered to form thin Diaphragm at Outlet
X
1½" Solution Line

FIG. 3. HOME-MADE DEVICE FOR SPRAYING WASH SOLUTIONS EMPLOYED IN OLIVER FILTER

With these mechanical difficulties overcome, we next turned our attention to the dissolved loss in the tailings. Notwithstanding extreme care with our thickeners, considerable value in solution went to the filter in a pulp thicker than 1 to 1. We could not add more wash water than we were using, on account of excess solutions. It had been found that the warm water from the jackets of the mine compressor helped largely, and that it was about the amount required to make up the natural loss in solutions. To get around the excess solutions and still give the cake an added wash, we brought the barren solution directly from the filter presses. The effect of this was immediate. When the filter presses were carefully watched, so that there was no value in the barren solution, the dissolved losses dropped to a minimum.

We were still dissatisfied with the manner of distributing the washes. We were using perforated pipes over the filter, the barren solution on the reverse side followed by the hot water on the discharge side. Neither had enough head to spray through a nozzle under its own pressure; consequently the solutions collected in streams and cut channels as they ran down over the filter, leaving the high points more or less dry. Acting on the suggestion of the general superintendent, we then tried an Ingersoll-Rand spray, of the type used in connection with their machine drills, to spread these solutions with compressed air. It worked perfectly, but when we found the cost of these to be excessive for the number we required, we fell back on our own resources once more.

We took some ¼-in pipe, drew several nipples to a point, bored pinholes in the ends, threaded them full length, then inserted them in a ½-in. bushing. The latter was screwed into a ½-in. tee. We plugged the other end of the tee, sawed off the square shoulder of the plug and bored the remaining part, assembled the whole as shown in Fig. 3, and had a nozzle which in labor and material cost less than $1.50. The spray was regulated by screwing the pointed nipple in or out. This opened or closed the water outlet so that the spray could be made a heavy stream or a fine mist.

During all these innovations, the employees as well as the superintendent's office were consulted freely, their suggestions and ideas were considered and credit was given where due. As a result, when I left to accept another position, the men had become so interested that they were still figuring improvements not only on the filter but in other units of the mill.

GREATER DISCUSSION OF MILL DEFECTS DESIRABLE

In conclusion, permit the suggestion that we read much of the perfections of the various new plants and nothing of their defects or shortcomings. Sometimes, the contributors of descriptive articles on this subject are the representatives of the constructing engineers or regular magazine correspondents, who are shown the merits of the mill rather than the points to be improved; consequently, those details for which the operator looks and finds wanting are overlooked.

The Packard mill is one of the most modern and perfect reduction works of its kind that has been built. The record of its work for the first few months is a tribute to its designer, and it is manifestly not to detract from the credit due him that this is written, but nearly every machine, idea or mill is revised and improved before it is perfected. It is these revisions and improvements that count in the long run, and not enough is heard of them. I hope that the few details set down here will induce more worthy contributions along the same line.

Mineral Wool is now being manufactured at Yarraville, near Melbourne, Australia. It is fabricated from basalt rock or bluestone, and a pure white product of metallic lustre is obtained with a staple of from 1½ to 2 in. The mineral wool is soft and pliable and can be used for many purposes for which the cheaper varieties of asbestos were considered almost indispensable, such as insulation for ice chests, engine cylinders, steam pipes, and like purposes.

Control of Mining by the State

The final reports of the South African State Mining Commission, together with the minutes of the evidence taken, have been published in a "blue book." The reports deal with information obtained from Britain, Australia, Belgium, Canada, Egypt and Germany, and the conclusions, according to the *Iron and Coal Trade Review*, are: (a) That the industrial operations of the state are adversely affected by considerations of a political nature. (b) That the state cannot and does not organize on such efficient lines as private enterprise. (c) That a system of Parliament and Ministerial control is not adapted to a highly specialized industry or business. (d) That in actual practice the state finds it impossible and impracticable to mine as cheaply and as efficiently as private enterprise. (e) That state coal mining has not resulted in a reduction of prices to the consumer. Unless the state works at least as economically as the private producer, it is conceivable that state coal mining might send up the price of coal, to the detriment of industry and the general community. (f) That the state is not so good an employer as the well-directed private concern. (g) That the workmen are in a more favorable position to bargain and obtain better conditions of wages and work from the private employer than from a government. (h) That the private employer pays higher wages than the state, and, generally speaking, raises the standard of efficiency, and therefore the earning capacity of employees: but government employment tends to produce the "government stroke" and a uniformity of output and capacity which militates against the highest standard of national development and efficiency.

Jackhamers *vs.* Reciprocating Machines

In the annual report of the Robinson Deep mine, Transvaal, South Africa, the manager, J. J. Wessels, stated that during the year an improved method of stoping was evolved by the adoption of the jackhamer machine. Its use has resulted in a saving of native labor, and it is more economical in explosives than the reciprocating machine. The results for the six months ended Dec. 31, 1917, when an average of 28.5 jackhamers were in continuous use for stoping, show that the average fathomage per jackhamer was 12.4% higher than that of the reciprocating machine, the latter using approximately 100% more labor per machine shift and 86% more explosives per fathom broken. The reciprocating machine used 102% and the jackhamer only 9% more explosives per fathom than was employed in breaking rock by hand labor. During the period each jackhamer, employing an average of 1.25 natives, did the equivalent fathomage of seven hammer boys, so that the replacement by jackhamers of the 37,000 to 62,000 hammer boys employed at the Witwatersrand mines at various periods would save for other work a large percentage of the present native labor force. Dust tests showed that stopes operated by the jackhamer (which cannot be worked without water) and stopes operated by hand labor were about equal, though the stopes where the reciprocating machines were used were about 100% higher in mineral dust.

Senate Passes Bill To Authorize Mining On Indian Reservations

The bill authorizing mining for metalliferous minerals on Indian reservations recently passed the Senate and has been favorably reported on by the House committee. The provisions in the measure are as follows:

SEC. 1. That the Secretary of the Interior be, and hereby is, authorized and empowered, under general regulations to be fixed by him and under such terms and conditions as he may prescribe, not inconsistent with the terms of this act, to lease to citizens of the United States or to any association of such persons or to any corporation organized under the laws of the United States or of any state or territory thereof, any part of the unallotted lands within any Indian reservation heretofore withdrawn from entry under the mining laws for the purpose of mining for deposits of gold, silver, copper, and other valuable metalliferous minerals, which leases shall be irrevocable, except as herein provided, but which may be declared null and void upon breach of any of their terms.

SEC. 2. That after the passage and approval of this act unallotted lands within Indian reservations heretofore withheld from disposition under the mining laws may be declared by the Secretary of the Interior to be subject to exploration for and discovery of deposits of gold, silver, copper, and other valuable metalliferous minerals by citizens of the United States, and after such declaration mining claims may be located by such citizens in the same manner as mining claims are located under the mining laws of the United States: Provided, That the locators of all such mining claims, or their heirs, successors, or assigns, shall have a preference right to apply to the Secretary of the Interior for a lease, under the terms and conditions of this act, within one year after the date of the location of any mining claim, and any such locator who shall fail to apply for a lease within one year from the date of location shall forfeit all rights to such mining claim: Provided further, That duplicate copies of the location notice shall be filed within sixty days with the superintendent in charge of the reservation on which the mining claim is located, and that application for a lease under this act may be filed with such superintendent for transmission through official channels to the Secretary of the Interior.

SEC. 3. That leases under this act shall be for a period of 50 years, with the preferential right in the lessee to renew the same for successive periods of 10 years upon such reasonable terms and conditions as may be prescribed by the Secretary of the Interior, unless otherwise provided by law at the time of the expiration of such periods: Provided, That the lessee may, in the discretion of the Secretary of the Interior, be permitted at any time to make written relinquishment of all rights under such a lease and upon acceptance thereof be thereby relieved of all future obligations under said lease.

SEC. 4. That in addition to areas of mineral land to be included in leases under this act, the Secretary of the Interior, in his discretion, may grant to the lessee the right to use, during the life of the lease, a tract of unoccupied land, not exceeding 80 acres in area, for camp sites, milling, smelting, and refining works, and for other purposes connected with and necessary to the proper development and use of the deposits covered by the lease.

SEC. 5. That the Secretary of the Interior, in his discretion, in making any lease under this act, may reserve to the United States the right to lease, or otherwise dispose of the surface of the lands embraced within such lease under existing law or laws hereafter enacted, in so far as said surface is not necessary for use of the lessee in extracting and removing the deposits therein: Provided, That the said Secretary, during the life of the lease, is hereby authorized to issue such permits for easements herein provided to be reserved.

SEC. 6. That any successor in interest or assignee of any lease granted under this act, whether by voluntary transfer, judicial sale, foreclosure sale, or otherwise, shall be subject to all the conditions of the approval under which such rights are held and also subject to all the provisions and conditions of this act to the same extent as though such successor or assign were the original lessee hereunder.

SEC. 7. That any lease granted under this act may be forfeited and canceled by appropriate proceedings in the United States district court for the district in which said property or some part thereof is situated whenever the lessee, after reasonable notice in writing, as prescribed in the lease, shall fail to comply with the terms of this act or with such conditions not inconsistent herewith as may be specifically recited in the lease.

SEC. 8. That for the privilege of mining or extracting the mineral deposits in the ground covered by the lease the lessee shall pay to the United States, for the benefit of the Indians, a royalty which shall be five per centum of the gross value of the output of the minerals at the mine, due and payable at the end of each month succeeding that of the extraction of the minerals from the mine, and an annual rental, payable at the date of such lease and annually thereafter on the area covered by such lease, at the rate of 25c. per acre for the first calendar year thereafter; 50c. per acre for the second, third, fourth and fifth years, respectively; and $1 per acre for each and every year thereafter during the continuance of the lease, except that such rental for any year shall be credited against the royalties as they accrue for that year.

SEC. 9. That in addition to the payment of the royalties and rentals as herein provided the lessee shall expend annually not less than $100 in development work for each mining claim located or leased in the same manner as an annual expenditure for labor or improvements is required to be made under the mining laws of the United States.

SEC. 10. That the Secretary of the Interior is hereby authorized to examine the books and accounts of lessees, and to require them to submit statements, representations, or reports, including information as to cost of mining, all of which statements, representations, or reports so required shall be upon oath, unless otherwise specified, and in such form and upon such blanks as the Secretary of the Interior may require; and any person making any false statement, representation, or report under oath shall be subject to punishment as for perjury.

SEC. 11. That all moneys received from royalties and rentals under the provisions of this act shall be deposited in the Treasury of the United States to the credit of the Indians belonging and having tribal rights on the reservation where the leased land is located, which moneys shall be at all times subject to appropriation by Congress for their education, support, and civilization.

SEC. 12. That the Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations not inconsistent with this act as may be necessary and proper for the protection of the interests of the Indians and for the purpose of carrying the provisions of this act into full force and effect: Provided, That nothing in this act shall be construed or held to affect the right of the state or other local authority to exercise any rights which they may have to levy and collect taxes upon improvements, output of mines, or other rights, property, or assets of any lessee.

SEC. 13. That the provisions of this act shall not apply to the Five Civilized Tribes and Osage Nation of Indians in Oklahoma.

Honduras Intends to Reduce the Fineness of Its Peso, or dollar, to 500 parts per 1000, and explains that the change is necessary on account of the withdrawal of so many of the coins from circulation. This has resulted from the fact that the bullion value of the normal coin is well in excess of its face value, and has led to extensive though illegal exportation and sale by private individuals. The government now plans to mint half a million new pesos out of a quarter of a million existing coins. The new pesos will be of the same size as their predecessors, but base metal, probably copper, will constitute the moiety of their contents.

Blast-Furnace Smelting of Stibnite

Details of experimentation in the blast-furnace smelting of stibnite, showing the effects of varying flux charge, and discussing, also, the minimum economic limit of coke required. The theory of antimonial ore smelting and the various other processes of recovery, and their individual application and result, are considered.

AT A MEETING of the Institution of Mining and Metallurgy held on Mar. 7, 1918, an interesting paper, by W. R. Schoeller, was presented. Dr. Schoeller's problem was the proper treatment, in a circular blast furnace 36 in. in diameter at the tuyeres and with a column of charge not exceeding 10 ft. above the tuyere level, of sulphide ore containing 49 to 57% antimony, of which 2% at most was present as oxide, and 19 to 26% of insoluble, chiefly quartz. As fluxes he had pure chalk (better than 50% excess CaO), tap cinder, burnt pyrites, basic slag from a lead blast furnace, and niter cake. Hering[1] had smelted liquation residues with tap cinder, limestone, and 14% of coke in a 40-in. furnace with about a 20-ft. column, obtaining a grayish metal running about 40% antimony, 50% iron, and 10% sulphur, with a smelting loss of about 10%. Dr. Schoeller tried a similar charge with 15% coke, adding metallic iron for better reduction, and obtained a slag running about 1% antimony, 33% silica, 40% ferrous oxide and 16% lime; a metal running 75% antimony and 20% iron; together with varying quantities of an antimony-iron-sulphur matte. His losses were about 7% in slag and matte and 33% by volatilization.

Cause of Deficiency of Iron in Slags

At various times during the first operations the supply of metallic iron ran out, and it was noticed, contrary to expectations, that this did not raise the antimony content of the slag; so the iron was omitted altogether. This resulted in the formation of a sticky slag, which, upon analysis, was found extremely deficient in iron, showing that the coke had reduced the ferrous oxide from the iron flux to metallic iron, which then combined with the antimony to yield ferruginous metal of the same composition as before, leaving the slag too siliceous. The coke was therefore cut down by successive stages to 7½% in an attempt to avoid this over-reduction, and this proved highly successful, the slag being satisfactory and the metal being almost entirely free from iron. Further, no matte whatever was produced. The furnace top also became much cooler, reducing the volatilization losses. An attempt still further to diminish these losses by reducing the coke to 7% resulted in freezing up the furnace, so it was clearly established that 8% was the lowest practicable amount of coke possible, that no additional reducing agent was required, and that the only fluxes necessary were those required to slag off the gangue material of the stibnite ore.

Regarding furnace manipulation, the greatest trouble experienced was that the contents of the crucible gradually froze from the bottom upward, so that, although at blowing in the furnace had a deep crucible with two tap holes, it was never long before the whole crucible was filled with solidified material, the metal then running out with the slag. It was therefore necessary to adopt continuous discharging and outside settling in a separator. A further improvement which was recommended would be a shallow reverberatory fore-hearth with a coal fire, which would give a perfect separation of slag and metal. It was also found necessary for smooth running to keep the antimony contents of the charge under 20%. Low blast pressure and a smelting column of at least 15 ft. were further recommended.

Theory of Blast-Furnace Smelting

As to the theory of the blast-furnace process, Dr. Schoeller's earlier researches[2], together with the operation described, have convinced him that the ore blast, and not the coke, is responsible for the production of the antimony; that the molten stibnite absorbs oxygen from the blast, giving a trioxide which is soluble in the sulphide; and that the oxide at once reacts with a further quantity of sulphide with formation of metal and sulphur dioxide, thus:

$$(1)\ 2Sb_2S_3 + 9O_2 = 2Sb_2O_3 + 6SO_2.$$
$$(2)\ 2Sb_2O_3 + Sb_2S_3 = 6Sb + 3SO_2.$$

The rest of the paper is devoted to consideration of the various processes for extracting antimony, and the advantages and defects of each process and its applicability to the class of ore for which it is best suited. No matter what the process used, a perfect flue system and efficient condensing plant are requisites of prime importance for any antimony smeltery. There are four processes in common use:

1. Roasting to the trioxide, with subsequent reduction by carbonaceous fuel.
2. Blast-furnace smelting.
3. Liquation.
4. Precipitation by iron.

Applicability of Methods

The first method is suitable for lean ores and liquation residues, but its application to the former is necessarily local, as the works have to be operated close to the mines to avoid payment of heavy freight on low-grade material. It is generally referred to as the "French process." Blast-furnace smelting is best adapted to ores containing 25 to 40% of metal, and its one disadvantage—high volatilization—can be decreased by using a tall shaft. For ores from 45 to 60%, liquation is the best process. It produces a large proportion of crude antimony metal direct. The richest ores (over 60%) are best treated by the precipitation process, which also produces pure antimony from the crude product made by liquation. The reverberatory furnace is used, the addition of the iron being effected in one of several ways. This metal exerts under proper conditions its preferential affinity for sulphur over antimony, and yields high-grade antimony metal. The refining and "starring" of antimony are done on a large scale in reverberatories; in small works those processes are accomplished in graphite crucibles.

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[1] Dingler's Polytechn. Journ., 1878, 230, 253.

[2] "On the Reduction of the Oxides of Antimony and Bismuth by their Sulphides." Journ. Soc. Chem. Ind., 1915, XXXIV, 6. "Notes on Chinese Antimony Ores, Crude and Regulus." Journ. Soc. Chem. Ind., 1913, XXXII, 260. "Oxygen and Metallic Antimony in Crude Antimony." Journ. Soc. Chem. Ind., 1914, XXXIII, 169.

Views on Foregoing Data

In the discussion which followed S. J. Speak stated that he thought Dr. Schoeller's paper of particular interest because of his own experience in the smelting of highly zinkiferous oxidized lead ores under conditions necessitating the production of similarly basic iron slags. He noted many parallelisms between the two processes, but said that he had found 10% to be the minimum coke possible, due, no doubt, to the carbon required to reduce his iron-ore flux to the ferrous state and also to reduce his lead carbonate. He believed that the real cause of Dr. Schoeller's greatest furnace troubles was the formation during blowing in of a crust of unburnt charcoal and semi-fused slag just above the crucible. He advocated the breaking up of this crust by barring, or neutralizing its effect by providing for a continuous flow of both slag and metal at different levels in the furnace.

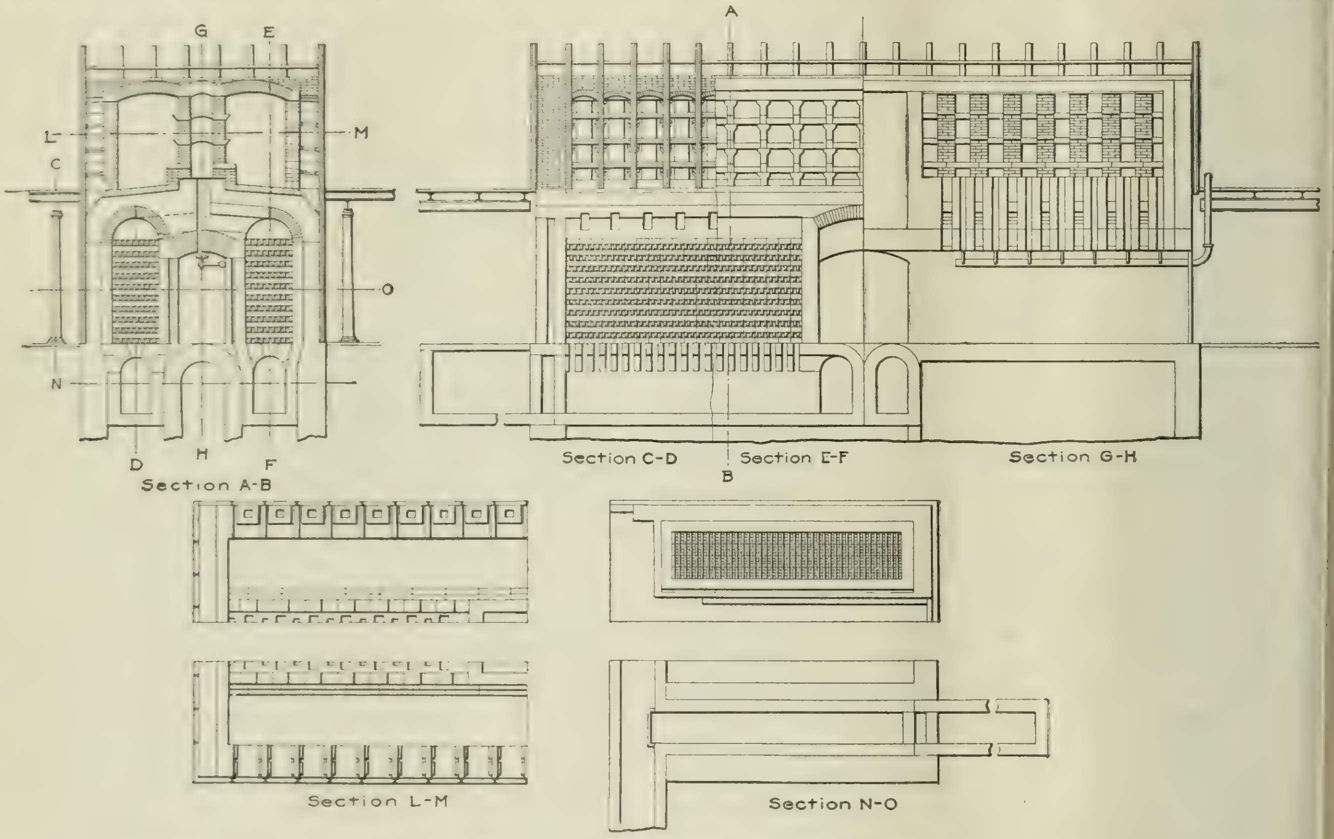
The Zinc-Smelting Works Of Vado Ligure

By Erminio Ferraris*

The Societa di Monteponi has built in Vado Ligure, near Savona, Italy, a zinc-smelting works, which was started last September. This plant is planned for 12 distilling furnaces, each of 216 retorts, but only three have been built as yet, since we are waiting for the results of the first furnaces, which are each of different design, though of the same capacity.

The plant is adjacent to a large coke factory, which supplies its superfluous gas to the smelting works after being spoiled of all byproducts. This gas is of nearly 4500 calories. It is first stored in a large gas holder, which delivers it to the furnaces at a pressure of 12 cm. of water. Near the furnaces is the pottery for making the retorts. The retorts are made of refractory clay of the Marne (France) mixed with graphite from Pinerolo.

The accompanying drawing of one of the furnaces shows that it is fitted with recuperators after the Siemens system. They deliver the air at nearly 700° C. to a middle combustion chamber, where the gas is introduced from below by means of pipes. Every 30 minutes air and gas are revérsed as usual. The retorts are of 1.56 m. length, of oval section, 0.20 m. x 0.30 m.; they are disposed in three rows at each side of the furnace.



ZINC-DISTILLATION FURNACE AT VADO LIGURE

The furnace charge is crushed to 3 mm. size and is thoroughly mixed with coke breeze. The average ore charge of a retort is 35 kg. The distillation is performed in 24 hours. The gas consumption is 8000 cu.m a day in smelting soft ores, and less than 10,000 cu.m. in treating refractory ores. Nearly 1¼ cu.m. gas are required for the distillation of one ton of ore. The retorts residues are rich in lead. After being concentrated they go to the lead smelting works of Monteponi company in Sardinia.

[I believe this is the first zinc smeltery ever operated with the use of waste gas from coke manufacture for the heating of the furnaces. The idea has been not infrequently suggested in cases where byproduct coke oven are to be installed and there is no market for the wast gas. The coking plant is necessarily the chief installation and the zinc smeltery is an appendage.—W. R. I.

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*Inspector General, Societa di Monteponi, Turin, Italy

Pyrite Deposits of Georgia

A timely report on the pyrite deposits of Georgia has just been issued by the State Geological Survey. It has 229 pages of text, a number of halftone illustrations, and a map showing the location of the principal pyrite deposits of the state, and contains a brief discussion of the geology of the pyrite-bearing area, uses of pyrite, mining methods, and related subjects, but is devoted chiefly to detailed descriptions of individual deposits from an economic point of view.

The report makes public the results of work done by the State Survey in compliance with the requests of the War Minerals Board and the United States Bureau of Mines for information regarding the possibilities of increased pyrite production. Pyrite is one of the two most necessary and important war minerals, is the principal source of sulphuric acid, and an essential in the production of food and munitions, being one of the basic materials in the manufacture of fertilizers and explosives.

The necessity for increasing the domestic production of pyrite may be realized by the fact that the United States has been importing over 1,000,000 tons a year from Spain. In order to release ships for troop movements, the War Trade Board has limited the 1918 imports to 125,000 tons, and all shipments are to be stopped after Oct. 1. The mines in the United States must therefore produce not only enough to make up this deficiency, but to provide for the increased demand for sulphuric acid, which has arisen from about 7,000,000 tons to approximately 9,000,000 tons a year, on account of the large quantity used in explosives.

Georgia has about 30 sulphuric acid plants, a greater number than any other state in the union. Most of these plants belong to fertilizer manufacturers, and the product has been used almost entirely in fertilizer. To operate all Georgia plants at full capacity would require 200,000 tons of pyrite a year, but the state has been producing only about one-tenth that amount. With its large and important pyrite deposits, there is no reason why Georgia should not be in a position to supply its own demand within a year.

The report, entitled "A Preliminary Report on a Part of the Pyrite Deposits of Georgia" (Bulletin 33), was prepared by H. K. Shearer and J. P. D. Hull, assistant state geologists. Copies can be obtained from Prof. S. W. McCallie, state geologist, by payment of 10c. postage.

Fellowships in Mining and Metallurgy

Applications for fellowships in the College of Mines, University of Washington, and the Pacific Northwest experiment station of the U. S. Bureau of Mines, will be received during the summer, it has been announced, the time for filing having been extended in order to meet the changes in personal plans incident to war service. Each fellowship has a value of $60 per month. Holders become candidates for the degree of Master of Science in Mining Engineering and Metallurgy. Graduates in science as well as technology may apply. Further information may be obtained by writing Milnor Roberts, Dean, College of Mines, Seattle, Washington.

Cornish Mining Development

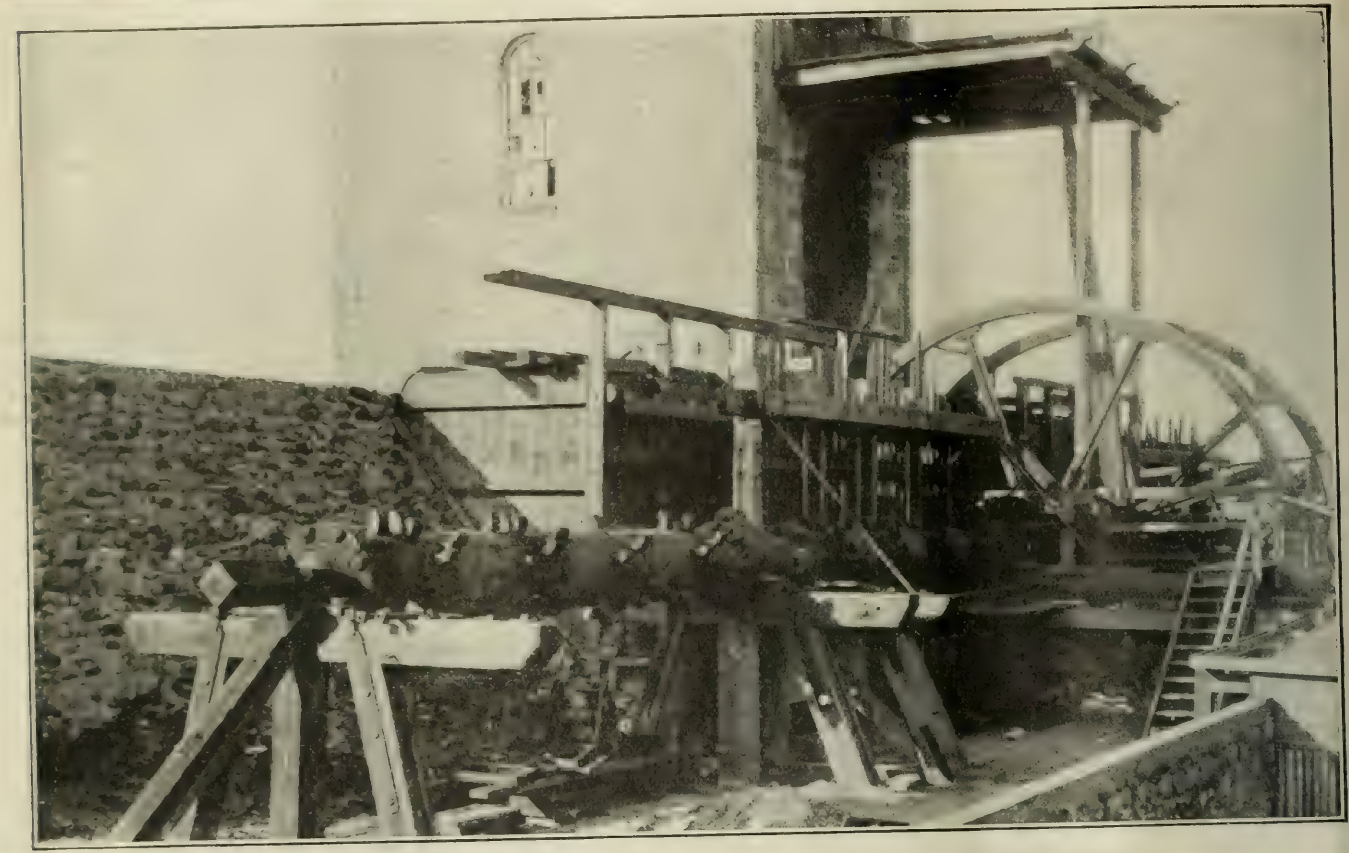
On several occasions in the last 20 years there has been talk of the revival of the Cornish mining industry. In 1907, and again in 1912, capital was raised for the purpose and booms on the stock market were engineered; but the practical result amounted to little, says the *Statist*. And yet the facts of the case justify the belief that a really great revival could be brought about if the inherent difficulties were removed. For years non-Cornish men were looked upon in the county's mining circles as "foreigners," and, as such, ignorant and not reliable; but gradually it has become recognized that without financial as well as technical help from outside nothing can stop the rot which for more than 50 years has resulted in Cornwall's best miners emigrating and becoming the mainstay of mining industries in practically every part of the world. The labor situation, then, is undoubtedly one great drawback in Cornish mining; but the greatest handicap of all to modern development is to be found in the extraordinarily irksome legal arrangements which have to be entered into with property owners before mineral-bearing areas of sufficient size can be obtained to warrant the provision of large sums for working capital.

High royalties on the gross value of the production, onerous covenants as to sinking shafts and performing other necessary work, and compensation for damage of land—such are the principal sources of complaint. Those best able to judge have come to the conclusion that the only hope of a real and sustained revival of interest in mining in Cornwall, and the consequent energetic and systematic development of its mineral resources, lies in the complete alteration of the customary conditions of leasing mining rights, or, alternatively, the reversal of the attitude of landlords, so that mining companies have the opportunity of purchasing leases outright.

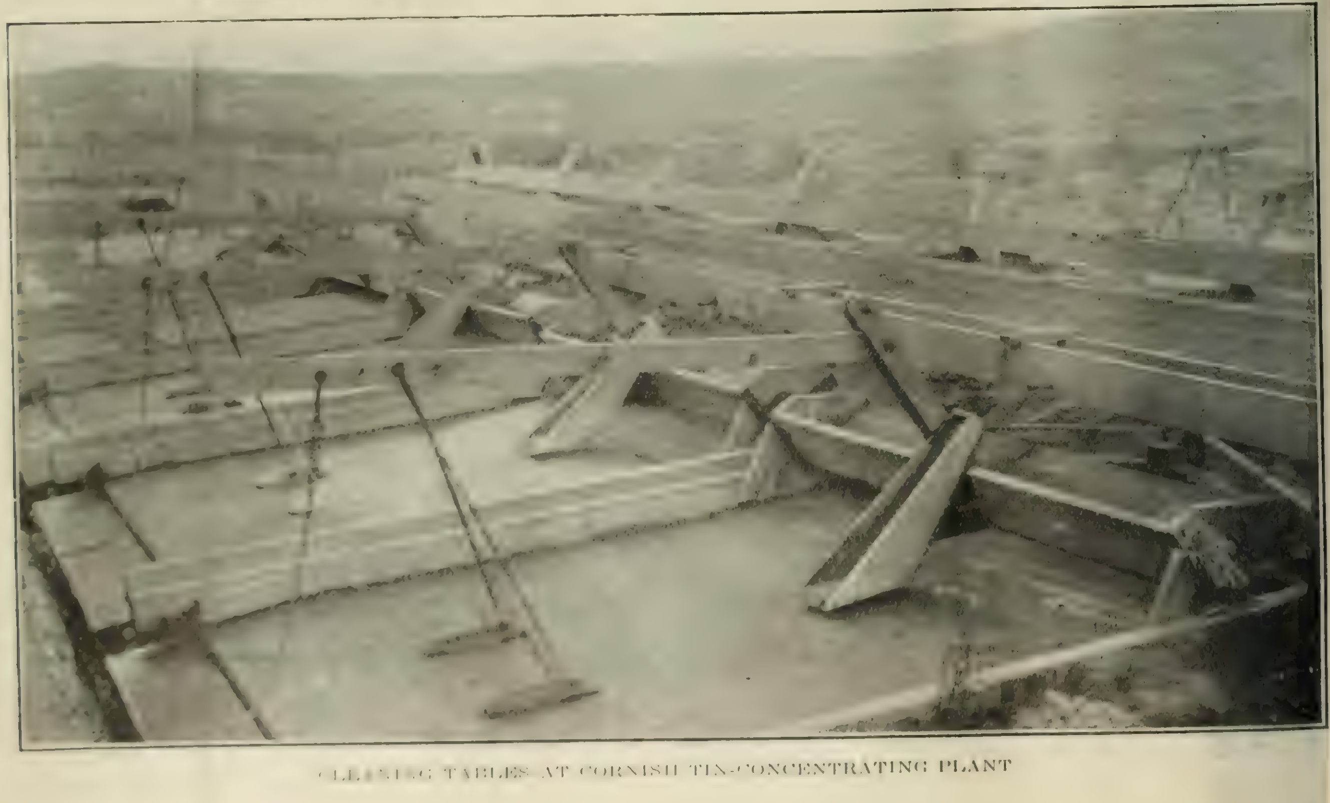
In recent years some of the world's most famous mines have been evolved from discoveries made below ancient workings, and the great advance that has been made in scientific engineering and mining practice in the last 50 years justifies the assumption that, if sufficient capital and skilled enterprise can be attracted, Cornwall may again become a great tin, wolfram, and, possibly, also, copper producer. At present only about 20 mines are being worked, the majority of them small; and it should be borne in mind that, above all, present-day practice in mining, as in other industries, requires the doing of things on a big and comprehensive scale, so as to attain the highest degree of economical operation. This necessitates the ownership of large areas, the provision of solid underground equipment, the development of ore far ahead of mill requirements, and the erection at surface of expensive permanent machinery of the latest design and labor-saving capabilities. In Cornwall, progress on modern lines, far from being widespread, as it ought to be, is confined to two or three mines, and there is no doubt that the basic reason for this is to be found in the exorbitant demands and the general hampering attitude toward industrial development on the part of the landlords, including the Duchy of Cornwall.

Remember the Comfort Fund of the 27th Engineers.

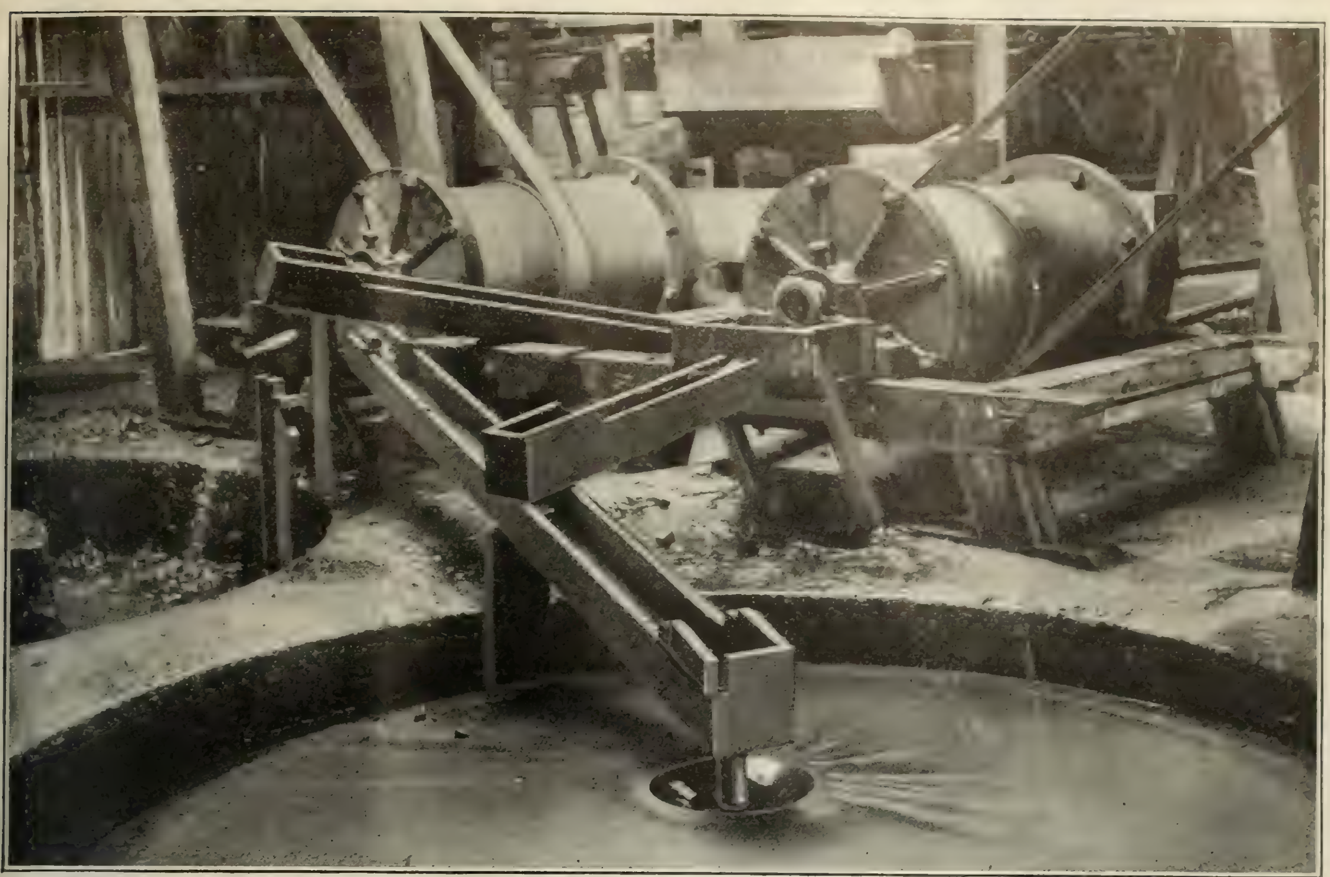
Tin-Concentrating Plants in Cornwall



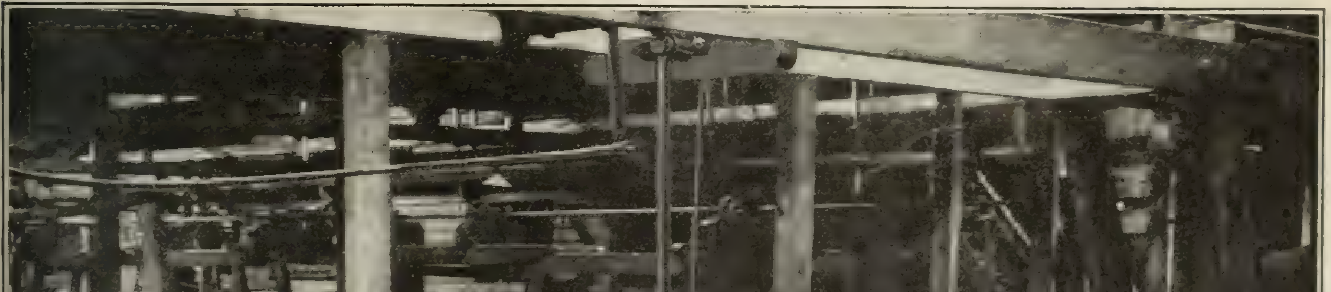
SINGLE-CYLINDER STEAM-DRIVEN BEAM ENGINE AT OLD CORNISH STAMP MILL



CLEANING TABLES AT CORNISH TIN-CONCENTRATING PLANT



REGRINDING TIN CONCENTRATES IN SMALL TUBE MILLS



CONCAVE STATIONARY BUDDLE FOR TREATING TIN CONCENTRATES AT CORNISH CONCENTRATOR

Experimental Extraction of Radium From American Pitchblende Ores By Chlorination*

By Mrs Ray Cable and Herman Schlundt

Apparently no satisfactory method of separating uranium minerals from pyrites by mechanical processes has been developed. Concentration results in several products ranging in content of uranium oxide, U_3O_8, from 1% to 25%. The final blending gives three grades: High grade, containing upward of 16% U_3O_8; medium grade, averaging about 4%; and low grade, containing less than 2% U_3O_8. The main body of all grades, however, is iron pyrites. The experimental results here presented summarize those obtained by a new method of extracting radium by direct chlorination of the ore.

The Reaction

When the ore is heated in an atmosphere of chlorine, the principal products are S_2Cl_2, and chlorides of the metals present. The reaction of chlorine with iron pyrites takes place mainly according to the equation,

$$2FeS_2 + 5Cl_2 = 2FeCl_3 + 2S_2Cl_2$$

and is an example of one of the general methods of preparing sulphur monochloride. By conducting the reaction in a stream of chlorine gas, the chlorides of iron and uranium appear as a crystalline deposit in the cooler parts of the apparatus; and the more volatile product, sulphur monochloride, can be separated as a gas, which is easily condensed and collected in a receiver. Chlorination probably converts the radium into chloride, which, contrary to expectations, is also carried forward in the current of chlorides, only a relatively small fraction remaining with the unattacked constituents of the ore.

Upon the addition of water to the residue and anhydrous chlorides of the metal, a vigorous interaction occurs. The radium compounds for the most part remain in solution. After filtering off the small insoluble residue, the radium can be precipitated nearly quantitatively as radium-barium sulphates by adding to the filtrate a little barium chloride solution and its equivalent of sulphuric acid. The minute quantities of radium in the solutions here under consideration lie below the solubility product of radium sulphate. When radium sulphate is precipitated together with a large excess of barium sulphate, the solubility of radium sulphate under these conditions is far below its actual solubility when alone.

The Experiments

The ore, in charges of 30 to 35 gm., was spread out over about one-third the length of a 1½-m. piece of hard-glass combustion tubing of 2 cm. diameter, fitted at both ends with one-hole rubber stoppers. The ore charge was heated in a long combustion furnace. At one end the tube was connected with a tank of liquid chlorine, and at the other with a condenser and receiver. A wash bottle containing sulphuric acid was placed in the train next to the chlorine tank, and this was followed by a T-tube dipping into mercury, which served as a vent for the escape of chlorine in case the products of the reaction clogged up the outlet end of the tube. A plug of glass wool was inserted near the outlet end of the tube to stop small amounts of metallic chlorides that are likely to be swept along by the vapors of sulphur monochloride when chlorination is rapid.

The chlorination was conducted by heating moderately at first with a slow stream of chlorine passing until rapid reaction starts, which occurs before low redness is reached. The supply of chlorine was then materially increased, and the temperature gradually raised to low redness. The metallic chlorides formed are deposited along the tube beyond the heated portion, and sulphur monochloride passes on to the condenser if the cooler part of the tube is kept at a temperature above 137°, the boiling point of the monochloride. Chlorination was carried out with samples ground to pass 20 mesh. Several of the chlorinations lasted three to five hours, but in most of the experiments the flow of chlorine was so regulated that a charge of 35 gm. was completely chlorinated within an hour.

When the tube had cooled, it was taken from the furnace and the contents were washed out with water or very dilute hydrochloric acid. After boiling the insoluble residue, the tailing was filtered off, washed, ignited and weighed. The filtrates were again heated to boiling, and radium was precipitated by adding a few cc. of a 10% solution of barium chloride and an excess of sulphuric acid. Three or four days after precipitation, the sulphates were filtered off, ignited, weighed, and finally assayed for radium. The liquors were diluted to 500 cc. and samples of 200 cc. were boiled and sealed up for quantitative determinations of radium remaining in solution.

Summary of Results

The extraction of radium in the sulphates, and the loss of radium in the tailings and liquors were determined by the emanation method. The experimental results are summarized in the accompanying table.

SUMMARY OF RESULTS IN RADIUM EXTRACTION FROM PITCHBLENDE

	Grade of Ore		
	Low	Medium	High
Radium content of ore, parts per billion	3.43	8.312	49.27
Uranium content of ore, expressed as U_3O_8, %	1.20	2.92	17.45
Weight of ore used, gm	32.0	35.0	35.0
Weight of tailings, gm	3.30 = 10.32%	0.795 = 2.27%	3.53 = 10.09%
Total radium in ore sample, gm	109.8x10—9	290.9x10—9	1,724.5x10—9
Weight of sulphates recovered, gm	0.0938	0.237	0.635
Radium recovered in sulphates, gm	102.5x10—9	267.1x10—9	1,615x10—9
Radium recovered in sulphates, %	93.34	91.78	93.68
Concentration of radium in sulphates—parts per billion	1,084	1,127	2,543
Concentration ratio	316:1	135:1	51.6:1
Radium losses:			
(a) In tailings—emanation method, gm	1.954x10—9 = 1.74%	4.36x10—9 = 1.53%	56.6x10—9 = 3.29%
(b) In liquors—emanation method, gm	4.23x10—10 = 0.34%	1.49x10—9 = 0.51%	4.43x10—9 = 0.26%
Radium unaccounted for, %	4.58	6.18	2.77

Speed and Efficiency in Mine Tunneling appear to have reached a striking degree of perfection in the Northwest. The performance of the Canada Copper Corporation, at Copper Mountain, B. C., detailed in its report, in driving its main haulage tunnel, does not break previous records, but is sufficiently good to merit notice. This adit is 2903 ft. long and 10 x 11 ft. in finished section. It was begun on Oct. 10, 1917, and was finished on Mar. 12, 1918. The average advance per day of elapsed time was thus 18.8 ft. During the month of December, 645 ft. was driven.

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*[illegible] from Chem. and Met. Eng., Mar. 1, 1918.

Benefits To Be Derived From Close Coöperation of Zinc Mining and Smelting Interests In Helping Win the War*

By W. R. INGALLS

THE American zinc industry has been historically characterized by an alternation of ups and downs which often have been sudden and sharp. For more than a year its fortunes have been going down. Recently, with spelter selling at about 6¾c., there was a nadir of depression. There is something grotesque in thinking and talking of spelter as being phenomenally low at 6¾c. per lb., when only four years ago we often saw it at 5c. without complaining; and even did not become very much worried until the price fell below 4½c. But since then economic conditions have changed fundamentally. There have been introduced new factors affecting all commodities, which factors find expression in increased costs and increased prices. At the beginning of this year the general ratio of increase in prices was about 1.8, as compared with those prevailing just before the war. Upon such an assumption, and it cannot be far out of the way, the recent price of 6¾c. for spelter was equivalent to about 3¾c. before the war. I do not need to tell you how that would have hurt. In order to have the equivalent of 5c. spelter before the war, we should need to have something like 9c. now, and for the equivalent of 5¼c. that we used to regard as a normal average, we should need to have about 9½c. now, if the physical conditions of our ore resources had remained the same. However, the physical conditions have not remained just the same, for there has been the exploitation of new, rich orebodies in Oklahoma, besides important developments elsewhere. We can see how these new factors have come into play, and have permitted so low, relatively, a price to be recorded as we lately witnessed while a large production was still maintained, but that perception does not alleviate the pinch and the pain that are felt generally in the industry or alter the recognition that the situation has been dangerous, and still is dangerous.

In fact, we have witnessed during the last 12 months a general closing down of smelting works. Many of the smelters who grew like mushrooms in 1916 have gone out of business forever. Such as now remain are those who intend to stick to the business. They have capital investments that are too large to be lightly thrown away. But even those smelters, possessing a total of about 196,000 retorts on July 1, 1918, had in use only 110,000. In other words, only about 60% of the live distilling capacity of the country—I am not including the electrolytic capacity—was in use at the beginning of this month. There were only three smelters operating at full capacity at that time, and only one of them was an important concern. Many of the other smelters, including some of the greatest metallurgical companies, were reduced to a basis of only 40%, or less. This has not been a time of the strong profiting at the expense of the weak. The strong have been blighted as well as the weak.

Not only is there this great setback in the smelting industry, but also there is the same thing in mining. If the smelters cannot easily sell their product, they cannot take ore from the mines, and the latter have also to curtail, accept very low prices, and struggle to make both ends meet. In the zinc industry, as in others, smelters and miners are in the same boat. There is not one party that lives in the cabin and the other in the forecastle, but rather is the simile that each is pulling an oar, one the starboard and the other the port, and in order to make the boat go ahead they have got to pull together. In the past they have not always pulled that way, and the boat has gone around in a circle. Henceforth your common inspiration must be to pull together, steer a straight course and get ahead.

It is unnecessary for me to review the causes that led the zinc industry into its present state. What was going to happen was evident almost from the beginning. The experience of this free, unorganized and highly competitive business during the last three years has been so true to form that its record may well be cited as one of the classics of economics. There is no use in going into the history of the past except in so far as it may afford teachings for guidance in the future. For the very reason that the recent history of zinc has been so true to form, I do not think that there is much, not previously known, that is to be deduced from it as a guide to the future. If we were going to make such a study, we might come simply to the conclusion to let the boat drift, just as we have done in crises in the past, but the time is too serious for that, and we may rightly be inspired to pick up the oars and row boldly into a new future, spurred by a spirit of adventure, not wild irrational adventure, but the kind which appeals to good sense, even if there be no bankers' guarantee of success.

I am speaking already as if the people of the zinc industry had made up their minds to do something together. I think they will so make up their minds. The prosecution of this great war, involving as it does the expenditure of every ounce of the effort of nations, has opened the eyes of everybody, as nothing ever did before, to the necessity and benefit of coöperation. Whereas former wars were matters of about 90% direct fighting and 10% engineering, the present war is about 20% fighting and 80% engineering. The engineers have to work three months or more in order to let the infantry go over the top and fight for a few days. In order that the engineers may do their work, the industries at home must supply them with material. We have learned that in order to maintain the supply of material our industries are bound to organize themselves, for in no other way can they do what is necessary. During the last year iron and steel men, copper men, lead men, and others have entered into associations among themselves such as they never had before. They have become better acquainted with each other, they have learned to coöperate, and they have found this to be beneficial. I do not believe there is anybody who will say that such associations will not endure and that they will not be strengthened to meet not only the problems of the war, but also those, that may be more serious, that will come afterward. Every few days do we hear of some new industrial association to promote the common welfare, and by virtue of such promotion the welfare of the country as a whole, which stands on its industries just as a chair stands on its legs.

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*An address delivered before the American Zinc Institute in St. Louis, July 29, 1918.

The prime and immediate question that is before this meeting is What can an association do for the zinc industry? At once let me say that many people can do together what no one can do alone. The great thing for the zinc producers, acting jointly, to do at this juncture is to engage in efforts to increase the use of zinc. If there be any other salvation for the industry, I cannot think of it. You possess mines, mining plants, and smelting works with a great excess of capacity over any use that there is at present or that is in sight. Your smelters could produce 800,000 tons of spelter per annum, and they are now producing at the rate of about 500,000 tons. The change in conditions has been so kaleidoscopic during the last four years that I scarcely venture to indicate the capital value of that 300,000 tons of surplus capacity. Some of it was paid for under pre-war conditions; some of it at the higher prices that subsequently prevailed. Some of it is in natural-gas plants and some of it in coal-fired plants, which are more costly. But if I should generalize the capitalization of that capacity, not in terms of replacement value but rather in terms of its brick and steel and labor when built—if, in other words, I should estimate its cost at $10,000,000—I think that my estimate would be conservative.

The value of idle mining and milling plants I hesitate even to guess, but it also must be large. In the six states comprising the Wisconsin and Joplin districts, including Arkansas and Oklahoma, there was a milling capacity in 1914 of about 10,000,000 tons, and nearly that quantity of ore actually milled. A record that I have caused to be compiled shows that 120 mills, costing about $6,000,000, and possessing a capacity for about 13,000,000 tons of ore, were built during 1915, 1916 and 1917, and doubtless that record is incomplete. But, anyhow, the miners of these six states actually milled upward of 19,000,000 tons of ore, or dirt, if you please, in 1917, and my estimate of 23,000,000 tons of milling capacity of an original cost of $9,000,000 at the end of 1917 is none too high, except for such portion of it as has already been abandoned and written off. Since then more mills have been built, especially in Oklahoma. How much of this milling capacity is now idle, I scarcely venture to guess. I can hardly say that it is the same ratio as smelting capacity, for the smelters never maintained their maximum for a whole year; and, moreover, their use of imported ore was radically reduced; but, nevertheless, it is obvious that a present production at the rate of 500,000 tons of spelter per annum, as compared with 680,000 tons in 1917, means the use of a correspondingly less quantity of ore and a reduction from the 23,000,000 tons of milling capacity in the six states. Bearing in mind that these states accounted for only 50% of the country's production of spelter in 1917, and that I am talking only of milling capacity, not of mining plant and the mines themselves, I may venture to say that the capitalization of the idle mining and milling capacity of the American zinc industry today is at least equal to that of the idle smelting capacity and may we therefore say $20,000,000 for the industry? This figure is very rough. I am trying merely to afford some indication of the magnitude of the problem so that we may view it and discuss it with the proper perspective.

Now, much of this surplus capacity is destined to become moribund and eventually to be thrown away unless some use be found for it, and I cannot think of any use, save to a small extent in making sulphuric acid, except in the production of zinc. A large part of your profits in 1915-17 is tied up in this plant, and there may turn out to be no profit at all unless you do something. At the least, this capital is at present earning nothing. Indeed, the predicament of the industry is worse than that. For a greatly increased number of concerns, both mining and smelting, have become participators in the business. Not only has a greatly increased plant been capitalized, but also a greatly increased administration of the business; wherefore there is an expanded overhead. Consequently, many of your plants, operating at only 40% capacity, are showing the increased cost per ton of ore smelted that inevitably follows from operation at reduced capacity. I suppose that some have even reached the stage of resignation where they may philosophically reason that the less ore that is smelted the less money may be lost in the aggregate, even if the loss per ton of ore be more. Many mining companies no doubt are deluding themselves with the fancy that they are just breaking even, when in fact they are not really getting a new dollar for an old one.

With this disagreeable and unhealthy situation in the zinc industry, we find that at the same time the country is in desperate need for many of the other metals. The shortage of tin is acute; of copper there is not enough; nor is there of iron and steel. In the lead industry there are ominous clouds. In zinc only, among the major metals, is there plenty. Manifestly, every pound of zinc that can be substituted for the scarcer metals at this time is a patriotic service. Incidentally, it will be helpful to the zinc industry itself.

I should take too much of your time if I should begin to elaborate to you my ideas as to the more extensive uses of zinc that may be made, and my ideas at present are but imperfect, anyhow. I will confine myself to general principles. Most metals have some uses that are peculiar to themselves, owing to special properties; i. e., such as those that make copper valuable as an electrical conductor and tin for solder. Other uses are due merely to certain general properties, such as malleability or ductility, which make them capable of being rolled into sheet or drawn into wire. For many purposes sheet zinc may serve just as well as sheet copper or a zinc casting may be quite as good as brass. In some cases zinc may be really better than some other metal that is commonly used, owing to tradition or habit, but the manufacturing and consuming trade may not know it. I have not the least doubt that zinc can advantageously be employed for a great many more purposes in this country than it ever has been. Even before the war it was employed for more purposes in Europe than here. Since the war it has been employed in Germany for more purposes, in substitutions for other metals, than anybody ever thought of previously. If we wait for the war to be over, we shall learn some marvellous things of what the Germans have done with zinc; but that will be far too late for us. We ought to get busy to learn things and to push things for ourselves. This is the psychologic time, right now, when zinc is plentiful and cheap and some of the other metals are scarce and dear. Obviously, those that are scarcest and dearest are the ones to go gunning for first. A multitude of consumers will be interested in substituting the cheap metal for the dear ones if they be shown how to do it, and in showing them the industry will not only be helping itself, but also will be performing a national service.

History has a curious way of repeating itself. Did many of you ever pause to think that zinc is commercially a relatively young metal? The ancients did not know it at all. The Chinese had it, probably in only a small way, several hundred years ago, but the production in Belgium was not begun until 1807. Then for many years the industry was only a trifling and struggling affair. There was no broad market for the metal. The people did not know what to do with it. It was not until Dominique Mosselman, a man of vast energy, entered the business in 1818, just 100 years ago, and devoted himself to establishing a market for zinc by educating the people in its uses, that the industry could be said to have its commercial birth, and even at his death, in 1837, it could scarcely be said to exist in the west of Europe except in expectancy. We are therefore confronted now with the same problem as Mosselman and his successor—the Vieille Montagne company— viz., the creation of new uses for the metal.

The promotion of the use of zinc is, in my mind, the main thing for an American Zinc Institute to consider. I do not want you to be under any illusion that great accomplishments are to be expected overnight. It is, on the contrary, an enterprise that should be entered upon only with patience and broad perspective and not too rosy expectations that it will make you everlasting fortunes. It may, it probably will, be slow in showing results. The results may be obscured by offsetting adversities. The results may be mainly in keeping the industry from passing into a worse state than it is in now. About the only test of results will be what is shown by the statistics of production and consumption, and even they will not be infallible indices. It is going to require a lot of hard work, a lot of time and a lot of money, but nevertheless it is going to be a good thing to do. As to the time and money that ought to be contemplated, I shall revert subsequently.

But while this proposed promotion is being instituted and is going on, I can think of some other things that may beneficially be undertaken, some of which will have earlier results, and not by any means results that will be only small. One of these is better statistical service.

Now, the zinc industry has not been destitute in the past of knowledge of what has been going on within itself, as revealed by statistics. On the contrary, I think that this industry, thanks to the coöperation of all the producers and their appreciation of the benefits accruing, has been rather better served in this respect than other metal industries have. But even at the best, our statistical reports are only imperfect pictures and they are capable of great improvement, to the great advantage of everybody in mining and manufacturing, in buying and selling.

We have been hearing recently a lot of talk of how the Germans captured the metal business of the world; of how the British and lately ourselves have broken their hold by the seizure of their concerns. There has been a lot of buncombe in this. The Germans may have captured the metal business of the Continent, but of the world they never did. Such a charge is too absurd to talk about. Yet it is true that over a long period of years the Germans have bought American copper more cheaply than have our domestic consumers. It is true that previous to the war, on those occasions when we have had a surplus of spelter and have had to export it, the sales could only be made at a painful sacrifice. It is true, moreover, that in trading in metals the Frankfurt houses and their affiliated concerns have made a great deal of money. How were they able to do that? Why, simply by knowing more of conditions than other people; by taking the trouble to know more; by knowing when to buy and when to sell. My friends, our grievance that Germany, or Europe, has bought our copper and spelter more cheaply than have our own people boils down to that. Only a few days ago I read an extract from a German paper complaining of how the American copper magnates had been arbitrary and ruthless in what they had made German manufacturers pay for copper.

Now, how did the German trading houses acquire such a powerful knowledge? They acquired it by study, and by organizing adequate intelligence services, and by collecting and publishing and analyzing statistics. Many of you know the painstaking and comprehensive statistical pamphlet that the Metallgesellschaft used to issue annually. Do you think that that work was done for the fun of the thing, or to enable some one to ride a hobby? Not at all. It was one of the German means of aquiring knowledge that was stupendously useful in the business.

I am bordering upon a subject that is far broader than what comes within the scope of the zinc industry alone. I must confine myself to some general features. Unless we profit from the German experience, we shall not put ourselves very much ahead. If we sit idly by, some one else, after the war, will get ahead of us, just as the Germans did before. This is the time of all times to seize upon this idea. For a while the Germans are not going to be able to collect international statistics. Animosities will prevent. But if we do not do it, some other rival will do it, and will get the advantage.

On this subject let me quote the following from a letter to me by one who knows whereof he is talking:

"It is important not to leave this field to our French and English friends. It has been one of the cornerstones of German metal power, by giving them a world-embracing picture of production and consumption. Through it they were often ahead of all others in recognizing changing conditions. The United States is entitled, by reason of its production, to be the metal center of the world, and not Germany or England. One of the steps in this direction would be first-hand information. The other, of course, is international organization by Americans both for buying and selling materials. This is one of the things we can learn from our enemies."

Here you have again the international aspect. Whether we want to or not, we have got to open our eyes to it, and be governed in our actions by what we see. The zinc industry of this country is no longer going to be provincial. It is going to be national, and it is going to have serious international problems and complicated relations, which are going to be uncomfortable to us unless we are prepared to face them properly. We have got to know what is going on in Great Britain, in Australia, in Japan, where there are rival producers, and in the South American and other markets where competitors will meet. In other metals there will be similar problems, and there will be formed similar associations, both here and abroad, which, among other things, will do their own necessary statistical work. The several bureaus will in some way be brought together in some international form. But I can tell you, based upon no trifling experience, that with proper backing and proper execution we—I mean we Americans—can do our statistical work, and do it better than Frankfurt ever dreamed. Without waiting, however, for that ultimate development, the American zinc industry ought to get busy with its own. That will be of more aid to you, and more quickly, than anything you can think of unless you have my imagination. This is one of the things that the American Zinc Institute can accomplish right away with the promise of some early, beneficial results.

Another thing to which the Institute may well direct its attention is the education of its members to what is a proper basis of accounting, which may well be evolved into a uniform system. You will forgive me, I hope, if I remark that, without any doubt, you—both miners and smelters—are at sixes and sevens with regard to this fundamental subject. A lot of you think you are making money who really are not. Others of you who are really making money are not doing so well as you ought to. Some of you who are losing are losing too much. There can be no real efficiency in your business, nor in any other, without a thoroughgoing system of accounting. I know that some of your leading metallurgical companies, which have what they consider to be perfectly elegant sets of books, are lacking in a good deal of the elemental information they ought to have, or else they do not possess it in the form they ought to.

In advising you to give thought to this matter and in emphasizing the importance of it I make no pretense to being original. It was the one great lesson that Edward N. Hurley learned during his ministry as chairman of the Federal Trade Commission, when he had unusual opportunity to examine the accounts of American industries; and he has been preaching it ever since. Only a few days ago he was addressing a national association of coal operators, lately formed to coöperate for the general welfare, just as you want to do, and in the course of his remarks he said this, which I can do no better than to repeat:

"It seems to me that one of the most important things your association can do is to begin active preparations now to increase your efficiency so as to maintain the production of coal at the highest possible level. You have taken the first step in this direction by working out a uniform system of cost accounting and by organizing a cost-accounting department to assist mine operators to put their business on a sound basis. In every trade association the strong must help the weak, and in most cases the weak are those who know the least about their own business. Accordingly, the first move to strengthen your industry is to teach those weak producers the facts about their own conditions. Coal should be mined at a profit, but no man can know whether he is really making a profit or not unless he knows his costs.

"Profits are not all, however. No man can know whether his organization is really efficient or not unless he knows his costs and unless he has some standard of costs, either the average for his field or the figures of the lowest producer, which he can use to compare with his own. It is vital to us all to develop the highest industrial efficiency of which we are capable today. In one sense, this whole war is a test of industrial efficiency. Thoroughgoing cost accounting is the very basis of efficiency in your business, as in every other business."

This association of coal operators has already begun to do that very thing. I am prepared to adopt Mr. Hurley's words and substitute zinc for every time he said coal, and to assure you that the advice is wise. With proper cost accounting, preferably on a uniform basis, you will know what you individually are doing, either in mining or smelting. With proper accounting at the sources of production, the collection of statistical data will be easy. With the right kind of statistical service, you will know what the industry is doing as a whole. You will be able to sense coming events. You will be able to form better judgment as to when to buy and when to sell. You will be able to deal with your laboring men in a more intelligent way and ameliorate your labor troubles, and the last is surely one of the great problems that confront you.

Do you ask me how statistical knowledge may ameliorate labor troubles? Well, I was asked quite recently to supply some statistical information in just such a connection. There was a strike based on claims of increased cost of living, which statistically it was easy to refute. Our employees are not always unreasonable. We are prone to make the mistake, when our employees murmur and strike, that they have no good reason to do any such thing. Often they have not, but sometimes they have, and we are apt to be blind to it, and perhaps unreasonable ourselves, until it is too late. But either way, the administrator of a business is wonderfully fortified if he knows just what the industrial situation is, what is the relative efficiency of labor, what are the costs of living, what is the prevailing scales of wages. I say if he knows, and does not merely conjecture, or perhaps not think of things at all.

On the subject of labor, that is surely going to continue to be one of your great trials and tribulations. It is going to be so in every industry. The only answer for a long time is going to be improvement of managerial efficiency and increased mechanicalization; the substitution more and more of machines for men. The American Zinc Institute may well make it one of its functions to examine critically the management of the mines, mills and smelteries of its members. A large percentage of the inefficiency in production of all commodities is poor management. Perhaps our great copper-mining industry is more free from that charge than any other, but even in it tremendous improvements are being made all the time. You might well consider the appointment in each district of a committee on efficiency for the purpose of exerting efforts to improve the performance of the management of mines in that district. In what better way could you help the Government at this time? Even if the Government may not want from you just now any more zinc than you are producing, it certainly wants all that you can possibly do in the way of paying taxes and subscribing for bonds, and how better can you render that aid than by increasing efficiency and saving?

I might outline other things for you to do, but I fear lest I weary you. We hope that we can so promote the American zinc industry that after the war we shall have a noble export business, both in crude metal and in manufactures. It will be necessary to consider joint action in meeting foreign competition, which now, by the terms of the Webb law, is legal. We ought to consider educational steps for our own common benefit besides those which I have previously indicated. We may well contemplate the nature of relations with manufacturers in this country, the consumers of our product. But these and other interesting possibilities may be postponed for discussion at another time.

My main recommendations to you, therefore, are steps to increase the use of zinc in this country, and steps to increase your efficiency in both production and selling, among which are statistical service and the organization of a good system of uniform accounting. The big thing, however, seems to me to be to increase the use of the metal. If you are going to carry out this program, you must make up your minds to undertake it in a big way. You must have patience and a proper sporting spirit. The leaders whom you choose must have judgment, inspiration and bold imagination. Without imagination they cannot accomplish much that is worth while. They must have visions and must make them come true. There is no use in thinking of undertaking the job in any picayune or mediocre way.

I cannot outline any budget to you. There will be need of a staff of good men. I think a dozen might be put advantageously to work about as rapidly as they could be secured. You will need a laboratory, or laboratories, for testing purposes. You will have to issue publications to reach the people you want to convince and also to apprise your own members of what is going on. You will have to advertise, which may cost a great deal of money. No one can intelligently forecast all of these expenses, and others, at the present time. But if you contemplate spending $200,000 per annum for the next five years I do not think that would be any too much. It is a big job that we are discussing. After all, the sum that I have mentioned is only about 1% of the capital that is tied up in idle plant at the present time.

I have not, perhaps, stuck very closely to my theme of what the zinc industry can do to help the country win the war. It is my conception that the industry by helping itself can best help the country. If the industry can induce the people to use zinc more freely, and thereby release scarcer metals that may be more especially required for munitions; and if the industry can increase its own efficiency in production; and if, then, I be asked "What else can it do to play its maximum part?" I shall find it difficult to offer any answer but "nothing more."

Strontium in 1917*

By James M. Hill

Approximately 4035 short tons of strontium ore, valued at about $87,700, of which about 10% was strontianite (strontium carbonate) and the remainder celestite (strontium sulphate), was mined in the United States in 1917, in California, Texas and Washington; and about 1700 tons of English celestite was imported.

The principal market for celestite and strontianite is in the East, the largest buyers apparently being the Foote Mineral Co., of Philadelphia, and E. I. du Pont de Nemours & Co. (Harrison Works), also of Philadelphia. The Beckman & Linden Engineering Corporation, of San Francisco, and a firm in Seattle are also buying strontium ores.

Prices reported by sellers of celestite ranged from $20 to $22 a short ton, but for strontianite ores prices from $35 to $90 a short ton were reported. The Foote Mineral Co. on July 14, 1917, was selling ground celestite (90% $SrSO_4$) at 2c. per lb. ($40 a ton) and ground strontianite (83% $SrCO_3$) at 7c. per lb. ($140 a ton).

Four companies in the United States reported sales of strontium carbonate and strontium nitrate in 1917, aggregating about 3,000,000 lb., or 1500 short tons. The principal salt sold was the nitrate in addition to a few thousand pounds of strontium bromide, and several thousand pounds of sulphide, which was presumably used for making other salts.

The demand for strontium salts comes principally from makers of fireworks and night signals. Quotations on strontium carbonate[1] have been steady throughout the year at 40 to 45c. per lb. for technical carbonate and 55 to 60c. per lb. for pure carbonate. Strontium nitrate was quoted at 42 to 52c. per lb. at the beginning of 1917, but declined to 25 to 30c. per lb. in June and remained at that figure till the end of the year.

Australian Copper and Tin go, to a large extent, to Great Britain and other ally nations for the making of munitions. In 1916 about 39,300 tons of copper was produced, of which 26,340 tons was shipped to Great Britain and 9530 tons to her colonies and Allies. About 5590 tons of tin was produced in the same year, and of this 4750 tons was exported, of which about 2180 tons went to Great Britain and the remainder to the Allies and the dominions.

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*Excerpts from "Mineral Resources of the United States, 1917." Part II.

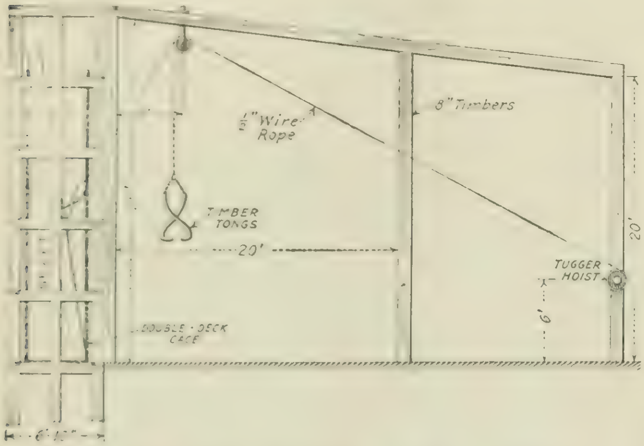
[1] "Oil, Drug, and Paint Reporter," Vols. 91-92, 1917.

Details of Practical Mining

Lowering Shaft Timbers

By C. T. Rice

Shaft timbers are often lowered into the mine from the surface by swinging them under the bottom deck of the cage, but this practice frequently gives trouble, for the square daps cut in the timbers are likely to catch on the shaft sets while being lowered. When this occurs, something generally is broken before the hoist can be stopped. At the Hecla mine, Burke, Idaho, a good method of lowering shaft timbers to the level from which the sinking is being done has been devised. It consists of removing the top deck of the two-deck man-cage and lowering the wall- and end-plates on the cage with the tops of the timbers extending through the hood. Owing to the construction of the cage (the top deck is held in position on supporting angle-iron ledges by four pins), this change can be made easily and quickly.



ARRANGEMENT FOR LANDING SHAFT TIMBERS AT UNDERGROUND STATION

At the station where timbers are to be landed, a block is secured in the roof about five feet back from the line of the shaft. Through this pulley is a wire rope provided at one end with timber tongs and fastened to a Little Tugger hoist, which is clamped to one of the posts of the station timbers. In landing the wall plates so that they will not be injured, the timber tongs are nipped into the wall plate about the middle. After the Little Tugger hoist has taken most of the weight of the timber, a shaftman sinks a picaroon (a pick would serve the purpose, but not as well) into the wall plate near its bottom and walks out in the station with the end. As he does so, the drum of the hoist is slacked off and the wall plates are lowered gently upon the station. In this manner the shaft timbers are lowered at the usual hoisting speed without danger to the shaft, and are landed easily and quickly, without injury, on the station floor.

Dog for Lowering Mine Timbers Into Stopes

Timbers occasionally get away while lowering or hoisting into stopes, even when a chain is used on the rope to grip the piece better. This is especially true if the timbers are wet or icy. At the Hecla mine at Burke, Idaho, much heavy round timber has to be either lowered or hoisted into the stull-set stopes. The caps are green timbers and average about 14 in. diameter and from 7 to 16 ft. long, and the posts are about 8 ft. long and of 10 in. diameter. These rather heavy timbers are, nevertheless, handled safely and easily, and got into the stopes by using dogs and chains on the ropes.

A chain such as is frequently used on the end of a timber rope is spliced to the cable, and the weight of the timbers requires an air hoist. Instead of having a ring at the end, this chain, which is much longer than the chains ordinarily used, has a strong clevis, which serves a double purpose. When timbers are being hoisted into a stope, it is used to fasten the chain to itself after it has been wrapped several times around the stick; when lowering timbers, the clevis is used to fasten to the chain a ring that has several timber dogs secured by short chains. In lowering timbers, reliance is placed entirely upon the dogs, several being sunk into the stick if it is large.

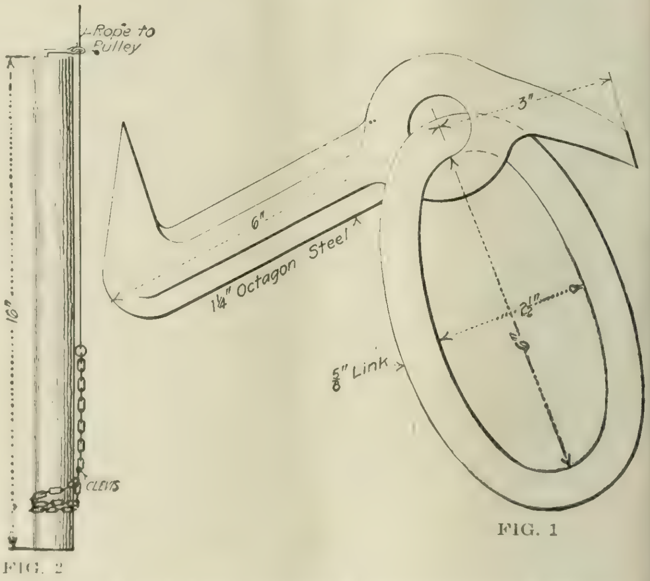


FIG. 2

FIG. 1

TIMBER DOG AND MANNER OF FASTENING TIMBER

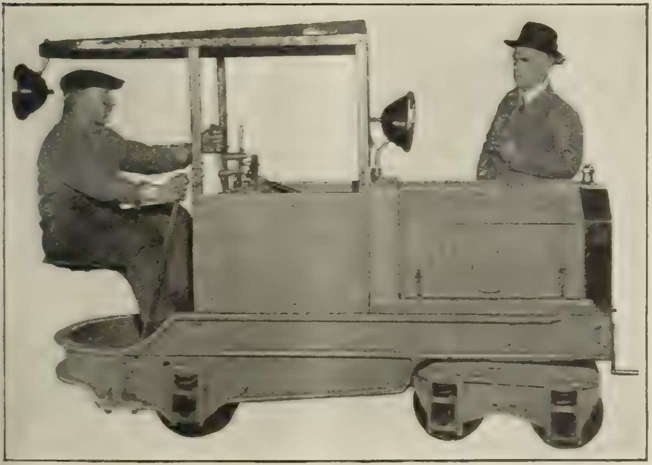
The timber dog shown in Fig. 1 is made of 1¼-in. steel and has an ordinary timber-dog point at one end, and at the other it is bent back. When it is desired to take the dog out of a timber, all that is necessary is to hit the dog on the bent end so as to pry it out. About two-thirds the way from the dog end, the drill steel is flattened and a hole about an inch in diameter is punched through. A long narrow link made of ⅝-in. steel and large enough to slip easily back and forth over the rope chain is then put through and welded.

In hoisting timber, the dog is fastened loosely to the cable by means of this link. First the chain is wrapped several times around the timber near the bottom and fastened to itself by the clevis. Then the dog is slipped up along the cable until it can be sunk into the top end of the stick. When the top of the timber has been hoisted level with the landing floor in a stope, a picaroon is applied and the dog at the top knocked loose. Then, as the timber is hoisted further, the top end skids out on the floor, and the stick is guided by means of the picaroon to the place where it is to be used. Fig. 2 shows clearly this method of landing timbers.

In lowering the timbers, a ring to which four dogs are fastened by short chains is used. If the timber to be lowered happens to be large, it is lowered singly and with three dogs. If the timbers are small, several are lowered at one time, a dog being sunk into each near the top. Whether the timbers are lowered singly or several at the same time, they are fastened only at the top, so that as soon as the floor is reached they can be landed easily by the use of a picaroon applied at the lower end, the workman walking out into the stope with the timber. Thus when lowering as well as hoisting timber, the bulk of the weight is kept on the cable, and the work of landing a heavy piece is reduced to a minimum.

The Ford Mine Locomotive

The illustration shows one more use to which the universal Ford motor has been put and its adaptability for underground haulage problems. The locomotive was built by the McFarlane-Eggers Machinery Co., of Denver, and is now operating in the Royal Flush mines, of Columbine, Colo. Details of the body are apparent from the illustration. The locomotive has a four-wheel fore truck which is pivoted to the frame. The frame consists of three iron castings, on which the well-known bonnet and a wooden cab and seat have been mounted.



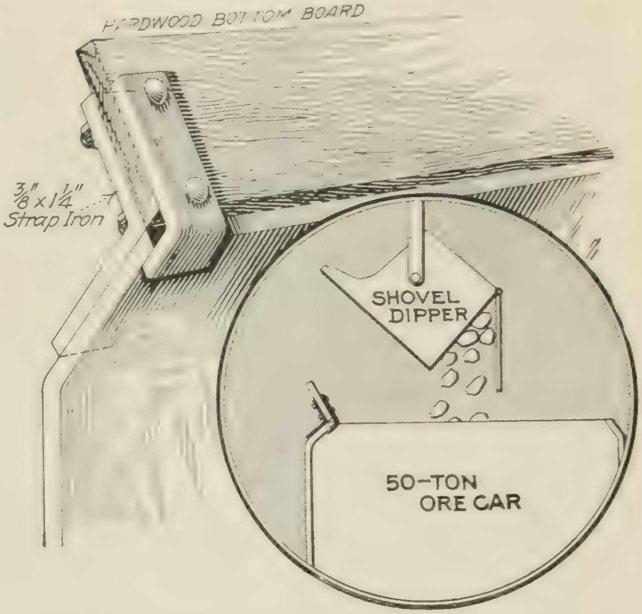
THE COMPACT AND USEFUL FORD MINE LOCOMOTIVE

The locomotive shown operates over an 18-in. gage track and will negotiate an 8-ft. radius curve. It is 30 in. wide, 7½ ft. long and weighs 2500 lb.; and the overall height at the cab is only 4 ft. The locomotive travels at a speed of 10 miles an hour and will draw from six to eight one-ton cars. This adaptation of the Ford motor will undoubtedly solve many problems in small outlying districts heretofore handicapped by the necessity of choosing between costly hand tramming over long distances or expensive and unwarranted haulage installations.

Use of Side Board in Loading Cars

By Hale H. Hunner*

In loading the stockpile at the Ferro mine of the Onahman Iron Co., on the Cuyuna range, in Minnesota, the main line running to the shaft was used as the loading track in making the first cut. The toe of the pile reached to within five feet of the track rail and had been riprapped about five feet high. On the opposite side of the track the embankment extended on the level about two feet beyond the end of the ties and then sloped off abruptly into a borrow pit about eight feet below the grade of the track. This slope was covered with pieces of rock that had been trimmed from loads, as well as a considerable tonnage of high-grade ore in large pieces and fines that had fallen from cars in previous seasons. To recover much of the ore thus spilled would have cost more than it was worth, as it was so underlaid with sand and rock that it was impossible to shovel it. The new spill from the dipper teeth was equally hard to recover.



DETAIL OF SIDE BOARD USED IN LOADING CARS

I tried the use of the movable side board shown in the illustration and saved from two to three tons in a day's loading. When a car was about half full, the board was put in position on it by two of the pitmen. When the car was loaded, the pitmen shoveled enough ore away from the board to enable them to drag the remainder up the side of the load as they removed the board. As the railroads were demanding maximum loads, the car spotter always saw that the board was used. There was no delay due to shifting, as this was done between shovel dips. By the time the two pitmen could trim the car and have the board ready to shift, the next car would be full enough for the board to be placed on it.

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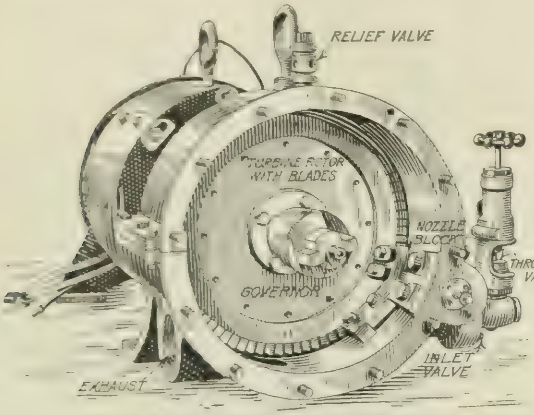
*Onahman Iron Co., Ironton, Minnesota.

Mining and Metallurgical Machinery

Small Turbo-Generator Unit

The Westinghouse Electric & Manufacturing Co. has recently produced a small turbo-generator unit for direct-current service. This unit is designed for 10 kw. output, although a temporary load of approximately 12.5 kw. may be obtained. A smaller unit of 8.5 kw. gives a range of capacity suitable not only for lighting work, but also for the many electro-magnetic purposes.



W. E. & M. Co. TURBO-GENERATOR

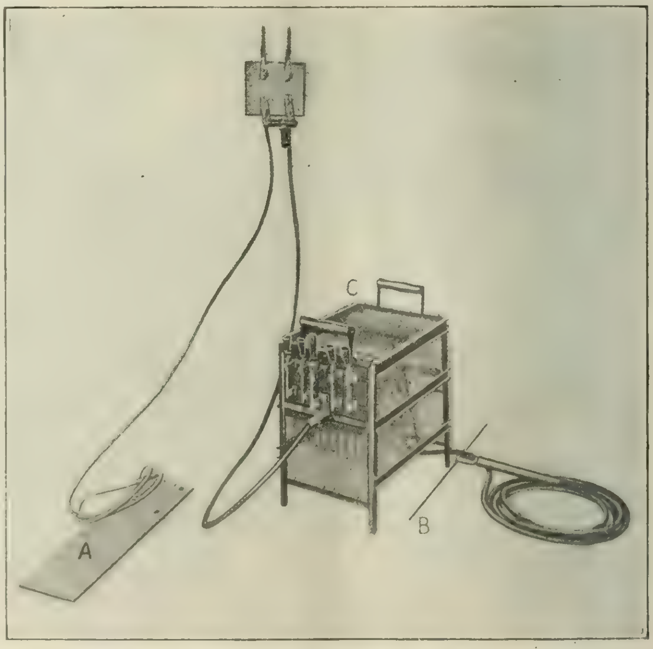
Among the fields of service for which it is adaptable may be mentioned surface mining, where flood lighting for night work has come into general use. Its range of operating conditions (80 to 235 lb. inlet, and from 0 to 10 lb. back pressure) makes this a suitable unit for other purposes. Since the energy developed is direct current, the installation is finding favor for use on steam locomotive cranes where the current is used for lifting-magnets. Many of these cranes are now equipped with electro-magnets, and this addition enables the purchaser to have all the advantages of the electric locomotive crane for handling scrap iron in electrolytic refining and elsewhere. Its construction is such that it can be used at considerable distances from machine or repair shops. There are no reciprocating parts to wear out; and, apart from filling the oil well occasionally, no further attention is needed.

It is simply constructed and possesses many of the features found in larger units. Among these is a hand and automatic throttle valve, and an emergency overspeed governor, placed on the generator end of the unit, which automatically closes the throttle valve of the turbine if the unit should show a disposition to overspeed. The device consists of a small weight placed in the shaft of the unit which, when the predetermined speed is reached, engages a trip lever connected in such a way to the throttle valve that it is then automatically closed.

The most important feature of this unit is that it has but one revolving part, the generator shaft being extended so that it also carries the turbine rotor. This not only makes a very compact machine, but eliminates all coupling and alignment troubles, and dispenses with turbine bearings and packing. The turbine rotor is made of an openhearth steel forging in the periphery of which are placed blades of electric furnace steel, which are held in place by pins tightly driven in through blade and rotor. The blades are of the impulse type, and although there is only one row of blades, yet by means of a reversing chamber the same steam is passed through the blades a second time, thus allowing complete expansion of the steam. Since the unit is designed to occupy the least possible space, the manufacturer has equipped the generator with ball bearings (no bearings being required on the turbine other than the usual type of surface bearing), thus effecting saving in bearing friction, while a decrease in length and weight of the unit is possible. The complete model is 3 ft. 8½ in. long, 23 in. wide and 18¾ in. high, and a unit, with cover removed, is illustrated herewith.

Arc Welding With a Portable Rheostat

The electric welding outfit shown in the illustration consists simply of a portable rheostat *C*, a contact plate *A* and a welding point *B*. The rheostat and contact plate are connected in circuit with a two-pole switch. The plate *A* is placed in contact with the object to be welded, and the point *B* applied in the ordinary manner to the joint to be welded.



ELECTRIC WELDING OUTFIT AND RHEOSTAT

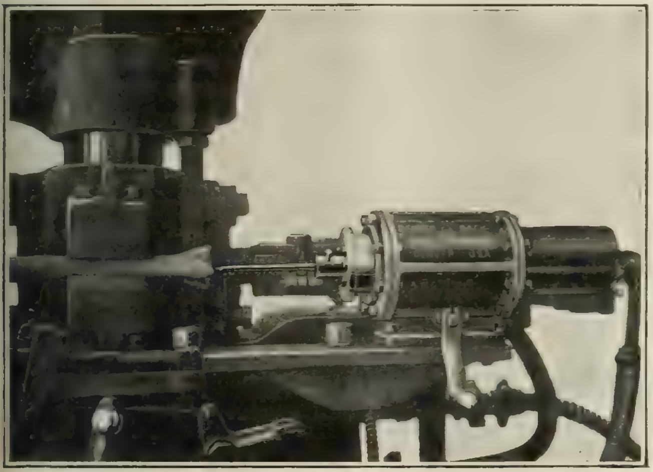
The illustration shows a rheostat adaptable for a 150-ampere, 110-volt circuit and it weighs only 16½ lb. without the leads. The overall dimensions are 20½ x 15 x 12 in., and it is easily portable to any part of the plant. The current is regulated from 15 amperes up to

150 amperes, in steps of 15 amperes, and is suitable, consequently, for all kinds of welding with a metallic pencil.

The Electric Railway Improvement Co., which has put this equipment on the market, also manufactures rheostats for 150 amperes and 220 volts. The great advantage of an outfit of this kind will be readily appreciated by welders and machinists, as its portability, combined with flexibility, affords a great advantage over the old type of electric welding equipment.

Drill Steel Puncher

The Denver Rock Drill Manufacturing Co., Denver, Colo., has just placed on the market an efficient pneumatic device for opening the hole in the end of a piece of steel while being worked into a bit or lug. It is called the Model 10 Waugh Steel Punching Machine and is designed to be mounted on the pedestal of their Model 8 Waugh Sharpener directly in the rear of the vise jaws, as shown in the illustration. The punch is held in a tappet chuck and is hammered into the steel as it is fed forward by an air-feed cylinder. The operation is simple and the machine will open the water hole in a shank or bit in a fraction of the time required to do it by hand. The device may also be mounted on a separate pedestal where such an arrangement is desirable.



WAUGH STEEL PUNCHING MACHINE

The Monroe Calculating Machine

Over the entrance to a New York business house hangs a service flag containing 57 stars. "How are you making up your loss in men?" the manager was asked. "By women and machines," he replied. The Monroe calculating machine does general figuring work—adds, subtracts, divides, and multiplies. One very large concern figured out a saving of 69% in time required to do a certain part of its work. Another considered that at least 15 men would be needed to take over the work of the machines.

This machine will do billing, ledger posting, sales classifications, purchase-ledger, and purchase classification work.

For many years adding or calculating machines have been used in the offices of mining or smelting companies for ordinary routine work. It has long been recognized that they offer far more dependable accuracy and speed than the fastest human calculator could give, but, until recently, these machines did not find favor among men responsible for the technical details of operation, for the reason that they were not sufficiently flexible in scope to include all the intricate calculations which occur in the work of mining and metallurgical engineers. Technical men were on the alert for a machine that would meet their requirements, for they realized that mechanical accuracy and speed are to be preferred to the fastest calculator, with his human tendency to error, or to the most adept user of a slide-rule. When such a machine became finally perfected, it met almost instant approval, and has shown remarkable saving in time and in the intangible but real losses occasioned through some slight error made when the brain was tired or when a guess between the graduations of a slide-rule was a thirty-second of an inch out of the way. The Monroe calculating adding machine was first used as an experiment, but it has now become part of the standard equipment of the Utah Copper, Braden, Chino, Ray Con., Phelps Dodge, American Smelting and Refining, St. Johns, Cerro de Pasco companies and many others.

The uses for the Monroe machine are legion, as it adds, subtracts, multiplies, and divides, with positive action. The American Smelting and Refining Co. uses a Monroe at its Perth Amboy plant, among other purposes, for keeping its stockbook of ore on the dump and for compiling its records of assay and laboratory results. In estimating ore reserves at a mine, an appreciable amount of time is saved with such a calculating machine, and the assurance is gained that the accuracy is positive. The following is an example of a problem calculated by a Monroe machine in 37 seconds:

CALCULATIONS OF AVERAGES FROM WEIGHTED ASSAYS

Width, Feet	Assay, Oz. per Ton	Foot Ounces
7	1.22	8.54
4	0.54	2.16
12	1.20	14.40
8	2.20	17.60
5.3	27.40	145.22
7	1.60	11.20
3.5	0.95	3.32
6	0.39	2.34
6	trace	.....
7.2	trace	.....
66		204.78

$$\text{Average, } \frac{204.78}{66} = 3.1 \text{ oz. per ton.}$$

Every engineer knows the amount of time that is wasted in checking up long additions or in repeatedly going over calculations involving decimals carried to the sixth place. Such work is performed on the Monroe machine at remarkable speed. For instance, the following problem in determining arithmetical mean-gross value for three-quarters of a year was calculated in 17 seconds:

	Third Quarter	Second Quarter	First Quarter	Total
Tons milled	523,871	642,683	541,093	1,707,647
Gross value	$1.01	$.112	$1.207	$1.111

$$\frac{(523{,}871 \times 1.01) + (642{,}683 \times 1{,}112) + (541{,}093 \times 1.207)}{1{,}707{,}647} = \$1.111$$

The tables indicate the machine's flexibility.

Events and Economics of the War

Unrelenting pressure by the Allies at all points of the Marne salient has forced the German Crown Prince to retreat in the effort to withdraw his forces from the dangerous pocket; the enemy, while endeavoring to hold his flanks, has been driven north of the Ourcq, leaving Fère-en-Tardenois in the Allies' hands. Three villages near Montdidier were also captured by the French. Elsewhere than on the Western front little action is reported. The White Star liner "Justicia," of 32,120 tons, was sunk by torpedo off the Irish coast, 11 of the crew being lost; the U-boat likewise scored in sinking the British armored cruiser "Marmora" on July 23.

The telegraph and telephone systems throughout the United States were taken over by the Government on July 31 by executive order. In its work upon a revenue bill, the House Ways and Means Committee is said to be in accord with the Senate committee as to excess profits, and to have committed itself definitely to a tax of from 30 to 80% on net incomes, to yield about $1,690,000,000. The Food Administration announced a cut in the household sugar ration to two pounds per person per month, effective from Aug. 1 to the end of the year.

Year's Steel Exports Over Billion Mark

The Government's figures relating to oversea movements of iron and steel in all forms for the 10 months of the year ended with April, 1918, show the total to be $941,400,902. Steel exports for the full year can safely be estimated at around $1,101,500,000, it is claimed, compared with $1,129,341,616 in 1917. The United Kingdom and Canada were the heaviest buyers in many lines, and Japan drew heavily on this country for ship steel. In the 10-month period mentioned, 850,344,047 lb. steel plates was exported; 331,837,297 lb. steel sheets; 353,450 tons steel rails; 28,057,772 lb. railway track material, and 209,389 tons structural iron and steel. Of the steel rails shipped 91,721 tons was for General Pershing's lines and other strictly French requirements. Other details are given in the following table:

MISCELLANEOUS STEEL PRODUCTS EXPORTED IN TEN MONTHS ENDED MAY, 1918

Billets, ingots, and blooms of steel, tons	1,678,620
Wire rods, lb.	376,396,816
All other bars or wire rods of steel, lb.	1,187,540,845
Bar iron, lb.	93,806,796
Galvanized iron and steel sheets, lb.	145,154,908
Iron sheets and plates, lb	107,247,564
Ship and tank plates, punched and shaped, lb	60,236,835
Shells and empty projectiles	$24,691,134
Tools	$18 924,328
Forgings	$33,217,643
Hoop, band, and scroll products, lb.	114,465,158
Bolts, nuts, rivets and washers, lb	57,371,189
Horseshoes, lb	18,519,079
Iron ore, tons	917,134
Wire rope and cable	$3,014,400
Cast iron pipe and fittings, lb	145,699,366
Wrought iron pipes, lb.	193,609,331
Nails, cut and wrought, lb	252,331,373
Machinery, chiefly of iron or steel	$237,976,872
Radiators and house heating boilers, lb.	5,581 259

No exports of pig iron were recorded. Ferromanganese, ferrosilicon and other alloys exported in the 10 months amounted to 331,378 tons. Other exports were 1272 locomotives and 1478 tractor and caterpillar engines.

Chemical Firms Quizzed as to Control

An inquiry into the ownership of three chemical companies to determine whether a transfer of German-owned stock to American interests, made just before the United States entered the war, was *bona fide* has been in progress since July 12. The investigation was begun in New York by the Attorney General at the request of the Alien Property Custodian. The concerns are the Roessler & Hasslacher Chemical Co., New York; the Niagara Electro-Chemical Co., Niagara Falls, and the Perth Amboy Chemical Works, Perth Amboy, N. J., the control of which firms was owned, up to 1916 at least, by the Deutsche Silber und Gold Scheide Anstalt, of Frankfurt-am-Main.

Whether these corporations will pass into the hands of the Alien Property Custodian depends, it is said, on the genuineness of a transfer of the control to American interests made in 1916. It has been shown thus far that despite huge profits the German owners had sold stock in the Roessler & Hasslacher company, which had a book value of $310, for $200 a share, and that the Perth Amboy stock had a book value of $1550 and was sold for $400. Dividends of the Niagara stock in a year were more than double the amount paid for the stock, it was shown. A certain contract proving the real status of the deal is said to be in existence in Switzerland.

War Board Creates New Divisions

The War Industries Board has created two new divisions, to be known as the Chemicals Division and the Explosives Division, it was stated on July 9. Charles H. MacDowell, formerly chief of the Chemicals Section, has been made Director of the Chemicals Division, and M. F. Chase Director of the Explosives Division.

The Chemicals Division will be subdivided into sections to handle the various commodities with which it is concerned. Representatives of the Army, the Navy, the Marine Corps, and other departments have been assigned to each section, and with the commodity chief constitute the sections' membership. In the Explosives Division, Mr. Chase coördinates with representatives of the Army, the Navy, and other departments concerned, and consults with the various section chiefs of the Chemicals Division.

The Business Situation

Business and manufacturing are as near maximum capacity as restricted supplies of raw materials and the difficulty in obtaining adequate labor will permit, according to Pierre Jay, chairman of the board of the Federal Reserve Bank, in a summary of the current trade situation. The two important features in business at this time are the widespread absorption by the Government of industrial products essential for the war and the increase in the scope of the Government's supervision over industry, especially through the control of raw materials.

Under arrangements made on June 6 between the Government and the American Iron and Steel Institute, industries using iron and steel on other than war orders will receive little material. About 85% of the pig-iron output is reported as being necessary for war purposes, although the present rate of production is the highest on record—in May, 3,446,412 gross tons, or 111,175 tons per day.

Traffic on railroads east of the Mississippi is moving smoothly, only 11,000 cars above normal being recorded as in transit on Eastern lines June 14, compared with 160,000 in January, when congestion was acute. April reports for the 34 roads of the Eastern region show increased gross earnings and mileage, net earnings being cut by high operating expenses.

Tax Program Interests Steel Men

"As regards the new taxation program, the steel producers are content to see a high rate imposed upon excess or war profits provided they are allowed a fair exemption in the form of a percentage of capital invested, including the large working capital now necessary, and also a fair deduction from profits for amortization," says the Pittsburgh correspondent of the *Evening Post*. "They lay particular stress upon the last-named item. Construction work has been particularly costly of late, and much of it has been undertaken solely to meet the requirements of the Government. What it will be worth after the war no one knows, but it is regarded as certain it will be worth much less than its cost. Accordingly, a high amortization rate is demanded against all recent new construction.

"Some producers go further and point out that in normal times the industry grows, and new construction takes care of mistakes that may have been made in increasing facilities too rapidly in one direction or another, whereas of late the industry has suffered a forced growth, and will have no occasion to grow after the war, so that this equalization will be denied, and larger depreciation charges should now be made than obtained before the war.

"Thus the administrative details of the prospective tax legislation interest the steel producers more than does the mere percentage rate that may be applied to the greatest profits. In some quarters, indeed, a high rate might be rather welcome, in that it might tend to restrain the War Industries Board from seeking reductions in iron and steel prices. As matters stand, the price schedule must run the gantlet every three months."

British Tungsten Subsidy Proposed

The necessity of manufacturing tungsten powder and ferrotungsten within the British Empire on a scale that will insure an adequate supply for defensive purposes in case of sudden need is pointed out to the British Board of Trade by one of its committees in a recent report. It is also recommended that the works manufacturing tungsten "which have come into existence, either at the request of the government or otherwise during the war, shall receive subsidies or special consideration as regards excess-profits tax in relation to the amount of money they have sunk in the industry, either by way of wolfram ore-dressing plant, tungsten-producing works, research work, mines or concessions for the raising of wolfram ore, and generally with a view to meeting German competition after the war."

The committee also makes the suggestion that engineering manufacturers be encouraged to work together in larger units, either by amalgamation or by joint working, by pooling of resources, by specializing production, and by organization of export sales, and for the purchase of raw materials.

Steel Used for Copper on German Roads

The substitution of steel for important copper parts was alleged by a member of the Reichstag to be the cause of frequent breakdowns of locomotives on German railways, according to an Associated Press dispatch from Amsterdam. The member, Herr Gothein, expressed much concern over the condition of rolling stock on the German roads and asserted that on one out of every five of his railway journeys in the last two years his travel had been interrupted by delays due to the engine breaking down.

Early Shipment of Phosphate Desirable

Those industries requiring the transportation of phosphate rock from the Florida district through the Virginia gateways, so-called, have been urged by the car-service section of the Railroad Administration to pay special attention during the summer months to getting this rock moved and into stock piles, because of the comparatively easy transportation conditions now prevailing. Transportation demands in the autumn and winter, it is intimated, may require restrictive methods. It is suggested that particular emphasis be placed on shipping to points reached via these gateways, as against stocking at points taking the river crossings west of Portsmouth, Ohio, because there will be less freedom of movement through Virginia than through the latter points during the period of heavy traffic.

Oil Trade To Be Regulated

Issuance of a general order regulating the trade practices of oil marketing throughout the country is contemplated by the Fuel Administration. In the case of an oil company at Shreveport, La., which complained of the unfair practices of one of its competitors, it was directed on July 24 that no allowances be made to retailers on gasoline or kerosene exceeding 1c. a gallon and that no drayage allowances should be allowed to consignees on drum or barrel shipments. It also was decided that no permanent equipment could be given or loaned to retailers and that neither premises nor equipment should be bought or rented for them.

Manufacture of turbine engines rated at 700 hp. or over has been placed under Government control, which is to be exercised by the War Industries Board. Only marine types of engines are affected, land types being excepted.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Staff of Bureau of Mines Increased

Irrespective of the passage of the bill for war-minerals control, the U. S. Bureau of Mines expects to concentrate largely on an investigation of war minerals. Work is to be done under the immediate direction of J. E. Spurr, who will also continue as mineral adviser to the U. S. Shipping Board. Mr. Spurr's investigation will cover mining, transportation, ore dressing, smelting and marketing of the war minerals. Special effort has been taken to dovetail this work with that of the Geological Survey on the one hand, and of the War Industries Board on the other.

A corps of men, acting as aides to the executive, has been organized in Washington to keep in touch with all field and experimental work. These comprise two groups, one specializing in mineral commodities and another on mining problems. J. H. Mackenzie, J. E. Maguire, F. W. Paine, H. S. Mudd, A. G. White, Hennen Jennings, H. C. Morris, A. W. Stockett, and Oliver Bowles are included in the former. A large amount of field work covering special war problems is already going on. This is divided into two sections, production and utilization, the latter being carried on largely in the experimental stations of the Bureau.

In studying manganese war problems, H. C. Morris and C. M. Weld are covering the general situation in Washington. Dr. George D. Louderback is in charge of examination work in California, H. M. Parks in Oregon, and C. E. van Barneveld in the Rocky Mountain region. Work is being done on the Cuyuna range, in Minnesota, and W. R. Crane and E. R. Eaton have been engaged in the Appalachians. E. G. Spilsbury and H. W. Hardinge are also making special investigations in the latter region. Bradley Stoughton, H. D. Hibbard, H. M. Howe, J. E. Johnson, Jr., and others are advising concerning the use of manganese in making steel.

Work on chromite is under J. H. Mackenzie and Albert Burch. J. E. Maguire has examined chromite deposits in the East and Earle T. Hill in North Carolina. Chromite deposits in Newfoundland are being investigated by F. H. Probert. R. T. Stull, at Columbus, Ohio, is making a special study of substitutes for chrome brick, in particular of magnesite and dolomite. Promising results have been obtained by the Bureau in concentrating low-grade chrome ores at Seattle, Wash., and Berkeley, California.

Field investigations of graphite are being made by G. D. Dub, loaned to the Bureau of Mines by the New Jersey Zinc Co. R. T. Stull is also making a comparative study at Columbus of domestic flake graphite and Ceylon flake as related to the manufacture of crucibles. F. G. Moses is studying graphite milling processes at the Salt Lake station. H. S. Mudd is in general charge in Washington. The potash problem is being investigated by A. W. Stockett. At Colorado City, in coöperation with the Portland Gold Mining Co., G. H. Clevenger is experimenting on the recovery of potash from the large piles of Cripple Creek tailings. Work on tungsten is in charge of J. H. Mackenzie, assisted by J. H. Means and J. E. Maguire.

The pyrites problem is under the general supervision of H. A. Buehler, with E. A. Holbrook and several assistants assigned to the study of coal pyrites. C. E. Julian has been actively engaged in the South, principally on pyrites. R. R. Hornor has investigated the pyrrhotites of the South and will study methods of mining pyrites in Virginia. L. D. Huntoon has been investigating pyrites in the Northeastern States.

The sulphuric acid situation is under constant review by A. E. Wells, assisted by D. E. Fogg. Iron is in charge of C. M. Weld. H. Foster Bain, assistant director of the Bureau of Mines, with a corps of consulting engineers including Charles Janin, Howland Bancroft, and A. P. Rogers, is covering the tin situation.

To Redraft Minerals-Control Bill

An effort will be made during the recess of Congress by Senator Henderson and other members of the Committee on Mines and Mining to redraft the Minerals-Control bill along lines meeting the approval of the members of the committee. It may be predicted with certainty that the bill which will result will be very different from that which was passed by the House of Representatives.

It had been Senator Henderson's intention to await the reopening of the regular session before attempting the formal drafting of the Senate bill. At the special request of the Secretary of the Interior, however, and with the understanding that the President is much interested, he has consented to work on the bill during the vacation period.

Platinum Licensing Placed in Charge Of Hennen Jennings

Hennen Jennings, one of the U. S. Bureau of Mines' consulting engineers, now doing active work with that organization, will be in direct charge of the licensing of platinum. Though the licenses will be issued by the Bureau, the allocation of platinum will continue under the direction of the War Industries Board. The regulations which will govern the licensing are now being drawn up by a committee consisting of Mr. Jennings, W. F. Hillebrand, of the Bureau of Standards; J. M. Hill, of the Geological Survey; Charles L. Parsons, of the Bureau of Mines, and C. H. Connor, of the War Industries Board.

Substitution of cadmium pigment to replace chrome is being suggested by the War Industries Board. It is stated that it has many advantages over chrome and could be produced in much larger quantities than at present. An important source would be the byproduct of zinc and lead smelting.

July Mining Dividends

Disbursements to stockholders in July, 1918, by 30 United States mining and metallurgical companies making public reports amounted to $5,765,456, compared with $16,531,242 distributed by 46 companies in July, 1917. Of the latter, however, $5,026,450 represented special Red Cross dividends, so that the regular payments were $11,504,792. Canadian, Mexican and Central American companies paid $864,342, as compared with $1,055,807 a year ago.

The interesting features of July were the initial payments by Butte Copper and Zinc Co. and Rochester Mines; also the payment by the Ontario Silver Mining Co., of Utah, which was the first since 1902.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Smelters, pfd. A	U. S.	$1.50	243,846
Am. Smelters, pfd. B	Mex.	1.25	149,885
Arizona Commercial, c	Ariz.	.50	132,500
Bingham Mines, c	Utah	.50	75,000
Butte Cop. & Zinc, mang., z	Mont.	.50	205,850
Caledonia, l.s	Ida.	.03	78,150
Camp Bird, pfd. g	Colo.	.18	110,501
Cresson Cons., g	Colo.	.10	122,000
Daly, l.s	Utah	.10	15,000
Dragon Con., l.s	Utah	.01	18,750
Golden Cycle, g	Colo.	.03	45,000
Homestake, g	S. D.	.50	125,580
Inspiration, c	Ariz.	2.00	2,363,934
Iron Blossom, l.s	Utah	.02½	25,000
Iron Cap, c	Ariz.	.25	36,203
Judge Min. & Smelt., s.l.z	Utah	.12½	60,000
New Idria, q	Calif.	.50	50,000
North Butte, c	Mont.	.25	107,500
Ontario, s	Utah	.50	75,000
Plymouth Cons., g	Calif.	.24	58,520
Portland, g	Colo.	.02	60,000
Rochester Mines, g	Nev.	.02	40,000
Shattuck Arizona, c	Ariz.	.50	175,000
Tonopah Belmont, s	Nev.	.10	150,000
Tonopah Min., s	Nev.	.07½	75,000
Union Con., g	Nev.	.05	10,000
United Eastern, g	Ariz.	.05	68,150
U. S. Smelting, com	U.S.-Mex.	1.25	438,894
U. S. Smelting, pfd	U S.-Mex.	.87½	425,555
Utah Con., c	Utah	.50	150,000
Vindicator, g	Colo.	.03	45,000
Wolverine & Ariz., c	Ariz.	.25	29,638

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Cons. Min. & Sm. Co., c.z	B. C.	.62½	261,936
Howe Sound, c	B. C.	.05	99,208
Lucky Tiger-Comb., g	Mex.	.05	35,767
McKinley-Darragh-Savage, s	Ont.	.03	67,431
N. Y. & Hond. Rosario	C. A.	.50	100,000
Nipissing, s	Ont.	.25	300,000

The totals for the first seven months of the year are as follows: Mining and metallurgical companies, $95,655,043; holding companies, $1,076,866; Canadian, Central American, South American and Mexican companies, $9,755,453.

Back Up the Fighting Men at the Front

Theodore Roosevelt says in a recent article: "There is no American worth calling such whose veins do not thrill with pride when he reads of what has been done by General Pershing and his gallant army in France. The soldiers over there who wear the American uniform have made all good Americans forever their debtors. Now and always afterward we of this country will walk with our heads high because of the men who face death and wounds, and so many of whom have given their lives fighting for this nation and for the great ideals of humanity across the seas.

"But we must not let our pride and our admiration evaporate in mere pride, in mere admiration of what others have done. We must put the whole strength of this nation back of the fighting men at the front. We owe it to them. We owe it at least as much to the gallant Allies who, for nearly four years, fought the great battle that was our battle, no less than theirs."

"Back Up the Fighting Men at the Front," and wherever they are, is not an appeal, but is a command to every American. Back them up here while they are preparing for the front. Give them your support in every way. Our own 27th Regiment is nearest to us. Keep the fund growing. Add what you can to the total.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	20.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Total	$15,867.11

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Owing to the large volume of work involved in administering the fund, contributions are acknowledged only by publication in the *Journal*.

Red Tape Cut in Steel Shipments

WASHINGTON CORRESPONDENCE

By permitting shipments of iron and steel products, not in excess of five tons, without a priority order, the War Industries Board has taken a step which is expected to prevent a great deal of inconvenience to many industries. Incidentally the board will be relieved of a large volume of work required in handling small orders. As the mining industry uses a large amount of steel in quantities of less than five tons, it will benefit considerably, it is thought, from the order. Mining tools, tin-plate and oil-well supplies come within the purview of the order.

Standardization of Wages Next

WASHINGTON CORRESPONDENCE

In discussing the standardization of wages throughout the nation, Felix Frankfurter, chairman of the War Labor Policies Board, says:

> Congress, through the taxes on excess profits; the War Industries Board, through its price-fixing; the President, through the veto of $2.40 wheat, have prepared the way for standardization of wages. Additional methods of keeping down the cost of living are being investigated at this time.
>
> All these measures, past and pending, have revealed the determination of the American people to let no one make money out of the war. What price-fixing means for the manufacturer, wage standardization is to the workers of the country.
>
> That means plainly that just as the price-fixing committee takes into account the cost of production and proper profits, so wage standardization must be built upon an accurate knowledge of the cost of living and a just estimate of what makes up the right American standard.
>
> Upon these general grounds, the War Labor Policies Board is advancing, as rapidly as the gravity of the problem permits, to the establishment of standard wages. Every one who has a real interest at stake will be consulted.

American Zinc Institute Meets At St. Louis

Successful beyond expectation was the meeting of the American Zinc Institute at the Statler Hotel, St. Louis, Mo., on July 29 and 30. Approximately 180 persons interested in mining, smelting and consumption of zinc attended, all sections of the United States being represented.

Permanent organization of the Institute will be carried out under plans to be worked out by a committee of seven, two of whom represent mining interests exclusively, two smelting interests exclusively, and three combined mining and smelting interests. Victor Rakowsky, of Joplin, and J. L. Bruce, of Butte, are the mining members; E. H. Wolff, of Peru, Ill., and A. B. McMillan, of St. Louis, the smelting representatives; and C. T. Orr, of Webb City, Mo., A. P. Cobb, of New York, and W. F. Rossman represent the mining and smelting interests combined.

This organization committee was named by a committee of 21 members, selected on Monday by Victor Rakowsky, C. E. Siebenthal and W. R. Ingalls, and will report by mail to the members of the Institute within 90 days. The committee of 21 is thoroughly representative of all branches of the industry and all parts of the United States.

The keynote of the meeting was coördination and coöperation of all branches of the zinc industry. This note was sounded by Mr. Ingalls in an address on the first day, and met with full endorsement from the delegates. The convention was unique in that the program as previously outlined was carried out in its entirety, no one of the speakers being absent. Features of Tuesday's meeting were addresses by A. P. Cobb on "New Uses of Zinc"; by E. H. Wolff on "Benefits of Coöperation Between Mining and Smelting Interests"; and by Dr. John Johnson on "Value of Experimental Work in Developing New Uses of Zinc and Zinc Products." Mr. Cobb stated that zinc can be made to take the place of other metals in countless cases. He referred to the uses of zinc in Europe for roofing and in freight cars and in other ways, and spoke of the possibility of making zinc replace copper, tin and other metals in the manufacture of many small articles. He also called attention to the fact that the New Jersey Zinc Co. is now erecting in New York a building for its use, in which all the metal work, except plumbing, will be of zinc.

Mr. Wolff said that one work of the Institute should be the formation of an export and import committee to consider the problem of securing a tariff on zinc products following the war. He said that just before the opening of the war, Germany and Belgium were becoming serious competitors of American sheet zinc makers by virtue of the tariff law of 1913.

Following a banquet on Monday night, at which addresses were made by C. T. Orr, Private Drew, of the Canadian forces, George E. Nicholson and several others, pledges for the expenses of the preliminary organization work of the Institute were asked for and about $1000 in excess of the sum named was subscribed. It was voted to contribute this surplus to the 27th Engineers' Comfort Fund, being raised by the *Engineering and Mining Journal.* The opinion of the mining and smelting representatives, expressed at the close of the meeting, was that a foundation has been laid for permanent betterment of the zinc industry in the United States.

War Minerals Corporation Favored By Senator Henderson

WASHINGTON CORRESPONDENCE

After a conference with President Wilson and a thorough discussion of the matter with Secretary Lane, as well as with Bernard M. Baruch, chairman of the War Industries Board, Senator Henderson, of Nevada, chairman of the Committee on Mines and Mining, will suggest to his committee that the War Minerals Bill be amended so as to place full powers for handling war minerals in the hands of the President, with the specific authorization that he may form a corporation to carry out the intent of the bill. Since Senator Henderson is being looked to by the members of the committee to take the initiative in this legislation, it is probable that his conclusions will be supported.

Senator Henderson considers that the $10,000,000 appropriation, which is carried by the bill passed by the House, is insufficient to carry out the purposes of the measure, and he will urge that $50,000,000, at least, be used as a revolving fund. The Senate, it is thought, will not go into the matter of maximum or minimum prices. The new bill will probably be much more general in its provisions than was the House bill. All details as to administration will be left to the discretion of the President.

Senator Henderson is denying himself a vacation and expects to have a draft of the proposed Senate bill ready to submit to the committee within two weeks. The committee will have the bill in final shape in time to lay it before the Senate immediately following the recess.

No formal consideration has been given as yet by the House Committee on Ways and Means to the things that specifically affect gold and other metal mining and the handling of platinum. It is probable that these matters will be deferred until the more general provisions of the bill have been agreed upon.

Editorials

Price-Fixing

THE subject of price-fixing, both in the phases of what has and what has not been done and in the effects, is too complicated for any economist yet to offer the results of a thorough study. But there are at least two incontrovertible deductions:

1. If there be fixed a maximum price, and if the market price remains at that figure, there is not enough of the commodity.

2. If a maximum price be fixed at a point above a free market price, the latter will fluctuate normally beneath it, but investment in new plant for the increase of production is likely to be deterred, wherefore there may eventually result the economic drawback of a maximum price that is directly restrictive.

There are probably many other theories to be deducted from the dangerous fallacy of price-fixing, but they will await more exhaustive study of cause and effect.

The Federal Trade Commission, which has been one of the exponents of price-fixing, sent to the Senate on June 29 a report on the existence of profiteering among American industries at the present time, which describes it in part as being due to "inordinate greed and barefaced fraud." Price-fixing, the report says, has tended to prevent run-away markets, but at the same time it strengthens the stronger factors in industries in their position and enriches them by profits "which are without precedent."

Clearly the only way that price-fixing can strengthen the stronger factors is by driving the weaker out of business and giving more of the market to the stronger; in other words, by being restrictive of production.

The Federal Trade Commission not only finds it difficult to maintain its equilibrium in walking that tight rope, but loses its balance completely on another one when it argues that the operation of the law of supply and demand is responsible for the large profits in the petroleum industry, that "industry being one where the law of supply and demand still operates."

The Federal Trade Commission, like King Canute, who commanded the tide to cease rising, feels that it has told the law of supply and demand that it is abolished, and therefore it ought not to operate anywhere. Incidentally, its minds have failed to react to the facts that the petroleum industry, which is one that has escaped price-fixing, is also that one of our great major industries whose products are in easiest supply and at no great advance in price.

The Federal Trade Commission was more responsible than any other agency for the trouble in our coal business last summer, which culminated in the disaster of last winter. That put it under such a cloud that it has been out of sight of late, but it was to be expected to bob up again serenely some day. Given a free hand, it can cause us to lose the war with its vagaries. The real place for the luminaries of this organization is at the elbow of Mr. Lenine and Mr. Trotzky.

The law of supply and demand has not been abolished any more than the laws of gravitation, of conservation of energy and the movements of the solar bodies. By the expenditure of energy an aëroplane can mount into the clouds, but the aviator knows well that the law of gravitation is not abrogated. In spite of price-fixing, the law of supply and demand has been working inexorably, vain and deluded persons to the contrary notwithstanding.

Mr. Hoover, who is a hundred times more intelligent than most of the leaders by whom he is surrounded in Washington, has leaned toward price-fixing as a matter of policy, but we are not sure that he is not somewhat confused on the subject, and certainly he has not violated the law in the way that the War Industries Board has done. In a recent address to some professional colleagues Mr. Hoover said frankly that economists of the old school were adverse to price-fixing, but he thought that we should recognize the new conditions of concentrated buying, something that never previously existed; and also should recognize that the classic argument of high prices being the surest and quickest way of curtailing consumption would be in favor of the rich and against the poor, a condition not to be tolerated.

The factors that are introduced by concentrated buying do not produce any violation of economic law, nor are they a novelty resulting from the war, except with respect to their enormous scale. A producing and selling monopoly is just as much subject to the law of supply and demand as is anybody else, as Professor Taussig will testify unless he has modified the ideas expressed in his "Principles of Economics." A buying monopoly meets the same principles from the opposite direction. Concentrated buying is admittedly of great influence upon a market, just as Mr. Hoover, with his great commercial experience, has demonstrated; but that is no new discovery. For example, the concentrated buying by the U. S. Steel Corporation long before the war had a dominating influence upon the American zinc market. It is conceivable that the business in a commodity might be confined to two parties—one producer and one consumer. Indeed, we have something of that sort now in the cases of aluminum and nickel. Prices are arranged by agreement between the two parties, but the law of supply and demand obtains just the same. The evil of Governmental price-fixing is that it is not a matter of agreement, or, if so, there is a good deal of fiction about the "agreement." Thus, the coal producers and departments of the Government *agreed* about a year ago upon a price for coal. Other departments of the Government repudiated that agreement and *fixed* a scale of prices much lower. We need not rehearse what ensued, but we may quote R. V. Norris, of the Fuel Administration, who, at the same recent meeting at which Mr. Hoover spoke, said bluntly that the Fuel

Administration had made a mistake; that it had been compelled to raise its fixed prices to within a few cents per ton below the figures of the Lane-Peabody agreement, and that the increased statistical production of coal in 1917 had, indeed, been increased production of slate. Mr. Manning, of the U. S. Bureau of Mines, was one of the first to make the last assertion. Let it be noted that we are not now quoting unofficial criticism, but rather that of bureaus of the Government itself.

With respect to Mr. Hoover's second point, questions of politics become involved with those of economics. We have been ready to admit that in the matter of food supply—something that the people must have in equal distribution—a rejection of the principles of *laissez faire* is defensible. An elimination of the intermediate speculation between the harvests, which Mr. Hoover has so skilfully managed, is distinctly economic and in no way in violation of natural law. But whether control or high prices would be most effective in curtailing consumption, and what would be the political reactions, are not so clear. There is considerable evidence that under the plan that has been adopted it is the rich who are thrifty and the poor who are extravagant. When the natural control over extravagance by high prices disappears, it becomes necessary to introduce ration-card systems. But even so, and with all the Governmental administration, both here and abroad, the natural law is determining conditions just as if there were no war. In Europe the price of bread is kept low by Governmental subsidies, but the governments themselves must pay for wheat the price that is necessary to get it.

We are beginning to unveil the complexities of the whole subject. There are certain differences in conditions of commodities that directly touch the necessities of the people, and those that do not; between those that are of seasonal production and those that are not, but in the long run the same law rules. Three years ago people would risk their money in building new plants. Now they will not. The Government has to supply the money or else supply a guarantee. Price-fixing may seem to save money in one way, but it costs more in another. We do not think that Mr. Hoover is such a repudiator of natural laws as sometimes he says he is. Anyhow, there is a wide difference between Mr. Hoover's practices in price-fixing and those of some other agencies in Washington.

Washington Quietly Reverses Itself

MANY months ago we used to be flooded with announcements of dictatorial actions by bureaus and boards in Washington. The War Industries Board, the War Trade Board, and every board, big and little, delighted in telling the people what they were to do on and after a certain date. The consumption of paper was enormous. Protests against actions announced, representations respecting their impracticability, and forecasts of difficulties to ensue all went unheeded. The board ordered, and so it was to be. Apparently the several boards thought that they were gifted with omniscience. Many humble persons thought otherwise. However, it took time for the boards to learn, but, given time enough, things were bound to creep into the minds of even the most blockheaded. It is noteworthy, however, that the reversals are not heralded by the press bulletins in the way that the orders used to be.

Washington was told at the very beginning of the war that it was a bad plan to draft miners. England had learned that by painful experience, but Washington disregarded both the experience and the warnings. It took time and the waning production of coal and the metals to get this into official heads.

Not long ago the War Trade Board was going to do spectacular things in the way of restricting exports in what it academically classed as non-essentials. However, the South American and other countries that wanted goods did not agree with our definitions about what was non-essential; and inasmuch as we needed things from those countries and had to pay for them by the exchange of either goods or gold, the occasion arose for a quiet reversal of policy.

So, too, with the War Industries Board. It was confident that it could suspend the law of supply and demand and dictate prices forever and a day, but after perpetrating much mischief it also is beginning to see things, and is raising prices, from time to time, though always too late.

The Federal Trade Commission still tries to stick crowbars through the spokes of production, but Dr. Garfield apparently does not think very much of the Federal Trade Commission. About a year ago it handed him a bomb, without telling him about it, and he innocently dropped it and caused an explosion that brought objurgations upon him. Nowadays, Dr. Garfield, who has developed a pretty good kind of an administration, does his own figuring respecting the cost of producing coal, and seems to be contemptuous of the Federal Trade Commission. Other people feel the same way toward it.

Well, the world does move, the members of bureaus and boards do learn by experience; but what a pity it is that the experience must be so dearly bought, simply for the sake of refusing expert advice.

The Government has taken over the telegraphs and telephones, which have been put in charge of Mr. Burleson. He tells the people, through interviews with the press, of the wonderful things that he is going to do in the way of reducing charges, improving services, etc. We should feel more assurance as to these optimistic promises if the postal service had been distinctly improved; whereas, on the contrary, it is well known to have deteriorated. We should think that the Post Office people would have some pride in being efficient, but they seem to be uninterested in their work and callous to complaints. We must confess to feelings of alarm about what is going to happen to the wire services. Is the time coming when we cannot be sure of the delivery of our messages to Washington and Boston inside of a day or two?

We have previously remarked upon how mining engineers are the men to do things, and have mentioned Hoover and others as shining examples. The State of Nevada did a good thing for itself when it elected one of the profession—Emmet H. D. Boyle—to be its Governor. Governor Boyle made a very fine impression upon everybody when he visited New York and Washington last winter. Governor Boyle did a good job when he appointed Charles B. Henderson to the Senate to succeed the late Mr. Newlands. Senator Henderson, as chairman of the Committee on Mines and Mining, has exhibited himself as an earnest, intelligent and hard-working legislator, who is sympathetic with the mining industry and is raising his committee to the importance that is its due as the representative of one of the great basic industries of the nation.

BY THE WAY

Jack: Howld tha jaw, Sampey. I doan't want ee prachen to me; aal tha same, bleve thare's truth en what thee's say. I doan't fess to be a Christian, but aal tha saame I bleve they who do liv too et hav tha best ov the argement. But how caan a feller be a Christian in a minin' taown like Broken 'Ill, weth all tha sin and cussedness by which ee be surrounded? In tha street ee can see sin in various forms, like ee can in biggar cities, and ef ee go to hes union metins, I tell ee, et es very diffurunt to a Methody praier metin; what wuth the hosifers cussing each other, and sumtimes members axing questuns tha hosifers doan't like, and especbully if they should ax any question about the strike funds—or the funds to relieve tha unemployed, oh! my Jemima! look out fur scwa's and storm, and a pre-emptory shut up. I tell ee, no dacent members of the unions care to cum to the metins, and so them les fitted fur the poshesuns and caan make moast noise get the sates of the hosifers, and doan't they show what they be maade of!

Sampey: Howld tha durnd tongue, taalking about tha unions. I doan't want any moar of they. Tha strike of larst year and tha way things was carried on satisfied me that unionism is a good thing fur a few, but a confounded costly thing fur tha many; and how we hav been such fools to stan et so long es what I caan't tell ee. Here the managers of the unions got the money, and they waen't pay out any ov et to the like of me, who haave been idle moast of tha time sense tha strike commenced laast year, and our state is very pitible, I sure ee; but they doan't care. It look to me like ef they want to keep et fur themselves, or to bolster up tha traading consarns they hav got on thare hands. Can you tell me, Jackey, who has got the benefit ov thoose consarns—the union members or the top sawyers in the consarns? Have they employed more men to do the wurk? Do they sell cheaper or what es the advantage gained to the working man? I fail to see et. Et may be because I am dense, and do not see so fur ahead as the clever labour leaders; but, take ut frum me, no more strikes fur me, thank ee.—"One and All," in *Barrier Miner*, N. S. W.

The disagreement of authorities, coupled with a prolixity in individual interpretation, is not a new feature in mining and geological endeavor. A gentleman who wrote of these matters in 1683 in a book dealing with "The Laws of Art and Nature in Knowing, Judging, Assaying, Fining, Refining, and Inlarging the bodies of confined metals," speaks, in the preface, of "the Rise and Springs of metallic oars, and how they grow in the Mountains, Veins, and Channels of the Earth, and how generated (of which the old and later Philosophers had many different opinions) as also the Streams, Channels, and their Enternals (and other accidents which do discover and produce oars whereby the miners do guid themselves in their proceedings and works) yet because it would be too long to recite those *Opinions of Philosophers* and various Operations of miners (in respect they do now agree in all things, and miss very much of their aims, and have written many books to little purpose) therefore, for brevity sake, I have omitted them, and proposed only my own practice for the better advancing this Metallick Art." The original treatise was written in German by one Lazarus Erckern, who was "Chief Prover (or Assay Master General of the Empire of Germany)," and the quaint way in which he brushes aside the "Opinions of Philosophers" to make room for a recital of his "own practice" indicates that the Teutonic sense of humor, as we understand it today, is also not a recent acquisition.

Metallurgists who are looking for knotty problems will probably hail with delight the recent discovery of a complex ore reported in a New York paper: "According to consular reports, residents of Puerto Cortes, Honduras, have discovered a deposit of manganese within two miles of the line of the national railroad. It is stated that the ore is mixed with graphite, copper and gold."

A Twentieth Century Paul Revere

Listen, my children, and you shall hear
Of another rider than Paul Revere;
Of a tiny lad on a strange, strange steed,
Who rode a race for his country's need.

He heard of his country's call for men;
He heard of their sacrifice, and then—
He heard of the need for money, too;
For food and clothes to help them through.

He wanted to help, though he could not fight;
He wanted to serve in the cause of right.
So he mounted a Thrift Card, reins in hand,
And rode and rode throughout the land.

"Money!" he cried. "Money for clothes,
The boys in the trenches"—off he goes;
And amid the sound of clattering hoofs
The call reëchoed across the roofs—

"Gather your nickels, gather your dimes,
Help the nation, prepare, these times."
The people heard, as the boy flashed by;
They heard his fevered, earnest cry.

And out of the stockings laid away,
And out of the closet hid from day,
They gathered their savings of many years,
And poured them forth with many cheers.

"Take these," they cried, "In the cause of right,
We'll save for the boys who nobly fight."
As on he sped he heard them say,
"We'll do our bit—save every day."

And when the boy on his valiant steed,
Had spread the news of his country's need,
He drew the reins on the old "Thrift Stamp,"
And petted his nose, all sweaty and damp;

"Our work is done," he said, "Old Man,
The nation's roused to the War Thrift Plan."
—*Unknown.*

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

The Mining Index

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9696—CARBOCOAL. Chas. T. Malcolmson. (Bull. 137, A.I.M.E., May, 1918; 7 pp.) 40c.

9697—POWDERED COAL—The Possibilities of Powdered Coal as Shown by Its Combustion Characteristics. W. G. Wilcox. (Chem. and Met. Eng., July 1, 1918; 5¾ pp.) Paper before the Western New York Section of the Am. Chem. Soc., May 31, 1918.

9698—PULVERIZED COAL—The Use of Pulverized Coal. Ch. Dantin. (Eng. and Contr., May 29, 1918; 2 pp.) From Le Génie Civil, June 10, 1916.

9699—PULVERIZED COAL—Use of Pulverized Coal at the Bunker Hill & Sullivan Smelting and Refining Plant. C. T. Rice. (Eng. and Min. Journ., July 20, 1918; 3¼ pp., illus.) 20c.

9700—WEIGHTS of Various Coals. S. B. Flagg. (Tech. paper 184, U. S. Bureau of Mines, 1918; 14 pp.)

MINING AND METALLURGICAL MACHINERY

9701—AIR COMPRESSORS—Modern Air Compressors—I. David Penman. (Min. Mag., June, 1918; 8 pp., illus.; to be continued.) 40c.

9702—FOUNDATIONS—Repair Work to Heavy Foundations. Sidney Gill. (Iron and Coal Tr. Rev., June 14, 1918; 1¾ pp., illus.) Paper before Yorkshire branch of Nat. Assn. of Colliery Mgrs. (British). 40c.

9703—LAMPS—Combustion Tube Safety Lamps. (Iron and Coal Tr. Rev., June 7, 1918; 1¼ pp., illus.)

9704—POWER HOUSE—Economic Handling of Ashes. Reginald Trautschold. (Ind. Management, July, 1918; 3⅔ pp., illus.) 40c.

MISCELLANEOUS

9711—LABOR—Cost of Constructing and Moving Portable Camp Buildings. (Eng. and Contract, June 19, 1918; 1½ pp., illus.)

9712—MINERAL WATERS in 1916. Arthur J. Ellis and Alfred L. Chambers. (Mineral Resources of the U. S., 1916—Part II, Mar. 13, 1918; 48 pp., illus.)

9713—POWER—Electric Power for Mining in Yavapai County, Arizona. (Eng. and Min. Journ., June 22, 1918; 4¼ pp., illus.) 20c.

9714—STATISTICS—Report of the Committee on the Standardization of Mining Statistics. Albert H. Fay. (U. S. Bureau of Mines, 1918; 39 pp.)

9715—WAR—American Chemists' Defensive Measures Against Gas Attacks in France. R. K. Tomlin, Jr. (Met. and Chem. Eng., June 15, 1918; 3 pp., illus.)

Personals

Have You Contributed to the Association of the 27th Engineers?

L. H. Goodwin has gone with Rogers, Mayer & Ball, 42 Broadway, New York, as office and field assistant.

John Seward has been assigned to the executive division of the General Staff, at Washington, D. C., with rank as major. He will specialize on war minerals.

Hugh Lee has resigned his position with the Porcupine Crown Mines, Ltd., at Porcupine, Ont., to become lecturer on metallurgy at the Pennsylvania State University.

E. F. Flad, formerly in charge of the Youngstown, Ohio, slag-crushing plant of the Carnegie Steel Co., has been made chief construction engineer and efficiency expert.

Dr. E. L. Bruce, of the Canadian Geological Survey, is making an examination of the Star Lake district, Manitoba, where discoveries of molybdenum and scheelite have been made.

J. W. Crowdus, 222 Mills Bldg., El Paso, Tex., has been commissioned first lieutenant in the Engineer Reserve Corps, and has been ordered to Camp Lee, Petersburg, Va., for duty.

H. W. Aldrich has resigned his position with the Anaconda Copper Mining Co. to become assistant general superintendent of the Inspiration Consolidated Copper Co.'s plant at Miami, Arizona.

J. Esdaile Florance and **William H. Hampton**, mining and consulting engineers of 68 Broad St., New York, mutually dissolved partnership on July 1, 1918, each resuming independent practice.

H. M. Hanna, Jr., has been elected president of the Detroit Iron and Steel Co.; **Frank B. Richards**, vice president; **R. S. Grant**, secretary; and **W. S. Whitcomb**, assistant secretary and treasurer.

R. J. Ennis, general manager of the McIntyre Porcupine Mines, Ltd., at Porcupine, Ont., was in Toronto recently in connection with plans for the extensive development of the Newray property.

A. L. Sweetser, recently mining engineer and chemist for the International Carbon Products Co., and the Huff Electrostatic Separator Co., is now engaged in war mineral research work for the Federal Government.

B. Magnus has been commissioned captain in the Engineers' Reserve Corps, and is now on active duty. He requests that all communications for him be addressed care of Henry M. Toch, 320 Fifth Ave., New York City

W. R. Ingalls delivered an address on "Benefits To Be Derived from Close Coöperation of Zinc Mining and Smelting Interests in Helping Win the War" at the meeting of the American Zinc Institute at St. Louis, Mo., on July 30.

Edwin O. Daue, formerly manager of the Dolores Mines Co., Madera, Chihuahua, Mex., and later general superintendent of the Primos Mining and Milling Co. and Primos Chemical Co., Lakewood, Colo., has been commissioned captain in the U. S. R. Engineers.

Prof. Mortimer E. Cooley, of the University of Michigan, has been nominated for president of the American Society of Mechanical Engineers for 1919. F. R. Low, editor of "Power," New York; Henry B. Sargent, of New Haven, Conn., and John A. Stevens, of Lowell, Mass., have been nominated for vice presidents.

Stuart B. Marshall, formerly manager of the American Manganese Manufacturing Co., at Dunbar, Penn., and until recently general superintendent of the property and buildings at Badin, N. C., of the Aluminum Co. of America, is now established at Roanoke, Va., as consulting engineer, chemist and metallurgist for coal and ore lands, blast furnaces and deposits of manganese, pyrites and other minerals.

Obituary

Joseph Rosenberg, a retired smelter, died recently at Brooklyn, N. Y., aged 75 years.

Prof. Stephen F. Peckham, chemist, died in Brooklyn, N. Y., on July 11, aged 79 years. He was at one time connected with the Geological Survey of Minnesota as chemist.

Charles Cetewayo, who claimed to be the son of the late King Cetewayo of Zululand and a protege of Queen Victoria, died on July 23 at Kingston, Ont. He was a mining engineer and had been engaged in the examination of mica properties near Westport, Ontario.

John Duir Irving, who joined the New York Engineering Corps at the outbreak of war, being among the first in the Yale faculty to volunteer for active service, died recently in France from pneumonia. Dr. Irving was born in Madison, Wis., in 1874, and graduated from Columbia University in 1896, receiving the degrees of Master of Arts and Doctor of Philosophy. He later became professor of economic geology at Yale University, was given the honorary degree of Master of Arts there in 1907 and was widely known as an authority on ore deposits. Further details of his career will be published as a complete biography in a subsequent issue of the "Journal."

Societies

American Society for Testing Materials, in coöperation with the American Society of Civil Engineers, the Bureau of Standards, the Bureau of Foreign and Domestic Commerce and the Office of Public Roads, is preparing a series of Spanish-English pamphlets for distribution throughout Latin America and Spain as a means of promoting trade. The first of the series has already been published under the title "Standard Specifications and Tests for Portland Cement," and will be followed by others on subjects such as carbon-steel rails, open hearth steel girders and high tee rails. The pamphlets will accurately define generally accepted American industrial standards for construction materials.

American Institute of Mining Engineers. Probably 40 or 50 technical subjects will be discussed at the war-work meeting of the Institute, to be held in Colorado on Sept. 1 to 6, the program of which was given in much detail in last week's issue. Among these subjects are the following: "The Byproduct Coke Oven and Its Products"; "Development of the Coke Industry in Colorado, Utah and New Mexico"; "The Possible Existence of Deep-seated Oil Deposits on the Gulf Coast"; "The Manufacture of Ferroalloys in the Electric Furnace"; "Electrostatic Precipitation"; "The Effect of Oxygen Upon the Precipitation of Metals From Cyanide Solutions"; "Roasting for Amalgamating and Cyaniding Cripple Creek Sulphotelluride Gold Ores"; "Pyrites Deposits of Leadville, Colo;" "Molybdenite Operations at Climax, Colorado"; and "Radium."

Industrial News

Aspromet Company, formerly the Asbestos Protected Metal Co., of Pittsburgh, has opened an office in the Munsey Bldg., in Washington. O. O. Robinson, district manager, and H. E. Marks, general sales manager, will be in charge.

Denver Engineering Works Co., Denver, Colo., announces that, at the annual meeting held in June, 1918, the following directors and officers were elected: Board of directors: H. W. Hardinge, Frank E. Shepard, William W. Torrence, Robert J. Pitkin, Richard B. T. Kiliani. Officers: Frank E. Shepard, president; Richard B. T. Kiliani, vice president and treasurer; William W. Torrence, general manager; Robert J. Pitkin, secretary. In addition to the manufacture of Hardinge conical ball mills, the company will continue to manufacture mining and milling machinery, electric hoists, mine timber framers, cylindrical ball mills, Richards pulsator jigs and classifiers, Ovoca classifiers and similar equipment

Trade Catalogs

Cameron Centrifugal Pumps. A. S. Cameron Steam Pump Works, 11 Broadway, New York. Flyer; form 909, illustrated. Relates to pumps for condenser service.

Vertical Triplex Power Pumps. Worthington Pump and Machinery Corporation, 115 Broadway, N. Y. Deane Works, Catalog D-702; pp. 56; 6 x 9; illustrated. Descriptive of single and double-acting pumps of type named.

Wire Cloth, Perforated Metals, Etc. Multi Metal Co., Inc., 247-253 W. 19th St., New York. Catalog and price list, 1918, pp. 20; 7½ x 10½; illustrated. Contains information interesting to the user of bolting, sifting and filtration materials.

"Pentarco" Distilled Pine Products. Pensacola Tar and Turpentine Co., Gull Point, Fla. Catalog and price list; pp. 16; 3⅜ x 6; illustrated. Discusses pine tar, pine oil, tar oil, pure pine flotation oils and gives a formula for making "Pentarco" oils soluble.

Roots Rotary Gas Exhausters. P. H. & F. M. Roots Co., Chicago, Ill. Catalog No. 63; pp. 40; 8½ x 11¾; illustrated. The predominating feature is the publication of tables of engineering data, making the catalog useful as a reference work to any one interested in the manufacture or use of gas.

Nonpareil Insulating Brick. Armstrong Cork and Insulation Co., Pittsburgh, Penn. Leaflet; pp. 4; 3½ x 6; illustrated. Copies free upon request. These brick are made of kieselguhr mixed with cork, the cork being later burned out, leaving a porous brick that will resist temperatures up to 1650° F. without change.

Green Sealflex Arches. Green Engineering Co., East Chicago, Ind. Pamphlet; pp. 14; 3½ x 6¼; illustrated. This little book, issued under the title "Capacity," describes as an improvement in furnace design a long, flat arch known as the "Sealflex," for which several advantages are claimed over the old-style flat and sprung arch. "Geco" arch tiles, designed and made by the company, are used in the arch described.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Hydrometallurgy—Method of Recovering Metals from Solution. Rudolph Gahl, Miami, Ariz. (U. S. No. 1,269,418; June 11, 1918.)

Alumina, Treatment of Insoluble. Howard F. Chappell, New York, N. Y., assignor to Mineral Products Corp., New York, N. Y. (U. S. No. 1,270,266; June 25, 1918.)

Amalgamator. Benjamin Q. P. Foss, San Francisco, Calif., assignor to the Foss International Ore Reduction Co., San Francisco, Calif. (U. S. No. 1,270,399; June 25, 1918.)

Concentrating Table, Submerged. William A. Huelsdonk, Modesto, Calif. (U. S. No. 1,270,736; June 25, 1918.)

Drill Sharpener. William A. Smith, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,270,667; June 25, 1918.)

Furnace with Conveying Apparatus for Treating Certain Mineral or Chemical Products. Charles J. Leyes, Jersey City, N. J. (U. S. No. 1,270,307; June 25, 1918.)

Phosphate and Potash—Process of Producing Potassium and Phosphorus Compounds. Edward W. Haslup, Bronxville, N. Y., and Benjamin A. Peacock, Philadelphia, Penn. (U. S. No. 1,270,515; June 25, 1918.)

Aluminum, Process of Making Chloride of. Dillon F. Smith and Harry Essex, Pittsburgh, Penn., assignors to Gulf Refining Co., Pittsburgh, Penn. (U. S. No. 1,270,226; June 18, 1918.)

Concentrator. John K. Turner, Portland, Ore., assignor to Lillie Turner, Portland, Ore. (U. S. No. 1,269,760; June 18, 1918.)

Dredge, Gold. Lorenzo R. Gage, Sr., Hoquiam, Wash, (U. S. No. 1,270,142; June 18, 1918.)

Filtering Process. Albert Legrand Genter, Salt Lake City, Utah, assignor of one-half to the General Engineering Co., Salt Lake City, Utah. (U. S. No. 1,269,700; June 18, 1918.)

Manganese, Process of Making Dioxide of. Carleton Ellis and Alfred A. Wells, Montclair, N. J., assignors to National Carbon Co., Long Island City, N. Y. (U. S. No. 1,269,915; June 18, 1918.)

Oil Shale, Method of Treating and Apparatus for. Lebbeus H. Rogers, New York, N. Y. (U. S. No. 1,269,747; June 18, 1918.)

Ore Dressing—Ore-Separating Device. Roderick W. Haddock, Independence, Ore. (U. S. No. 1,269,704; June 18, 1918.)

Phosphate—Process of Producing Gas and Phosphatic Fertilizer Material. Alberto, Francesco Delacourt, Genoa, Italy, assignor to Societá Anonima Italiana Gio. Ansaldo & C., Genoa, Italy. (U. S. No. 1,269,795; June 18, 1918.)

Editorial Correspondence

SAN FRANCISCO—July 22

Baja California Gold is again attracting attention. Display was recently made at San Diego, Cal., by J. F. Delgado & Co. of high-grade ore taken from property said to be situated about 30 miles from Campo, and owned by Mexicans who have been developing and mining for several years. They use the primitive arrastre, driven by burro power, for separating the gold. Although the ore is reported to be rich, the owners are not getting rich. There are also some rich silver leads in the southern part of the peninsula, but, like the gold properties, they lack modern methods of mining and metallurgy essential to the development of profitable mines. Baja California awaits not only northern enterprise, but the eradication of Mexican rule. However, the political conditions are not as bad on the peninsula as in Mexico proper.

A Decrease in Oil-Well Drilling of 31% in California fields during the first six months of 1918, as compared with the like period of 1917, shows plainly the need of renewed attention to the subject of oil-field development and emphasizes the necessity of preparation on the part of operators—not only preparation for development of areas known to contain possible oil measures, but the avoidance of drilling in ground where no positive indications of oil appear. Wildcatting is an essential part of the program for the thorough prospecting and development of oil-bearing lands. But wildcatting for the mere purpose of exploiting and promotion is not only detrimental to the oil industry, but is a reprehensible practice that should be discouraged by legal authority, which may or may not rest in the powers of the oil and gas supervisor. If the law does not provide this power, there is no valid reason why the law should not be amended.

Chrome Ore in California is held by a recent decision of the U. S. Land Office to be subject to location and development on railroad land. William Hales and associates made four locations on Central Pacific lands in Placer County. These lands are now held by the Power Timber Co., assignee of the railroad company, which claimed that the right to possession was vested in the assignor by the law of 1864. Hales and associates contended that chrome iron ore, which produces chromium, is a special mineral that is not to be classed as iron, as the important content of the ore is not iron but chromium, and extremely valuable to the Government at the present time. Both the local land office at Sacramento and the General Land Office at Washington approved the contention and awarded to the locators the right to proceed with development and production under their locations. That the land office acted upon no precedent may give rise to other or further contention that chromic iron is more iron than chrome, but the fact is established without recourse to precedent of legal action that if there were more iron in the chrome ores than chromium the percentage of chromium would not be high enough to warrant its development for chromium content. And the railroads could keep it and welcome. If the demand for California iron ores were sufficient to warrant extensive mining of iron, the iron miners would not hunt for commercial iron properties in the chromic iron fields. The land office decision has the merit of common sense, which is sometimes practiced irrespective of precedent.

YREKA, CALIF.—July 22

The Chrome Interests of Siskiyou have been advised by Congressman Raker that the Government will at once begin work on the construction of roads into the chrome deposits of the Scott and Klamath River section, where many new chrome deposits are being developed. The county has appropriated $10,000 to assist the Government in opening these highways, which, it is estimated, will cost $97,000. One hundred heavy trucks will be required to handle the output of the new districts.

The Mining of Manganese is a new industry in the central part of Siskiyou County. Several deposits have been found, but heretofore none have been extensive enough to interest capital. A number of high-grade deposits have been uncovered between Forks and Salmon and Orleans Bar, which will be operated as soon as a road is built. The manganese mines now operated by the Western Metals Co. are within a radius of 18 miles from Yreka. The deposit in Cottonwood district near Black Butte is within a short railroad haul of the Ager. This mine is an open cut with 1000 tons of 45% ore in sight. The company's other principal property is in the Deadwood district six miles from Fort Jones.

BISBEE, ARIZ.—July 22

Production of Manganese is being rushed by the Phelps Dodge Corporation, which has found the metal in a number of its local copper workings. Last month 600 tons of high-grade manganese went direct to the Alabama works of the Tennessee Coal, Iron and R. R. Co. This month the shipments will approach 1000 tons.

The Copper Queen Steam Shovels will begin by the end of August the actual mining of chalcopyrite ore on Sacramento Hill for the test concentrating mill. The rock has proved much harder than expected, a condition met simply by the use of more dynamite. Some difficulty is being found in disposal of the waste, which now is being dumped into ravines near the Spray shaft. It is not improbable that it will be used later in the leveling of a large tract of land at Warren.

Mines of Arizona Will Profit Little or not at all by the lift of the copper price from 23½ to 26c. Here is the way the added 2½c. will go: The railroads, under the rate increase effective June 25, take 1¼c; the Eastern refineries will get ½c. and the wage advance represents ¾c. These items absorb the raise, and there still must come the added state and national taxes on the higher gross income, leaving the producer possibly a bit worse off than he was before the advance in both price and taxes. The strike in Bisbee last summer is estimated to have lost the nation about 19,000,000 lb. of copper, worth about $4,700,000. Had the reign of terror not been broken by the deportation, it is probable that production hardly could have been re-established within 90 days, and the loss would have been six times as great. The suits in connection with the deportation claim gross damages approximating $5,000,000, or about the value of the copper product for the period of paralysis of actual production in the Bisbee camp. Consequently it has been computed that the deportation may have had a patriotic result well worth even the maximum possible cost, in the event that judgments be secured for the sums claimed. The immediate resumption of production at the mines undoubtedly added many millions of dollars' worth of copper to the national assets. During 1917 the mines of Arizona paid in wages approximately $65,000,000 and in war taxes $24,000,000. The total copper output was 716,487,197 lb., with gross marketed value of $182,874,577. The large relative importance in Arizona of the copper industry is shown by the valuation of all other mineral products of the state at $16,903,350.

JEROME, ARIZ.—July 22

The United Verde Extension Smeltery is to cast its first bullion soon. The first unit, a 500-ton blast furnace, already has been fired up several times in experimental testing of ores and fluxes in order that there may be no doubt of the proper charges at the time of the real start. About 10,000 tons of ore that averages around 15% copper is in the bins. This single furnace has a possible output of 4,500,000 lb. of copper a month. Three converter stands are in place and ready. A reverberatory furnace, also of 500 tons' capacity, is under construction, and a second reverberatory is to be added for emergencies. Six Wedge hearth roasters are to be in operation within a few months. The bedding bins are of concrete, with 9000 tons' capacity, and the steel receiving bins hold 1500 tons. The firing of the reverberatories and boilers with powdered lignite coal, under air pressure, will be in the nature of an experiment, the coal to be of the ordinary Gallup variety. Another innovation is the flooring of the converter shed with about 400 tons of ore, with the idea that the endless shoveling of overflow matter shall have admixture of something more valuable than ordinary dirt. Dominating the landscape is the 425-ft. stack, 30 ft. in diameter at the bottom and constructed of 7000 tons of molded brick. Gases go to it through a 20 x 25-ft. flue that is 1000 ft. long. Most of the building has been constructed with brick, though there was disappointment in not finding local clays suited for brick making, resulting in delay and much added expense. The water supply now is 350 gal. a minute, with a saving accomplished by the cooling and re-use of the flow from the furnace water jacket. A modern power plant has been provided, with electricity, generated at the works, used wherever practicable. The new plant was begun on Apr. 14, 1917. Nearly 800 men now are employed, but only 300 will be needed for operation of the completed plant. A new town, Verde, is to be built of brick and concrete, a half-mile distant. Plans for the works were drawn by A. G. MacGregor. Thomas A. Stiles has been in charge of construction. Barry Hogarty is superintendent, assisted by John A. Rule. H. O. Hammond is in charge of the laboratory. At first the ore supply must come in roundabout fashion, by way of the United Verde Ry., through Clarkdale. The 12,384-ft. haulage tunnel will later give outlet for the ores on the 1100-ft. level. Of this tunnel about 3000 ft. remain to be driven; the work has been pushed by the Potter Construction Co., of St. Louis, but is going slowly at present.

MOGOLLON, N. M.—July 18

New Cyanide Mill of the Socorro Co. is nearly ready to start. The various sections have been tried out and regular production will begin soon. Ore will be dumped from skips into steel ore bin in headframe. Two jaw crushers 13 x 24 in. and 10 x 20 in. will reduce ore to 1-in. ring. Belt conveyor transfers ore to circular flat-bottom storage bins at mill. A pan conveyor running under this feeds two Hardinge ball mills, the fines going to slime plant and the coarse to two tube mills. The slime plant consists of Pachuca tanks, Dorr thickeners and Burt filters. Zinc shavings are used in precipitation and steel Harvey furnace for melting bullion. The capacity is 250 tons per day. All machinery is motor-driven, power being generated by De La Vergne oil engines.

CALUMET, MICH.—July 23

The Labor Situation in the Michigan copper district is steadily becoming worse. The draft and the call of the higher wages offered in the munitions factories are taking the men. Calumet alone has sent close to 1000 into the Army. The city of Detroit has taken hundreds, and other cities, with their big plants, are taking men steadily. Many of the machinists and other skilled workmen have gone to the shipyards and other Government plants. The result is that most of the mining corporations are showing decreased production. In June they almost held up to their May records, but July will show a falling off, it is believed. Whether or not another increase in wages would solve the labor question is a matter of doubt. Hancock and Isle Royale stand out among the mines as exceptions to the general rule of decreased tonnages. Hancock has almost doubled its tonnage in a month. Isle Royale will this month practically equal the June output, which set a new high record for the property.

The Calumet & Hecla Co's. Operations for the recovery of the slight copper content of the stamp sands is becoming more and more important year after year as the company adds to its equipment for working over the old sands, and a recovery of copper is now being made from this former waste material that is greater than the recovery from amygdaloid rock. For many years stamp sand has been used in the building of highways, in making concrete for construction work, in laying sidewalks, and for similar uses. It was estimated, when the plans were made for building the regrinding plants, that about 37½% of the copper contained in the sand could be recovered. No. 1 regrinding plant, however, started recovering an average of 40% of the copper. No. 2 plant was then constructed, and a leaching plant, to still further increase the recovery, was put up and handled 2000 tons of sand per day. Regrinding and leaching brought the recovery of copper up to about 75%. A second unit of the leaching plant was constructed, doubling the capacity, and then the company turned its attention to oil flotation as a means of still further increasing the recovery. Experiments proved successful, and a plant is being installed. Foundations are now going in and the 17-unit plant will take care of the slimes from approximately 5000 tons of stamp sand or tailings per day. When the entire plant is in operation, the cost of copper from the stamp sands will, it is expected, be reduced to around 4c. and perhaps even lower. This would be the lowest-cost copper produced in the district.

SPOKANE, WASH.—July 22

The International Mining Convention, held at Revelstoke, B. C., July 8 to 11, which was attended by mine owners and operators from both sides of the line and by influential officials and representatives of mining industry of British Columbia, heard five important addresses. The Hon. William Sloan, Minister of Mines, described the good results attending the subdivision of the province into seven mineral districts, in charge of competent engineers. Thomas French, mining engineer, discussed the trouble between the smeltery at Trail and the mine owners. He said in part: "If the smeltery could recover 20% of the 25% that is lost at present it could give the miner the additional $23 for an ore containing 60% lead and still make as great a profit as at present. The loss of lead need not be more than 5% if the smelting operation is properly conducted, and the smelter should be given no rest until this result is attained." Managing Director J. J. Warren, of the Consolidated Mining and Smelting Co. of Canada, replied that the fundamental trouble which has prevented making better terms with mine owners is the general refractory character of the ores of the district and the absence of sufficient quantity of local clean lead ores to dilute the zinc content of the refractory ores. S. G. Blalock, assistant general manager of the same company, reviewed the work of the smeltery during the war and its inestimable service to the Allied cause. A. G. Langley made an address on "Discovery and Development of Prospects"; Bruce White reviewed the "Geology and Mineral Resources of the Revelstoke District"; the Hon. John Hart, Minister of Finance, discussed mine taxation; A. B. Clabon made an address on the "Value of the Mining Industry," and W. Orville Young one on "Northwest Kootenay." A paper by Dean Milnor Roberts of the Washington State University on the aid that has been given mining by state and Federal authorities was read by Professor Crowell, of Indiana University. A resolution in favor of a royal commission to investigate smelting plants was tabled for future consideration.

COBALT, ONT.—July 22

The Rising Costs of Mining are again exemplified by the increased tariff for concentrates from Cobalt. The A. S. & R. Co., which handles a considerable proportion of the table and flotation concentrates, has raised the rate for these products. Flotation concentrates now going to Denver will hereafter have to pay a treatment charge of $15 per ton. As there is a 5% deduction and an $18 freight rate, the total cost of freight and treatment will be about $45 per ton, or approximately 20% of the value of the product. There seems to be slight justification. It works a hardship on the mines of the district, and offsets, to a great extent, the benefit that the Cobalt district has experienced by the flotation process.

Aid to Gold Mining has been proposed, but so far as the Canadian government is concerned, it is doubtful if any direct aid will be given. Proposals have been made to abolish taxation and duty on mining machinery and chemicals used. This, however, would be a small factor, and if the gold mines are not able to make a reasonable profit with the present taxes and duties, it is certain that cutting off these items would not result in their remaining open. The two chief factors which have resulted in the closing down of the gold mines of this district are the high costs of all materials used and the scarcity and inefficiency of labor. It would be practically impossible to commandeer labor that would give satisfactory results in the mines, and it would seem that the gold-mining companies must endure present conditions until such time as the costs of materials decline and there is a sufficient supply of labor to guarantee efficient work.

The West Dome Consolidated Mines in its recent report gives little encouragement to the stockholders, and the results are so greatly at variance with what was expected that the dissatisfaction expressed with the Dome report is immediately called to mind. The report of this latter company is such as to justify a thorough investigation by a shareholders' committee. The last two annual reports have shown a decided falling off in grade and tonnage. In the annual report of the West Dome for the year ended May 31, 1918, the estimate of the ore reserves by the then manager of the company was $2,020,000. Independent reports by two other engineers show reserves at that time of only $113,032, only partially developed. Since then 2000 tons, averaging $8 per ton, has been added to the reserves. Cash on hand amounts to $38,000. The company has been advised to close down the property until conditions become more nearly normal.

VICTORIA, B. C.—July 22

Deposits of Strontianite, the carbonate of strontium, have been found on the lower Ashnola River, Similkameen district, B. C. No development work of consequence has been done, but the discoverers believe that there is a considerable body of the ore. Owing to the special use to which the mineral is being put, the prospect has attracted more than usual attention.

The Rosebery-Surprise Mining Co. has taken a bond on the Ivanhoe group, the property of the Minnesota Silver Co., owned largely by W. H. Yawkey, of New York. The deal includes the concentrator which was put up by the Surprise Company under agreement with the Minnesota Silver Co., to replace the mill destroyed by fire several years ago. Work on the Ivanhoe has been started by the Rosebery-Surprise forces, and negotiations are under way for the acquisition of the Canadian group, adjoining the Ivanhoe, and owned by Brandon Bros., of Silverton. D. McKenzie, formerly superintendent of the Ruth mines, will be in charge of operations at the Ivanhoe. Shipments were made from the Ivanhoe several years ago, but the mine did not prove profitable under the then prevailing prices of metals. The mine product is silver-lead-zinc milling ore.

The Encouragement of Gold Production by the state in British Columbia is to be hoped for, as the effects of increasing cost of mining and the augmented prices of other minerals have been felt to a serious extent. A notable case in point is the closing down of the Rossland mines by the Consolidated Mining and Smelting Co. of Canada. It is felt that, under the exceptional conditions, some effort should be made to maintain the output of gold, which is steadily declining in British Columbia. A resolution passed by the Northwestern Mining Association at a meeting held at Spokane, Wash., was as follows: "Resolved, That all war taxes be remitted, in so far as they affect gold mining; that present advance in freight rates be abrogated in respect to gold mines; that motor roads be built to hitherto inaccessible commercial gold mines; that the industry be placed on the same basis as other war industries in respect to financial assistance; that operators be given a guaranty which shall assure them profits commensurate with those that would have accrued under pre-war conditions, and that any and all acts of the government directed to the financial aid of the gold-mining industry shall be subject to mining and accounting experts acting on behalf of the government."

SYDNEY, N. S. W.—May 30

The Federal Treasurer Has Granted a syndicate the necessary permission to form a company to take up certain leases at Eaglehawk of the Bendigo Amalgamated Co. which the company has intimated that it is ready to hand over to any other party willing to work same, provided suitable arrangements are made regarding the plant and equipment. The new syndicate claims to be in a position to spend £25,000 on the leases, and it is reported that provided certain conditions were complied with and the proposed scheme of developmental work were satisfactory to the department, the Ministry would advance £10,000—the maximum allowed by the Mining Development Act—spread over a term of years.

Broken Hill Proprietary Co. is calling meetings to sanction the increase of capital from £1,500,000 to £3,000,000. The scheme of redistribution of shares amounts to the exchange of 10 shares of 8s each for 13 shares of 20s each, besides certain bonuses. The increase is fully warranted by the steel business at Newcastle, N. S. W. Large extensions are necessary to cope with the commonwealth's requirements for rails, ship plates, and structural steel. During 1917, about 360,000 tons of 60% iron ore was mined at Iron Knob, South Australia, and made into various forms of merchant steel by this company. The April output was below normal and in round figures was 10,000 tons. Another blast furnace is to start in August.

The British Government Contract for zinc supplies, as originally planned, called for 100,000 tons of zinc concentrates and 45,000 tons of spelter per annum for the next 10 years, but it has since been modified and now calls for 250,000 tons of zinc concentrates per annum until the war is over and for one year after, and 300,000 tons per annum for the nine years following. If the war is not over in 1918, the contract will last 11 years or more. Allowing for the requirements of the two Australian electrolytic zinc works, only one of which is at present built, there would still be far more to export to England than present or projected works there could treat. Even if all the Belgian and French spelter works are reëstablished under Allied control, there will still be a large surplus of zinc concentrate.

The Potentialities of the Papuan Oil Field are still undetermined, although six years have now elapsed since the first indications of petroleum were revealed in Papua, although the Commonwealth's experimental operations have extended over practically the whole of that period. Seven bores have been sunk up to date, and from these 2000 gallons of oil have been extracted. The result of boring operations from 1913 up to the beginning of the present year is as follows:

Bore	Begun	Depth, feet	Result
No. 1	Jan. 16, 1913	242	Oil at 224 ft.
No. 2	Apr. 8, 1913	133	Gas only
No. 3	Apr. 2, 1913	460	Little oil at 320 ft.
No. 4	Feb. 19, 1914	312	Gas only
No. 5	Aug. 6, 1914	395	Small production
No. 6	Sept. 28, 1915	500	Little oil
No. 7	Oct. 23, 1916	1800	Little oil at 190 ft.

From the beginning of operations to June 30 last £64,955 has been spent on the field. The annual salaries amount to £7342, exclusive of administrative charges, and £1800 a year for native labor and maintenance. Drilling plants delivered on the field have cost £12,052. This amount includes the cost of the rotary drilling machinery (£7000), which is now lying idle on the oil fields, for the reason that the section manufactured in America cannot be adjusted with the parts supplied by a Sydney firm.

New Electrolytic Works are being built at Kandos, near Lithgow, N. S. W. Operations are to start on a small scale with a capacity of only 2500 tons per year and will be primarily for the treatment of copper from the C. S. A. mines, Cobar, but the plant will also be able to treat copper from practically all of New South Wales. There have been three electrolytic works for copper in Australia; the first being at Wallaroo mines, South Australia, which is now closed, as the company finds it more profitable to make furnace-refined copper. The second was established at Lithgow, N. S. W., and treated blister copper from Great Cobar, but was dismantled when the Great Cobar mine was sold to an English company. The third and largest, the Electrolytic Refining and Smelting Co., of Port Kembla, is now the only plant in Australia producing electrolytic copper and also the only customs works for copper ores. The backbone of the new electrolytic works at Kandos will be the C. S. A. mines, producing about 250 tons monthly and now shipping to the Port Kembla works. The situation is well chosen for iron, lime, water coal and labor, and the railway lines provide communication with the western northern and southern districts. Those in charge of the erection and operation of the works were concerned in the establishment of the three above-mentioned plants.

The Output of Molybdenum Tungsten and Bismuth in Australia is expected to increase largely in 1918 and 1919. In New South Wales the three mines near Bathurst have over 1,000,000 tons of rock, from which they may expect to recover over ½% of molybdenite concentrates. One of them the Mammoth, has its first unit of 1 stamps now at work, and the others are being equipped. Near Glen Innes, N. S. W. the Kingsgate pipe deposits are now in the hands of a strong Melbourne company, which will open many more of the 50 known pipes than were formerly worked. In Queens land, the Thermo Electric Co., of Luton, England, has acquired controlling interests in most of the big mines of the Wolfram Camp district fo North Queensland, and is erecting large mills. In other parts of Queensland, New South Wales, Victoria and the three other states, many small mines of molybdenite, tungsten and bismuth are now being worked. The sale of the three products has, since the war, been in the hands of Messrs. Dalgety, as imperial agents. The firm of Messrs. Dalgety has extensive wool and cattle interests in all the states, and already having numerous branches, is able to handle the business in excellent manner. It is no fault of that concern if the unit price in Australia is far below that in the United States and Canada. The Queensland agency will now be in the hands of the Thermo Electric Company.

The Bendigo Amalgamated Co. has not yet been successful in making any discoveries of a promising character and has even found considerable difficulty in keeping up the output to an average of 5000 tons of ore per week. It has been decided to concentrate operations in the more central portions of the holdings, as it is believed the opportunities there fully justify exploratory work. With this object in view, operations on the Eaglehawk areas have been stopped, and in order to take advantage of the present high prices ruling for second-hand machinery and scrap iron, also to provide the necessary funds to maintain development work, the plants on these mines have been sold. Since the inception of operations over £13,000 has been realized from this source, and on the other hand the company has spent £23,000 on the installation of new or the improvement of old plants. The aim of the management is to centralize operations to a much greater extent than under old conditions. It is proposed to maintain sufficient mills to treat approximately 8500 tons per fortnight. These mills are the Virginia, Johnson's No. 2, Nelson, Koch's Pioneer, Carlisle, Consols and Garden Gully. With the exception of the Virginia mill, the power will be supplied by suction gas plants with wood producers. Efficient air compressors are being concentrated into three main stations at Koch's Pioneer, Virginia and Johnson's No. 2. These stations are now well on the way to completion, and will provide for from 150 to 180 rock drills. This will enable the company to discard a considerable number of obsolete compressors, which it is now compelled to run at extravagant cost. The policy is to maintain about 30 winding plants of modern type.

The Mining News

ALABAMA

Jefferson County

SLOSS-SHEFFIELD STEEL AND IRON (Birmingham)—Plans to erect 120 Semet-Solvay byproduct coke ovens at North Birmingham. The cost of the plant will be approximately $5,000,000. The Government will take all of the byproducts, except gas and tar, which will be disposed of locally.

ARIZONA

Mohave County

BERKELY (Kingman)—Reports uncovering of ore in the old property at depth of 18 ft. Shaft sinking being rushed.

GOLD TRAIL MINING (Kingman)—Intends to reorganize and begin development. Mines known as the McKeeson property.

STANDARD MINERALS (Kingman)—Opened rich vein in crosscut from 300 level. To sink to 500 level soon.

WASHINGTON-ARIZONA (Kingman)—Getting ready for operation. Has mill and has opened large tonnage of ore.

Pima County

BLACK BESS (Ajo)—Ore containing tungsten, gold and molybdenum is being developed and mined.

BULLION BAR (Ajo)—Improvements being made preparatory to beginning operations; include several dwelling houses.

GUNSIGHT GOLD AND TUNGSTEN (Ajo)—Articles of incorporation have been filed. Capital stock $500,000 in shares of $1 par value.

Pinal County

SILVER KING (Superior)—Vein tapped on 400 level near shaft was crosscut 15 ft. and drift run on vein 22 ft. It contains streaks carrying high-grade silver. Mine idle for years.

Santa Cruz County

MOWRY (Patagonia)—Shipping manganese ore to smeltery.

Yavapai County

PHILADELPHIA MINING (Crown King)—Owns and operates the Nelson Co. properties. George P. Harrington is manager.

BELT (Humboldt)—Shipped carload silver ore to Grey Eagle Reduction Company.

CALUMET & JEROME (Jerome)—Diamond drilling to supersede other methods of development. Several holes to be put down from 600 level. Crosscut No. 1 is in 2000 ft. south from 600 station. No. 13 is being advanced.

JEROME GRANDE (Jerome)—Financing for extensive operation. Stock sales in June heaviest in history of company. No resumption of operations until the Jerome-Prescott auto road is built.

JEROME VERDE (Jerome)—Work concentrated in main top ground and in crosscut on 1050 level. Grade of tunnel from Columbia to Maintop corrected for drainage and haulage. A station finished at 1000 level.

VERDE COMBINATION (Jerome)—Small stringers of best ore found prominent at 1080 ft. in shaft, where station is being cut. Drifts to be started east and west. Dave Morgan is manager.

ARIZONA-BINGHAM (Mayer) — Last rich strike made on 600 level. Mill treating 175 tons daily and showing better than 95% recovery.

BIG BUG (Mayer)—Shaft started on outcrop which shows strong copper stains for 2000 feet, and at 50 ft. ore was encountered.

COPPER QUEEN (Mayer) — Entirely new orebody encountered 500 ft. below main adit level. Vein about 20 ft. wide; contains some ore of shipping grade.

COPPER MOUNTAIN (Mayer)—Shaft sunk to 250 level and to be sunk to 500 level. At 100 level a shoot of ore was cut.

POCAHONTAS (Mayer)—Constructing mill and machinery for 50-ton flotation unit on the way.

CROWN KING DISTRICT (Prescott)—Treating dump and handling 60 tons daily. Tiger mine tailings also being treated.

BLACK DIAMOND (Walker)—Ordered new machinery, including compressor and steam-power drilling plant.

ARKANSAS

Marion County

MONKEY HILL (Flippin)—Under operation by Central States Lead and Zinc Co. Sinking shaft for ventilation and ore hoisting. Work showing orebody of jack.

HAWKE-EYE (Rush)—The 50-ton Joplin-type plant under construction for last four months was put in operation recently.

DRY MILL (Yellville)—The Sutton, Steel & Steel dry process mill, completed several months ago, given test run on ore from Paradise mines. Test was satisfactory.

LUCKY DUKE (Yellville)—Starting active mining. Produces zinc carbonate and lead ores.

Newton County

BIG JOE (Everton)—Has installed two tractors and trailers to move zinc production for shipment.

CALIFORNIA

Butte County

CHROME DEPOSIT of large size reported at Intake on Western Pacific Ry. Cropping indicating ledge formation and extending over width of 60 ft. has been traced 1200 feet.

Calaveras County

CHROME MINING active in Campo Seco district. Much ore is high grade. Concentrating mills contemplated.

CHROME ORE mined and shipped from region of Copperopolis is packed on animals or hauled in motor trucks about 17 miles to Milton, on Southern Pacific. Miners asking railroad for better loading facilities.

PENN COPPER (Campo Seco)—Maintaining large copper yield. Good ore in lower levels.

Inyo County

TOMBOY (Lone Pine)—New lead-silver property opened recently promises to become a producer. Shaft is down 50 feet.

COLORADO

Boulder County

MOLTKE (Brainerd Camp)—Lease secured by F. H. Cobb; to resume development. Sampling indicates reserve of 100,000 tons of silver-lead ore.

BURLINGTON-BOULDER (Sunshine)—Adit on Taurus vein advanced to length of 700 ft. and to be advanced 250 ft. more. An orebody opened near present breast of adit and a raise is being made. To connect with bottom of discovery shaft. Crosscut to prospect parallel veins.

Clear Creek County

CONSOLIDATED MINES (Alice)—Recent development opened ore. Contract let for new mill. Machinery ordered. Plant hoped to be ready first of September.

COLORADO CENTRAL (Georgetown)—Flotation plant completed. To treat ore from Equator and Ocean Wave mines and from Marshall dumps.

KELSO MINING (Georgetown)—Properties in the Argentine mining district secured under lease by R. R. Wheeler. Development to be resumed soon.

SANTIAGO (Georgetown)—High-grade ore opened by development under direction of Joseph Campbell.

ARGO MILL (Idaho Springs)—During first twelve days of July the following shipments were received from lessees operating near-by mines: Hawquist & Co., Gem mine, 11 tons; Columbia Leasing Co., Gem mine, 50 tons; Fred Weeden, 5 tons; Tremont Mining Co., 75 tons; Tremont Mining Co., from Concrete mine, 50 tons; Joe Reese, Pewabic mine, 25 tons; Frontenac mine, 25 tons; Chris Stangier, Windsor Castle mine, 25 tons; O. C. Redeck, Bryant tunnel, Black Hawk, 25 tons; Johnson & Jenkins, Poso mine, 25 tons; Alvin Clark, Homer mine, Central City, 25 tons; Cooper Brothers, Lord Byron mine, 25 tons.

San Juan County

EARLY BIRD (Animas Forks)—A 6-ft. vein of gold-silver-lead ore opened in new crosscut tunnel. Considerable new development contemplated. C. B. Blitzkie is manager.

TELESCOPE (Chattanooga)—Developed successfully by the Telescope Mining and Milling Co. B. F. Majors is superintendent. Carload trial shipment of ore from main tunnel made to Durango smeltery. Regular shipments contemplated.

JOE AND JOHN (Gladstone)—Workings being retimbered, and development in progress. E. W. Walter, of Silverton, is manager.

MINNEHAHA (Gladstone)—Acquired by the new Minnehaha Mining and Milling Co. George Bibb, of Silverton, is manager. Active development to be undertaken soon.

KOEHLER TUNNEL (Red Mountain)—Active development to be undertaken soon.

BULLION KING (Silverton)—Property in Porphyry Basin secured under lease by local operators. Mine buildings and compressor to be repaired; tunnel retimbered, and development work resumed soon. Has produced high-grade lead-silver ore.

San Miguel County

SILVER CHIEF (Telluride)—Workings being repaired preparatory to examination and resumption of development. W. H. Trout is manager

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Building drydock at Torch Lake for big Bucyrus dredger, which handles tailings for regrinding mills

SENECA (Calumet)—Vertical shaft was sunk 99 ft. during first half of July.

QUINCY (Hancock)—Slight fire at No. 2 shaft night of July 12 extinguished in few hours; origin not incendiary.

HOUGHTON (Houghton)—Third lode 80 ft. from west vein of Superior lode; if it has extent will make mine of property.

WINONA (Winona) — Good ground opened in 15th level drift driven under King Philip shaft No. 1.

NEVADA

Humboldt County

ROCHESTER COMBINED MINES (Rochester)—Development work progressing and 200,000 tons ore blocked out. Main tunnel cuts vein at depth of 320 ft. New mill almost completed.

RYE PATCH (Winnemucca)—Operated by American Mining and Exploration Co. and now shipping 50 to 75 tons ore per day. Imlay mine also being operated, and shipments to be made soon.

Lander County

RUBY GROUP (Battle Mountain)—Cinnabar property 20 miles from Bridges on Nevada Central R. R. sold recently by local men to John Ross. Price stated $50,000. Development work to begin at once.

Lyon County

NEVADA-DOUGLAS (Ludwig) — Big square-set stope with area of about 60 by 200 ft. caved July 14th; no loss of life. Loss serious and considerable time and expenditure will be required to reopen.

McCONNELL (Mason)—Regular shipments being made.

WESTERN NEVADA (Mason)—Opening up shipping-grade copper ore in new territory. Subsidiary Nevada-Douglas Copper Company.

BLUE JAY (Yerington)—Reopened by lessees, and good ore being mined from surface.

Mineral County

GOLD STRIKE IN PAMLICO DISTRICT recently made. Prospect being opened for copper ore when shoot of quartz showing much free gold was broken into.

WALL STREET (Luning)—Shipments by burro and wagon of 30 to 40 tons high-grade copper ore daily.

DUNLAP (Mina)—Siliceous ore with good copper oxide content being broken on surface.

OLYMPIC MINES (Mina)—Mill running steadily on good gold ore, but at reduced capacity, on account of water shortage. All-sliming cyanide process used. Fred Selbert is manager

SIMON LEAD (Mina)—Shaft sinking continued; now down 250 ft. Heavy lead-zinc ore opened

TAFT (Mina)—Lessees shipping copper ore.

Nye County

MANHATTAN CONSOLIDATED (Manhattan)—Ore being tested at Goldfield Consolidated mill. Discovery of high-grade free-milling gold ore in shoot 3 to 8 ft. wide and 30 ft. long made recently in raise from third level. Development in ore under way on 5th level

CONSOLIDATED MAYFLOWER (Pioneer)—Mill dropping 10 stamps. Power furnished by oil engines and water pumped from mine. Development work opened large tonnage of gold ore. Drift being driven on [illegible]-ft. level

TONOPAH JUPITER (Tonopah)—Shoot of lead-silver ore opened at depth of 130 ft. in shaft sinking

WEST END CONS (Tonopah)—Motor to haul ore from Ohio section of mine to West End shaft to be installed. Other hauling facilities to be improved, cutting down number of men necessary

Storey County

NORTH END MINES (Virginia City)—Unwatering progressing satisfactorily, and also development work. High-grade silver ore opened on [illegible]

NEW MEXICO

Grant County

GREAT EAGLE (Lordsburg)—Negotiations on for purchase from Cauthon & Connors by interests represented by A. Interreiden of 85 Mine. Price asked $300,000 net cash. Owners estimate 800,000 tons high-grade fluorspar ore.

MISER'S CHEST (Lordsburg)—Randell & Crocker ceased work until questions regarding terms of lease are adjusted with owner, James Berryhill, of California.

AJAX COPPER (Rodeo) — Installing 300-cu. ft. compressor. To remodel 200-ft. shaft to meet Arizona law requirements.

HILL-TOP METAL (Rodeo)—Continues to show good lead-silver orebodies in 3000-ft. tunnel. Crosscuts being driven on one of largest bodies. No. 2 tunnel is in 1700 ft.; to be carried 700 ft. further. No. 3 tunnel is in 900 ft. R. O. Fife is superintendent.

KING COPPER (Rodeo)—Sinking Ainsworth shaft at 100 ft. opened body of good copper-sulphide ore. C. E. Welch is superintendent.

KING OF LEAD (Rodeo)—Under negotiations with James P. Porteus, Lordsburg, N. M., for California parties.

BRADFORD & CLOUDMAN (Steins)—Shipped four cars silver-lead ore to El Paso smeltery. To install machinery later.

McGEE BROS. (Steins)—One test car silver-lead ore ready to ship. Charles McGee is superintendent.

SILVER BELL NO. 1 (Steins)—Tregear & Connolly, owners, have car gold-silver ore ready to ship.

BURRO MOUNT. COPPER (Tyrone)—Three cars per week of fluorspar being shipper by Contractor O'Brien.

OREGON

Jackson County

E. W. SHATTUCK (Applegate)—Uncovered gold ore at Thompson Creek mine.

ANDERSON (Gold Hill)—Gold mine, situated in the Ashland and Shorty Hope group, on Wagner Creek south of Talent, sold to Seattle men for $30,000 on 60-day option.

Josephine County

HOLTER & FAUCHE (Grants Pass)—Developing leased chrome deposit in Williams Creek district and building auto road.

CHARLES OWENS (Grant Pass)—Developing chrome ore on Sucker Creek, in Illinois district, and hauling by trucks to Waters Creek for shipment.

R. A. SPENCER (Grants Pass)—Developing chrome deposit on Briggs Creek and building a road. Rich ore now packed by mules eight miles.

R. G. ADAMS MAGNESITE CO. (San Francisco, Calif.)—Mining chrome ore on High Plateau deposits near California-Oregon line.

SOUTH DAKOTA

Pennington County

INGERSOLL (Keystone)—Taken over by W. T. McCaskey, of Moloney Blue Co., and J. E. Carter, of New York. To work for lithia minerals. Ores carry amblygonite, lapidolite, spodumene, columbite and mica. Machinery to be installed soon.

MOLONEY BLUE (Keystone)—Shipped nine cars ore during June to Omaha smeltery. W. T. McCaskey is president.

UTAH

Beaver County

CROFT MINING (Milford)—Taken under bond and lease by neighboring Stampede Co. at price of $100,000 if paid in one year, and increasing by $10,000 yearly if payment is delayed. B. F. Caffey and R. H. Strickland interested.

Juab County

TINTIC SHIPMENTS week ended July 13 amounted to 132 cars.

TINTIC STANDARD (Eureka)—Production continuing at high rate, but hampered by labor shortage

Salt Lake County

CAMP OF ALTA, in Little Cottonwood Canyon, is shipping 1000 to 1500 tons weekly. Shippers are South Hecla, two to three cars a day; Michigan-Utah, about two cars daily; Columbus-Rexall, 35 to 40 tons. The Sells, Alta Consolidated, Peruvian, Wasatch Mines, Alta Consolidated, Alta-Michigan and Emma Consolidated are also shipping.

Summit County

PARK CITY SHIPMENTS week ended July 13 were 3,819,685 lb. of ore and concentrates.

DALY-WEST (Park City)—Connections being made between shaft and Daly-Judge tunnel. Mill working three shifts on tailings from dump.

PARK-UTAH (Park City)—Work being done in both north and south drifts from tunnel. Ground difficult to work and labor shortage felt.

GLEN-ALLEN (Park City)—Formerly Glencoe. New machinery on ground and work to be speeded up.

Utah County

BELOROPHON (American Fork)—Mill completed. Has blocked out 10,000 to 11,000 tons of low-grade ore, and mill expected to produce 10 to 15 tons concentrates daily.

PACIFIC (American Fork)—Mill of leasing company producing steadily. Capacity 150 tons daily. Auto truck installed for haul down American Fork Canyon.

WASHINGTON

Spokane County

SPOKANE TIN AND TUNGSTEN (Moran)—Incorporated by F. C. Bailey and F. A. Ross, Spokane. Doing preliminary work on tin property 10 miles south of Spokane.

Stevens County

NORTHWEST MAGNESITE (Cnewelah)—Installed 300-hp. gasoline motor to supplement power. Installing two calcining kilns. R. B. Rogers is superintendent.

QUEEN (Deer Trail)—Expects to begin shipments soon.

SEAL (Deer Trail)—J. Van Horn and brother taken lease and to begin shipping at once.

O-LO-LIM (Spokane Indian Reservation)—Begun small shipments copper ore. Has 25-year lease from Indian Department.

CLEVELAND (Springdale)—Santa Rita Mining Co., organized by Robert Sweeny, has purchased property and begun work. Workings 100 ft. deep show orebody 12 to 15 ft. wide.

CANADA

British Columbia

SILVERSMITH (Slocan) — Strike of high-grade orebody 9 ft. wide. Formerly the Slocan Star.

WAKEFIELD (Slocan) — Acquired by Clarence Cunningham. Shipping Queen Bess and Van Roi ore to Trail smeltery.

Ontario

CASTEL (Gowganda)—Shaft is down 150 ft., at which point geological conditions were favorable and will be sunk to 350 ft. to reach contact of diabase and Keewatin.

WALSH (Gowganda)—Shaft sunk to 200 level, where crosscut being driven.

McINTYRE (Porcupine) — Developing New Ray property under option, work being on 400 level.

NORTH DAVIDSON (Porcupine)—Option to Apex extended two months. Another diamond drill hole to be sunk.

PORCUPINE CROWN (Porcupine)—Closed indefinitely. Supplies being sold.

THOMPSON-KRIST (Porcupine)—Contract for 500 ft. drifing let to the Vipond.

McKINLEY-DARRAGH (Cobalt)—Large amount of ore being treated from old workings of the Savage, which had been left because its extraction was unprofitable before the rise in the price of silver.

MINING CORPORATION (Cobalt)—Pumps for handling old tailings for retreatment have arrived. Capacity of mill, 300 tons ore per day, but with new plant in operation is expected to treat only 100 tons ore per day and 500 tons old tailings.

PENN-CANADIAN (Cobalt)—Purchased control of Peninsula Mining Co., owner of St. Maurice molybdenum property in Quebec. A mill to be started immediately.

PETERSON-LAKE (Cobalt)—Flotation plant closed to make changes to increase capacity.

WRIGHT-HARGRAVES (Kirkland Lake)—Underground work stopped. Sufficient ore to justify mill, but probably will not be erected until after war.

MILLER - INDEPENDENCE (Boston Creek)—To install 7-drill compressor to enable more comprehensive development.

ONTARIO WESTERN (Boston Creek)—A number of promising veins uncovered and two prospecting shafts to be sunk.

GRAHAM-HORNE-TAYLOR (Lightning River)—A discovery of gold has been made adjacent to the Howie-Couchenour-Willans group.

The Market Report

SILVER AND STERLING EXCHANGE

July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence	July	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence
25	4.7530	99⅝	48 13/16	29	4.7530	99⅝	48 13/16
26	4.7530	99⅝	48 13/16	30	4.7530	99⅝	48 13/16
27	4.7530	99⅝	48 13/16	31	4.7530	99⅝	48 13/16

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

July	Copper: Electrolytic	Tin: Spot.	Lead: N. Y.	Lead: St. L.	Zinc: St. L.
25	*26	†	8.05	7.75	8.05@8.15
26	*26	†	8 05	7.75	8.05@8.10
27	*26	†	8.05	7.75	8.05@8.10
29	*26	†	8.05	7.75	8.00@8.05
30	*26	†	8.05	7.75	8.00@8.05
31	*26	†	8.05	7.75	7⅞@8

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

July	Copper: Standard Spot	Copper: Standard 3 M.	Copper: Electrolytic	Tin: Spot	Tin: 3 M.	Lead: Spot	Lead: 3 M.	Zinc: Spot
25	122	122	137	380	380	29½	28½	54
26	122	122	137	380	380	29½	28½	54
27	...	...	...	...	...	...	...	...
29	122	122	137	385	385	29½	28½	54
30	122	122	137	388½	388½	29½	28½	54
31	122	122	137	390	390	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—July 31, 1918

The metal markets were destitute of new features of special interest during the last week.

Copper—The great subject of interest is the forthcoming meeting between the producers and the Price-Fixing Committee of the War Industries Board to settle upon the price for copper after Aug. 15. Although the advance to 26c. on July 2 pleased the producers, it is recognized that the increment did nothing but offset increased costs of production, freight rates, etc., and did not in itself afford any stimulus to increased production, which is greatly needed.

Copper Sheets are not quoted, as there is a wide diversity in prices of different dealers. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots.

Tin, Lead, and Zinc

Tin—The local market does not respond to the increased price abroad and is rather quiet. There is not much tin here, and local buyers are getting all that they need or have stocked up and are holding off. Straits tin was quoted in New York on July 25 and 26 at £377, c.i.f. London; on the 29th at £383; on the 30th at £384 and on the 31st, at £386.

Lead—The situation is ominous, and consumers are in despair. The quoted prices establish the terms of settlement for lead that is being produced and consigned on contract, but nobody can obtain any lead in the market at the prevailing prices, for free lead does not exist. The only alternative for manufacturers who need lead not arranged for previously, and now find themselves unable to get it, is to close their plants. Cases of this have already happened, even in such important matters as the manufacture of shrapnel bullets. The Government is requiring a great deal of lead for chemical construction, and apparently has new plans on foot. The shortage of chemical lead is acute, and rolling-mills that ought to be at work in producing that class of sheet have had to be switched to other work. The situation in lead promises to become worse before it will begin to be better, even if the recent rate of production be maintained. If production falls off it will be almost a calamity. The most important thing is to strain every nerve to increase production.

Zinc—This market continues dull and uninteresting. Producers are rather puzzled, for the statistics for the second quarter were regarded favorably, and it was thought probable that upon their showing the market would exhibit some life.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Sheets are 42c. per lb. for 18 gage and heavier. Price established June 1 and continues to Sept. 1.

Antimony—The market is quiet but strong in futures. We quote spot at 13 to 13⅛c., and futures at 11¾@12c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted $1.50@1.75 per pound.

Nickel—Market quotation is 40@45c. per pound.

Quicksilver—Steady at $125. San Francisco reports, by telegraph, $117, firm.

Consumers report inability to obtain supplies of metal. One of them, last week, requested the authorities at the Mare Island Navy Yard to send him immediately 500 flasks, and received the reply that they were unable to collect anywhere near that quantity. He considered this strange, in view of the fact that most of the producers at the recent hearing of the Tariff Commission in San Francisco reported that their cost of production is only $70@$75, and the Government price is $105, which affords a reasonable margin of profit. The consumer, in conversation, explained that the theoretical margin is undoubtedly large enough, but that in his opinion the extreme delay between delivery of metal and receipt of payment from the Government is responsible for the inability to obtain supplies. Most of the quicksilver producers are small concerns or individuals. The small producer is like the man of small salary. He lives more or less from hand to mouth, and his continuous operation demands prompt receipt of the funds becoming due him. One concern reports being many weeks behind in settlements for shipments. To a big company this may not be a serious matter, but the small operator has to have prompt cash in order to meet his payroll.

Gold, Silver and Platinum

Gold—Imports of gold during the fiscal year amounted to only $124,000,000, as compared with $977,000,000 in 1917; exports were valued at $191,000,000, compared with $292,000,000 in 1917.

Silver—The silver situation remains unchanged, with quotations established in London at 48 13/16d. and in New York at 99⅝ cents.

Silver imports amounted to $70,000,000 in 1918; against $35,000,000 in 1917, and silver exports increased from $78,000,000 in 1917 to $139,000,000 in 1918.

China exchanges continue high and at a level to permit bids over the Government price of $1 per oz., but difficulty in obtaining Federal license to export is restricting buying for China account. Exports of silver from New York to London for week ending July 27 amounted to 822,000 ounces.

Mexican dollars at New York: July 25, 77; July 26, 77; July 27, 77; July 29, 77; July 30, 77; July 31, 77.

Platinum, Palladium, and Iridium—Prices fixed at $105, $135 and $175, respectively.

The War Industries Board asserts that there is platinum enough. The fact that none is purchasable at less than $105 indicates the contrary. It is said that $125 could easily be realized in the trade. We hear rumors, via England, of clandestine transactions around that figure in this market.

Zinc and Lead Ore Markets

Joplin, Mo., July 27—Blende, per ton, high, $77.60; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $50@45; calamine, basis 40% zinc, $37.50@30. Average selling prices: Blende, $56.25; calamine, $37.20; all zinc ores, $55.59 per ton.

Lead, high, $104.10; basis 90% Pb, $102@100; average selling prices all grades of lead, $99.68 per ton.

Shipments the week: Blende, 7676; calamine, 294; lead, 1023 tons. Value all ores the week, $544,870.

A peculiar situation, much resembling a panic, occurred this week. On Thursday sellers seemed firm for an unchanged or upward market. Friday morning's papers published rumors concerning the Government taking over the interests of the American Metal Company, and Friday afternoon this company was getting more offers of ore than it could take on $47.50 base and had to reduce the level to $45, at which figure several hundred tons were secured. Today, apparently satisfied that this company is still wanting ore, the market again strengthened.

Platteville, Wis., July 29—Blende, basis 60% zinc, highest price reported paid for premium grade was $75.30 per ton; high lead blende, $52 per ton base; lead ore, basis 80% lead, $90 per ton base. Shipments reported for the week were 2568 tons blende, 40 tons galena and 978 tons sulphur ore. For the year to date the figures are 75,308 tons blende, 4240 tons galena and 29,804 tons sulphur ore. During the week 3552 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Ore of 40% grade quoted at $1.40 per unit, f.o.b. California, with 50% low silica chrome offered at $1.70 per unit.

Manganese Ore—Charles Hardy says under date of July 30: "The high prices fixed by the Government, which also allows a delivery of manganese ore containing a high percentage of silica, have brought out so much manganese ore that most of the users have been flooded with supplies and some of the principal users have withdrawn from the market for the time being, as they receive a sufficient quantity under contract, and do not bid for isolated lots now. On the other hand, good-grade ore, low in silica, still finds a ready market at the prices fixed by the Government."

Molybdenum Ore—Situation remains almost unchanged, with no new business to speak of; price is nominally around $1 per unit for ore containing 90% or over.

Tungsten—The market for high-grade ores is active, prices of $24 being paid for scheelite, 70% and over, and $24 for the highest grade wolframite. Ordinary high grades brought $22.50 to $23.50 per unit; low-grade ores $18, on the basis of 65 per cent.

Other Minerals

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight. Tonnage is extremely difficult to obtain. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines, f.o.b. mine.

Iron Trade Review

NEW YORK—July 31

A conference in New York Monday between Government leaders in shipbuilding, the Director of Steel Supply and the steel manufacturers' committee had to do with means of increasing the allotment of steel to shipyards, in view of the enlarging program for the Schwab drive, says "Iron Age." At a meeting in Washington later in the week, plans will be made to insure shipyard work against interruption in the coming year, also for the prevention of lost motion through competing efforts of Washington departments, the commanding general in France and the Allies.

The whole tenor of the conference talk was that, however detailed figures might be changed, the main fact was the increasing war demand for steel and with it an indefinite but inevitable reduction in the amount available for other uses.

The large schedules of steel for direct and indirect war needs give weight to the claim still widely made that all Governmental agencies concerned have put their requirements at top figures, in spite of repeated requests for pruning. In short, if deliveries meet schedule figures, it is believed the reservoir would be an ever-filling one, unless the talked-of railroad breakdown should be really serious. The half-year's demand for shell steel has risen to 3,000,000 tons, requiring a shipment rate probably 15% above that now obtaining, and the plate total is close to theoretical capacity and about 12% more than the recent [illegible].

The Steel Corporation's net earnings of $[illegible] in the second quarter, plus [illegible] set aside for Federal [illegible] a total 7[illegible]% greater than a similar total for the first quarter, with its drastic shutdowns in January and February. The exhibit, even with the lavish [illegible] for war taxes, is striking testimony to the earning power of a great integrated [illegible] on the present scale of [illegible] prices. Evidently the [illegible] included [illegible] deliveries at the [illegible] ruling before steel control set in last September.

The [illegible] wage increase announced by the Steel Corporation was a surprise to the independent companies, from which like [illegible] may be expected [illegible]. Five other 10% advances in the past 30 months and one of 15% make the new wage 103% higher than that paid on Jan. 1, 1916. The Steel Corporation's [illegible] of wage increase adds to the problem of some small producers, who are pinched by Government [illegible] on which the corporation can make large profits.

Washington has come to the help of the [illegible] many of whom were left with small stocks owing to poor deliveries in recent months. For August the Director of Steel Supply permits them to receive from the mills shipments equal to their average in the first six months of the year. Beginning with September, however, the War Industries Board's plan becomes effective, permitting the replacement each month of the amount shipped by the jobber from stock for Government and essential purposes in the preceding month.

PITTSBURGH

The usual Pittsburgh letter had not been received up to the time of the Journal's going to press.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1916	New York 1917	New York 1918	London 1916	London 1917	London 1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.340	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407		31.498	43.418	.....
Sept.	68.515	100.740		32.584	50.920	.....
Oct.	67.855	87.332	.....	32.361	44.324	.....
Nov.	71.604	85.891	.....	34.192	43.584	.....
Dec.	75.765	85.960	.....	36.410	43.052	.....
Year	65.661	81.417	.....	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1917	New York Electrolytic 1918	London Standard 1917	London Standard 1918	London Electrolytic 1917	London Electrolytic 1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23. 00	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	.....	122.391	.....	137.000	.....
Sept.	25.073	.....	117.500	.....	135.250	.....
Oct.	23.500	.....	110.000	.....	125.000	.....
Nov.	23.500	.....	110.000	.....	125.000	.....
Dec.	23.500		110.000		125.000	.....
Year	27.180	.....	124.892	.....	138.401	.....

Tin	New York 1917	New York 1918	London 1917	London 1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	[illegible]
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	.....	243.978	.....
September	61.542	.....	244.038	.....
October	61.851	.....	247.467	.....
November	74.740	.....	274.943	.....
December	87.120	.....	298.556	.....
Av. year	61.802	.....	237.563	.....

(a) No average computed.

Lead	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	2 .50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	.....	10.518	.....	30.500	.....
September	8.680		8.611	.....	30.500	.....
October	6.710		6.650	.....	30.500	.....
November	6.249		6.187	.....	30.500	.....
December	6.375		6.312	.....	30.500	.....
Year	8.787		8.721	.....	30.500	.....

Spelter	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	9.619	7.836	9.449	7.66[illegible]	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6. 0	9.289	6.71	54.632	[illegible]4.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.373	8.473	8.338	54.000	54.000
August	8.360		8.190		54.000	.....
September	8.136		7.966		54.000	
October	7.983		7.813		54.000	
November	7.847		7.672		54.000	
December	7.685		7.510		54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡ 1917	Bessemer‡ 1918	Basic‡ 1917	Basic‡ 1918	No. 2 Foundry 1917	No. 2 Foundry 1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.17	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45		53.80		53.95	
August	54.17		50.37		53.95	
September	46.10		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	July 30
Alaska Gold M.	3½
Alaska Juneau	2¼
Am.Sm.& Ref.,com.	77⅞
Am. Sm. & Ref., pf	106
Am. Sm. Sec., pf., A	88½
Am. Zinc	19
Am. Zinc, pf	49¼
Anaconda	65¾
Batopilas Min	1¼
Bethlehem Steel	83⅞
Bethlehem Steel, pf.	‡88¼
Butte & Superior	28½
Butte Cop. & Zinc	11¼
Cerro de Pasco	34
Chile Cop	16½
Chino	39
Colo.Fuel & Iron	46
Crucible Steel	66¼
Crucible Steel, pf.	90¾
Dome Mines	9⅛
Federal M. & S.	10
Federal M. & S., pf.	33
Great Nor., ore ctf.	31½
Greene Cananea	44¼
Gulf States Steel	81½
Homestake	72
Inspiration Con.	52⅞
International Nickel	30
Kennecott	33⅛
Lackawanna Steel	82
Mexican Petrol	99⅞
Miami Copper	29⅜
Nat'l Lead, com.	58¼
National Lead, pf	101
Nev. Consol.	20
Ontario Min	10½
Ray Con	24
Republic I.&S.,com.	91
Republic I. & S., pf.	100½
Sloss-Sheffield	61½
Tennessee C. & C.	19½
U. S. Steel, com.	107⅞
U. S. Steel, pf.	111¾
Utah Copper	81¼
Va. Iron C. & C.	72

BOSTON CURB*	July 30
Alaska Mines Corp.	12
Boston Ely	75
Boston & Mont.	.51
Butte & Lon'n Dev	.15
Calaveras	50
Calumet-Corbin	‡.01
Chief Con.	2½
Cortez	.05
Crown Reserve	.19
Crystal Cop	.23
Eagle & Blue Bell	2¼
Gila Copper	‡17
Houghton Copper	50
Intermountain	‡.05
Iron Cap	18½
Mexican Metals	.45
Mines of America	1⅛
Mojave Tungsten	10
Nat. Zinc & Lead	18
Nevada-Douglas	52
New Baltic	90
New Cornelia	18⅜
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.07
Yukon Gold	1

SAN FRAN.*	July 29
Alta	‡.03
Andes	‡.05
Best & Belcher	‡.03
Caledonia	‡.03
Challenge Con.	‡.03
Confidence	‡.04
Con. Virginia	.26
Gould & Curry	‡.01
Hale & Norcross	‡.01
Jacket-Cr. Pt.	.06
Mexican	.20
Occidental	‡.51
Ophir	.06
Overman	‡.02
Savage	‡.03
Sierra Nevada	‡.09
Union Con.	.38
Utah Con.	‡.01
Belmont	2.75
Jim Butler	.59
MacNamara	.31
Midway	.04
Mont.-Tonopah	.10
North Star	.06
Rescue Eula	.10
West End Con.	1.02½
Atlanta	.03
Booth	.04
Comb. Frac.	.02
Florence	.10
Jumbo Extension	.10
Kewanas	.04½
Nevada Hills	.01
Nevada Packard	‡.27
Round Mountain	‡.18
Silver Pick	.04
White Caps	.30
Big Jim	‡.75
United Eastern	3.50

COLO. SPRINGS*	July 22
Cresson Con.	4.68¾
Doctor Jack Pot	.03¾
Elkton Con.	.04
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.64½
Granite	.18
Isabella	.04½
Mary McKinney	.05
Portland	.80
United Gold M.	.13
Vindicator	.30

BOSTON EXCH.*	July 30
Adventure	.50
Ahmeek	75
Algomah	‡.15
Allouez	50½
Ariz. Com., ctfs.	14½
Arnold	20
Bingham Mines	9⅜
Bonanza	.15
Butte-Balaklava	.25
Calumet & Ariz.	68½
Calumet & Hecla	450
Centennial	13
Copper Range	48
Daly West	2⅛
Davis-Daly	6
East Butte	9¾
Franklin	4⅜
Granby	78
Hancock	6
Hedley	‡12
Helvetia	.15
Indiana	‡.40
Isle Royale	26
Keweenaw	1
Lake	5⅜
La Salle	2⅝
Mason Valley	4
Mass	5¼
Mayflower	2⅝
Michigan	2½
Mohawk	57
New Arcadian	1⅜
New Idria	14
North Butte	14½
North Lake	65
Ojibway	.40
Old Dominion	42
Osceola	51
Quincy	68
St. Mary's M. L.	52
Santa Fe	.65
Seneca	11
Shannon	4¼
Shattuck-Ariz	16
So. Lake	1
So. Utah	13
Superior	‡4¼
Superior & Bost.	2 1/16
Trinity	3
Tuolumne	.97
U. S. Smelting	42
U. S. Smelt'g, pf.	43½
Utah Apex	2⅛
Utah Con.	10
Utah Metal	2
Victoria	2¼
Winona	1¼
Wolverine	27
Wyandot	.50

N. Y. CURB†	July 30
Big Ledge	1 1/16
Butte & N. Y.	.75
Butte Detroit	.16
Caledonia	.45
Calumet & Jerome	1⅛
Can. Cop. Corpn.	1 13/16
Carlisle	‡2
Cashboy	.05
Con. Ariz. Sm.	1⅜
Con. Coppermines	‡5⅜
Con. Nev.-Utah	‡ 1/16
Emma Con.	.10
First Nat. Cop.	2
Goldfield Con.	.24
Goldfield Merger	.03
Greenmonster	‡⅜
Hecla Min.	4 11/16
Howe Sound	‡4½
Jerome Verde	1/16
Kerr Lake	5.60
Louisiana	1/16
Magma	‡32
Majestic	.18
Marsh	‡.05
McKinley-Dar-Sa.	.38
Milford	‡.75
Mohican	.06
Mother Lode	36
N. Y. & Hond.	‡12½
Nipissing Mines	8½
Nixon Nevada	.51
Ohio Cop.	1 1/16
Rawley	‡2¼
Ray Hercules	4⅜
Richmond	‡.56
Rochester Mines	.38
St. Joseph Lead	14½
Standard S. L.	⅜
Stewart	‡17
Success	‡10
Tonopah	2¾
Tonopah Ex.	1 11/16
Tribullion	‡ 1/16
Troy Arizona	12
United Cop.	‡ 1/16
United Verde Ext.	37½
United Zinc	1⅝
Utica Mines	‡.08

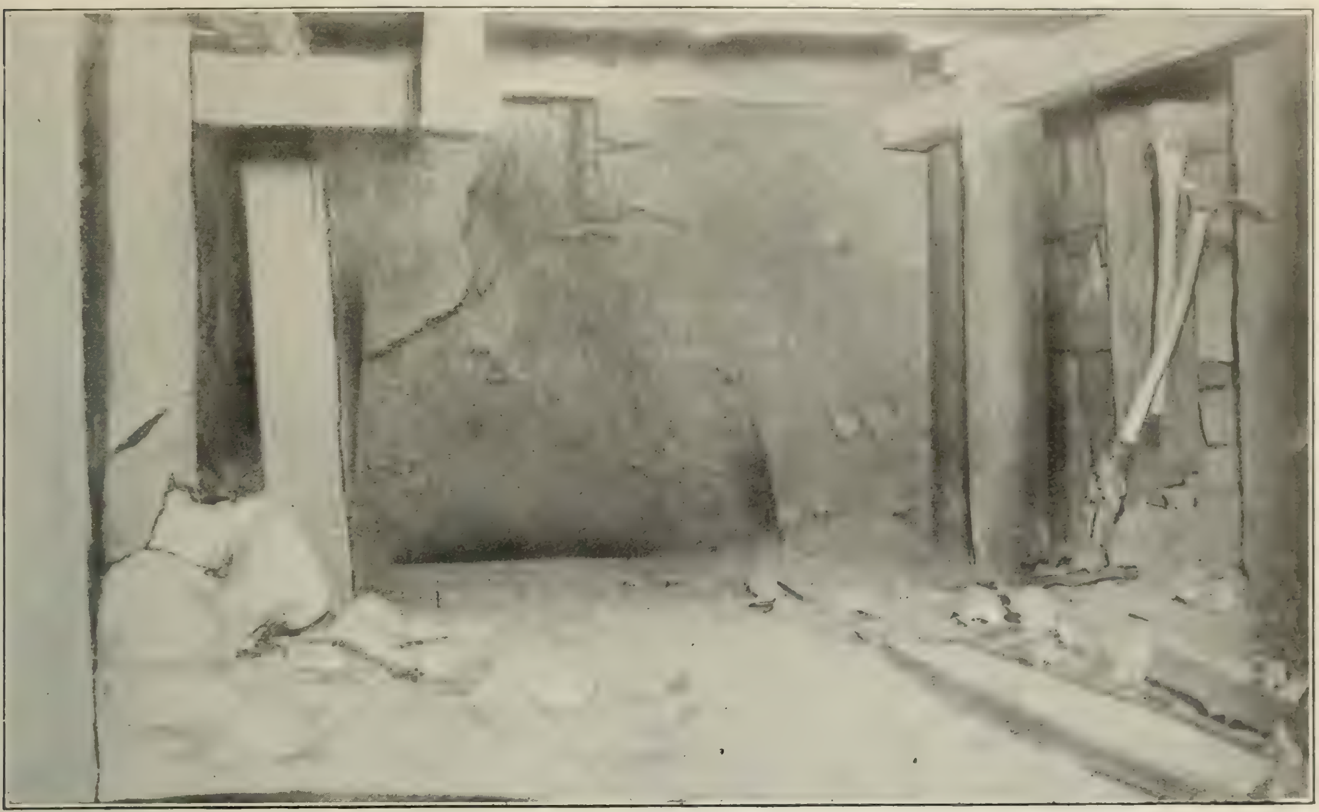
TORONTO*	July 30
Adanac	.07¼
Bailey	.03
Beaver Con.	.23
Chambers Ferland	.12
Coniagas	2.50
Hargraves	.04
La Rose	.35
Peterson Lake	‡.09½
Temiskaming	.30
Wettlaufer-Lor.	.04
Davidson	‡.35
Dome Exten	.10
Dome Lake	.12
Hollinger	4.50
McIntyre	1.28
Newray	.12
Porcu. Crown	.10
Teck-Hughes	.14
Vipond	.12
West Dome	.09

* Bid prices. † Closing prices. ‡ Last Quotations.

Engineering and Mining Journal

August 10, 1918

Volume 106 *Number* 6



VIEW OF A WORKING OPPOSITE CAVED STOPE IN THE HECLA MINE

Recovering Caved Stopes in Narrow Veins—III*

BY C. T. RICE

A stope 30 ft. wide caved for a length of 90 ft. along the vein and to a height of 75 ft. The ore in the cave was confined to a strip 10 ft. along the hanging wall, the other 20 ft. being mainly barren quartzite. Recovery of a cribbed chute buried under the center of the pile of barren vein matter was necessary in order to stope the ground above the cave economically. By carrying trenches down, a floor at a time, both along the hanging wall and across the center of the pile, using spiling to hold back the loose rock, the ore was removed and the cribbed chute recovered with a minimum of labor and without accident, although the trenches had to be carried down eight floors, or about 70 ft., through the caved material. The method described is safe and expeditious.

THE most difficult problem in handling caved ground which has as yet presented itself at the Hecla mine was that of reopening the stope which caved several years ago between No. 4 and 6 chutes of the 900-ft. level. This stope had been carried up a few sets above the tramming tracks on the 14th floor, when the back for a distance of about 90 ft. along the vein suddenly gave way and took out everything before it down to the tramming floor. The stope was 30 ft. wide, although at the time practically all the ore was confined to a 10-ft. strip next to the hanging wall. The ground, furthermore, was broken up by a number of minor slickensides. As a result, the stope continued to cave until the back had reached a point about 75 ft. above the 14th floor, as shown in Fig. 1.

A trench cut across the caved material from wall to wall showed that in this ground, before the accident occurred, the ore had been confined almost entirely to the 10 ft. next the hanging wall, as was the case lower down, and that, in caving, little of it had become mixed with barren vein filling. In no place throughout the other 20 ft. of the pile was it thought that there was enough ore to make its recovery worth while. The real problem, however, in reopening this stope was not to get the ore, but to recover, at a reasonable cost, No. 5 cribbed chute, which was buried under the center of the pile of barren vein filling, and was needed in order to mine the ore above the cave economically.

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*Continued from Part II, July 6, 1918, which followed Part I, June 15, 1918. This paper completes the series.

The plan adopted in reopening the working was to catch the back up securely over the caved area, and then, beginning at the top, to remove the ore by trenching along the hanging wall, timbering this opening with drift sets and using spiling to hold back the barren quartzite on the foot-wall side of the cave. Then, when this hanging-wall trench was even with the top of No. 5 chute, a trench 15 ft. wide was cut from wall to wall across the pile. Spliced stulls, slightly trussed and tied together into stull sets, were used to hold this central trench open, the broken vein matter along the sides being kept from moving by driving spiling down until new stull sets could be put in below. Thus proceeding carefully, a floor at a time, these two trenches were carried down through the caved vein, filling a distance of eight floors, or approximately 70 ft., without setting the pile in motion and without serious accident.

Stope Reopened From East End

A large open space had been left at the top of the cave, and as the stope had been worked two floors higher at the west than at the east end, it was possible to get into the cave at the former end, to study conditions. It was seen that the back was much flatter at the east than at the west end, and so, although it necessitated carrying the stope two floors higher in order to bring it even with the top of the cave, it was decided to reopen the working by trenching in from the east end. Consequently, the ore between No. 6 chute and the cave, and the much longer block of ground between it and the waste raise at the east end of the working, were stoped out even with the top of the cave. Stull sets were used to hold the ground open. But as many large slabs and boulders were scattered through the caved material, the end of the stope next to the cave did not have to be lagged to hold back the loose filling as the stope was carried up.

It was necessary to keep open the ground between No. 6 chute and the cave, in order to use that chute in reopening the cave, and fortunately this opening was only a few sets long. But the last part of the stope between No. 6 chute and the waste raise was lagged off and then filled tightly with waste to within two floors of the back, so that no more ground would be open in the vicinity of the cave than was absolutely necessary. The waste for filling this part of the stope was trammed from the waste raise at its east end, and later the tracks were extended into the cave when it became necessary to fill the central and hanging-wall trenches.

The first thing to be done in the cave proper was to catch up the back temporarily with sprags and posts, until the rather heavy flat part at the east end could be timbered securely with trussed stulls. These sprags and posts were stood on top of the pile with head- and foot-boards. Then, when the back had been picked down carefully, the work of placing the spliced stulls under the flatter part of the back began. As the west end of the cave had arched itself up rather securely, these stulls were necessary only a little more than half way.

Even under the flatter part of the back, the open space over the pile of caved material varied greatly in height, sometimes 10 to 12 ft. and again only 3 or 4 ft., according to the way in which the boulders and large slabs were scattered. Because of this irregularity, it was thought best to carry the stulls on stringers while they were being worked into position and blocked, for the stulls which were spliced together to form the trusses were green timbers 15 ft. long and from 14 to 18. in. in diameter, and so were heavy. Moreover, by carrying the stulls in this way, it was certain that they would be put in properly and at an even height—an advantage when stoping was resumed in the ground above.

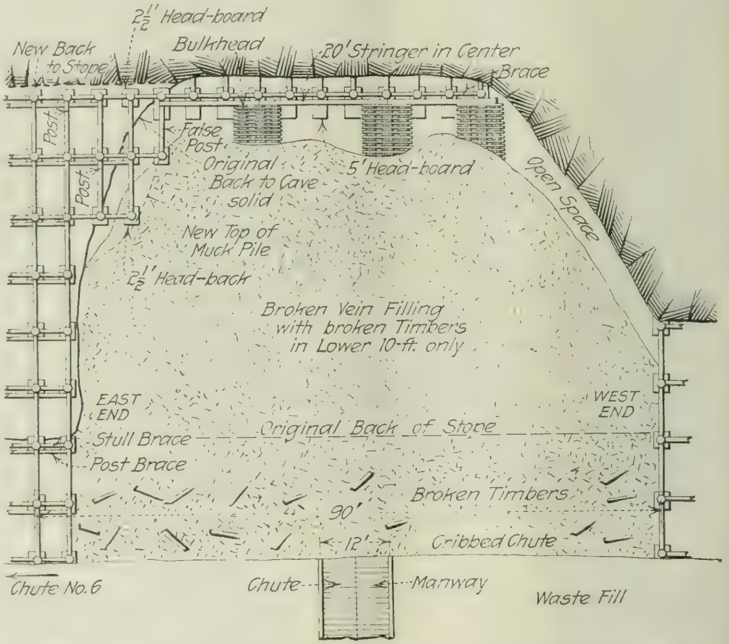

FIG. 1. LONGITUDINAL SECTION OF STOPE THAT CAVED ABOVE THE 900-FT. LEVEL, BETWEEN CHUTES NOS. 4 AND 6, FOR A HEIGHT OF 75 FEET

The full importance of trussing spliced stulls at a greater angle was not understood at the Hecla mine at that time, and so the center stringers were put in only about 12 in. higher than those along the walls. These stringers were round timbers, 16 ft. long and slabbed off on their upper and under sides to 8-in. faces. Four of them were placed in the stope, one near each end of the stulls that were to be trussed together. These catching-up stulls were put in beginning at the east end of the stope. In working ahead, the temporary sprags and posts were removed when necessary to get the stulls in properly.

The eastern ends of the first stringers were carried on false posts from the stull caps of the top floor of the east stope, and were wedged down on these posts securely from the stull cap above, so that they would not be displaced while the new stulls were being worked into position on them. The outer or cave ends of these four stringers were carried at their proper height by cribs from the pile. These cribs were built of 3-in. planks 5 ft. long, with three planks put in to a course, and were positioned, as shown in Figs. 1 and 2, so that they would catch the inner ends of the next stringers as well as the outer ends of the first ones. When the center of the cave was reached, care was taken to place the cribs so that they would not interfere with the sinking of the trench that was to be carried down to uncover No. 5 cribbed chute.

STRINGERS CARRY TOP WEIGHT UNTIL IT NIPS STULLS

As soon as the first four stringers were ready, three pairs of stulls were positioned on them at 5-ft. centers from the stull sets of the stope. Headboards three deep, of 3-in. planks, 5 ft. long, were then placed between their ends and the walls, and sufficient blocking was put in over the splices to catch up the back. Spreaders were put in to keep the stulls from swinging sideways, and the several trusses finally wedged tightly in place by driving home the wedges in the headboards.

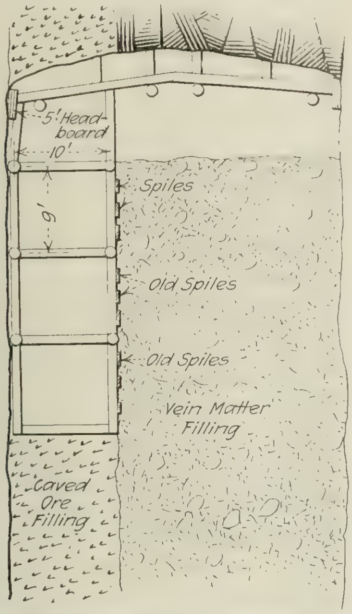

FIG. 2. CROSS SECTION OF CAVED STOPE SHOWING STULL SUPPORT UNDER BACK AND THREE FLOORS OF SPILED DRIFT

As soon as the back had been caught up securely from these first three trusses, cribs were built to carry the next four stringers, three other pairs of trussed stulls were put in, and the back was again securely caught up from them. Thus, working ahead three stulls at a time, the back was caught up for a distance of about 50 ft. over the east end of the cave. At that point the top of the cave began to arch itself both crossways and longitudinally along the vein, so that only an occasional post or sprag was required to make it perfectly safe. In putting in the cribs on the hanging-wall side of the cave, care was taken to place them in such a way that they could be caught up easily from below when the ore along that side was being trenched out, for it was highly important to keep these cribs in until the top weight had seated the stulls and their headboards securely against the rough walls of the cave, as until then most of the top weight coming on the trusses had to be carried by the stringers.

Occasionally the back ran up so high that short posts, or even false sets, had to be placed on top of these catching-up trusses to make the back secure. But generally that was unnecessary, as the back of the cave, although 30 ft. wide and rather flat at the east end, had caved until it was in fairly strong ground.

Starting at the top and east end of the pile, a trench was cut along the hanging wall, wide enough to get out all the ore. This was then timbered with drift sets having 10-ft. caps and 8-ft. posts, put in at 5-ft. centers. Mud sills were placed under these sets, which later became the caps of the drift sets on the next floor below. In cutting this trench, spiling had to be driven on the cave side, as already stated, so as to hold back the barren vein filling. But as many large slabs were scattered through the pile, and the quartzite of the vein had, as a whole, broken into rather coarse pieces, the spiles, which were nothing but 3-in. planks, 9 ft. long, that had been beveled somewhat at one end, did not have to be placed close together, and generally were driven from 12 to 18 in. apart. Bridge pieces, therefore, were unnecessary for catching the ends of the spiles, when the set ahead was put in, as sufficient room was always left between them for starting new spiles, even when the weight had forced the spiling in tightly against the posts.

As soon as the hanging-wall trench, which was 9 ft., or a floor, deep, had advanced far enough, the trench 15 ft. wide, previously mentioned, for uncovering No. 5 cribbed chute, was started across the pile and carried 9 ft. deep from wall to wall. The drift sets were placed in the hanging-wall trench as fast as it was advanced. In making room for the sets, no trouble was caused by ore running in the face, and breast-boards were found unnecessary, as the ore had broken rather coarsely, and would not run enough to undermine more than one mud sill at a time. As the sills of the different sets were securely tied together by means of braces when they were put in, the catching up of the timbers on the floor above was comparatively easy, the only thing needful being to put in two angle braces from the last mud sill on the lower floor to carry the mud sill of the set ahead on the floor above before it was undermined. These angle braces were placed so as to come just inside the posts that were to be put under the sill, converting it into a cap. Then, as soon as the ground had been worked out from under the set above, two posts and a mud sill would be positioned properly under it, braces put in to tie this mud sill to the mud sill of the last set, and the set finally blocked up tightly in place from beneath so as not to permit the timbers above to settle when the slice below was carried further ahead.

CENTRAL TRENCH TIMBERED BY SLIGHTLY TRUSSED STULL SETS

In the central trench, the caved vein filling had to be held back, as well as the walls kept open. This was done, as shown in Figs. 3 and 4, by means of stull sets and spiling driven down along their sides. As soon as the central trench had been dug deep enough to get in two floors of stull sets below the catching-up stulls above the trench, driving of the side spiling in the central trench was begun.

As the spliced stulls were put in at 9-ft. centers vertically from one another, longer and stronger spiling had to be used than in the hanging-wall trench. So they were made by beveling off at one end round timbers about 8 in. in diameter that had been ripped in half. These did not have to be placed closely together, owing to the general coarseness of the rock in the pile. Furthermore, as the caved vein filling had little tendency to run, they were not driven down level with the stulls of the floor below. Neither was it so hard to work these spiles in as might be thought, owing to the coarseness of the caved material, for round spiling drives more easily than flat spiling.

Some trouble was caused by boulders in driving the spiling, both in the hanging wall and in the central trench, but not much, except when one came in the way of the next set or stull, as the boulder, caught securely in the pile, would hold the loose ground back as well as spiling would. When the boulder could not be worked out of the pile without too much danger of causing the muck to run, or when so much of it was in the way of a timber that the projecting side or corner could not be sledged off (care always being taken to brace the boulder securely up into position before beginning to sledge it), recourse to explosives became necessary. A hole would be drilled into the boulder (or slab) so as to break off enough, with a minimum amount of powder, to make room for the timber. Great care was taken in such blasting not to use charges heavy enough to shake the pile badly, which might result in disaster. Dynamite, therefore, was never used in this cave unless it was absolutely unavoidable, as there were large holes or voids in the pile, due to the way the ground had broken. Heavy blasting would undoubtedly have caused serious shifting and possibly have crushed important timbers.

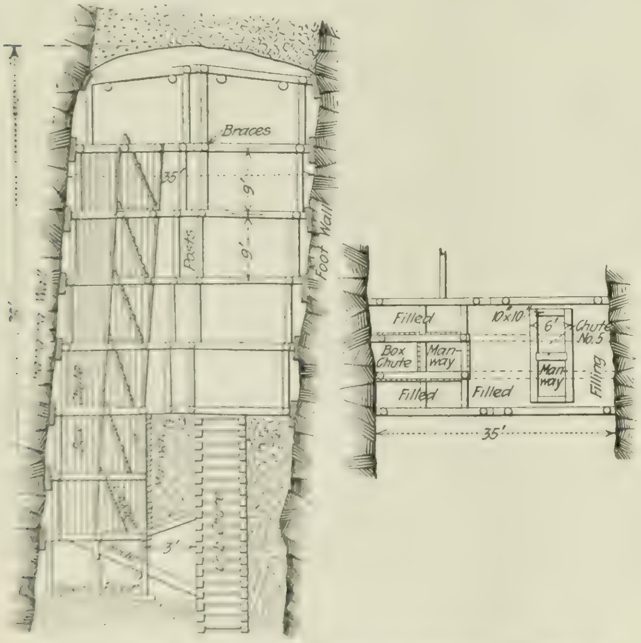

FIG. 3. SECTION AND PLAN OF CENTRAL TRENCH SHOWING METHOD OF CARRYING UP CRIBBED CHUTE AND FILLING

Nothing about the timbering of the central trench is specially to be noted As soon as there was room enough for stulls at 9-ft. centers directly under those above, four pairs of spliced stulls were put in across the trench. These were placed with their centers slightly higher than their wall ends, just as in the case of the catching-up stulls. But though 3-in. planks, three deep, were put in as headboards, the planks themselves were only 2½ ft. long, as their main function was to act as cushioning rather than as friction pieces for tying the stulls to the walls, as in the case of the catching-up stulls. Posts fitting into shallow daps, both at top and bottom, were put in to tie the different spliced stulls together into stull sets, and the stulls and posts were braced sideways from one another on the different floors to take care of the side pressure of the filling, and to prevent "jack-knifing" of the timbering in the central trench. The spliced stulls in the trench were, of course, blocked into place by tightening the wedges in their headboards after the posts, one at each end of each stull, had been put in, for in that way the stulls of the lower truss, through these posts, were brought securely home against the truss above.

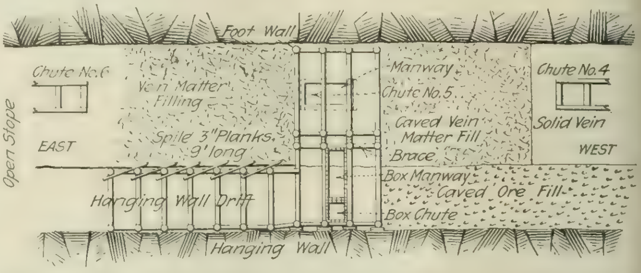

FIG. 4. PLAN OF CAVED STOPE SHOWING SPILED DRIFT AND CENTRAL TRENCH

Thus, by first working the ore out along the hanging wall, and then trenching across the pile, the workings being timbered as they were carried down, the ore was worked out a floor at a time, and the central trench carried down until the bottom of the cave was reached. In this way the ore in the east end of the cave was removed and No. 5 chute finally uncovered.

A timbered working 10 ft. wide and 8 floors, or approximately 70 ft., high had now been opened along the hanging wall from No. 6 to No. 5 chute, a distance of about 50 ft., and through the center of the pile of caved vein matter was a trench 15 ft. wide, 30 ft. from wall to wall, and 70 ft. high, held open by stull sets put in slightly trussed. The cribbed chute that had been uncovered had to be carried up, and the opening along the hanging wall and the central trench had to be filled, before the ore along the hanging wall in the west part of the cave could be mined. For if an attempt were to be made to mine the ore in the west half of the cave without first filling the openings in the east half, so much ground would be open that the timbering along the hanging wall would probably begin to swing, and the chute which had taken so long to uncover would again be lost.

METHOD OF RAISING NO. 5 CHUTE

Raising No. 5 chute and filling the central trench was not such an easy undertaking as it might at first seem, for this chute, which measured 12 x 6 ft. overall, and was timbered with 10 x 10-in. cribbing, ran lengthwise with the vein, so that the two central stulls of the trench had to be taken out in order to raise the chute. Moreover, in order to mine the ore in the west end of the cave without first carrying a stope up at that end, it was necessary to carry a box chute and a manway through the filling along the west side of the trench near the hanging wall, as shown in Fig. 3. This box chute had to connect at the bottom through a slide with the chute compartment of the cribbed chute. Furthermore, this chute compartment was on the east or far end of the cribbed chute, and the manway and timber slide were on the near or west end. To carry such a slide from the box chute to the chute compartment of No. 5 cribbed chute necessitated that practically the entire hanging-wall half of the bottom floor of the central trench be left open.

Obviously it would not do to take the two middle stulls out of this central trench, from top to bottom, in order to raise the chute all at one time. So after the slide had been put in to connect with the cribbed chute, and the stulls on the hanging-wall side on the bottom floor of the trench had been posted up and braced at the posts, the chute was raised, and the central trench filled, a floor at a time. At the same time that No. 5 chute was raised a floor, the whole cribbing was shifted over bodily a little toward the hanging wall, so that, when the top of the cave was reached, the chute was again under the ore, as it was highly desirable that, in mining the ground above the cave, the stope should not be carried any wider than the width of the ore along the hanging, unless drill holes showed that ore was again making toward the foot wall.

Work of Filling Central Trench Begun

As soon as the slide on the bottom floor had been put in from the bottom of the box chute to the chute compartment of No. 5 chute, the work of preparing the central trench for filling began. Posts were placed under the two central stulls, about 3 ft. back from the line of No. 5 chute. Then braces were put in to tie these posts and the stulls to the side stulls and posts. After that had been done, the stulls were sawed off about 2½ ft. back from the line of the chute. By that time the two central stulls on the foot-wall side of the chute had also been taken out.

Then, while No. 5 chute was being raised to the stull caps of the floor above, with a hole 3-ft. square left in the side of the cribbing where the slide from the box chute joined it, a manway-and-chute compartment was started next the hanging wall and on the west side of the trench by putting in, even with the outer edge of the ore, braces from the outside to the central stull, and lagging them. Then, when the other side of this compartment had been lagged off, and the bottom floor had been covered over, everything was ready for dumping in the filling. Lagging the bottom floor of the trench was easy, except for the space left between No. 5 chute and the ends of the sawed-off stulls. This opening was covered over without possibility of future damage to the chute by putting in short lagging, lean-to fashion, against the the chute from the regular lagging carried by the stulls.

Method of Filling Trenches With Waste

To aid in filling both the hanging wall and the central trench, the stope tracks were extended into the cave and carried across to the foot wall over the center of the chute trench. Then waste filling was run into the cave by car from the raise to the east.

In filling the cave the sole precaution taken was to dump only the finest filling around the cribbed chute, and that part of the trench was always filled first, so that no boulders would roll over against the cribbing. For when large boulders or timbers get against the side of a cribbed chute, there is danger that the pressure of the filling will finally drive them through the cribbing. Moreover, it was to prevent the stulls on the hanging-wall side of the trench from getting against the side of the chute later in the life of the stope that they were cut off from 2½ to 3 ft. back from the line of this chute.

As soon as the central trench and the opening at the east end along the hanging wall had been filled even with the top of No. 5 chute, the central stulls on the next floor would be taken out, the chute raised up to the next stulls, fine filling dumped in around the chute, and coarser filling further away, the hanging wall trench then filled, and the process repeated.

When the central and the hanging-wall trenches had been filled up to within two floors of the back, the mining of the ore along the hanging wall in the west part of the cave began. Starting at the top and from the box chute, this ore was trenched out, and the opening held open with drift sets having 10-ft. caps and 8-ft. legs, put in at 5-ft. centers, and with the barren vein filling on the cave side held back with spiling, just as had been done in getting out the ore at the other end of the cave, except that this time the ore was taken out through the box chute and slide to No. 5, instead of to No. 6 chute. When the ore had been worked down to within a floor of the old gob at the bottom of the cave, the slide was torn out and the ore wheeled directly to No. 5 chute.

When all the ore had in this way been sliced out along the hanging wall, the hole in the side of No. 5 chute was closed, the opening at the bottom of the cave as well as the trench along the hanging wall filled, and stoping began in the block of ore to the west of the cave. As that stope rose, the different floors were carried over to the edge of the cave. In that way the sloping back over the west end was squared up for resumption of normal stoping as soon as these floors and the west stope had been filled to within two floors of the back, tramming tracks for the new slice raised to that floor through the stope, and the crossboard lagging put in on the floor above. Thus, without a serious accident of any kind, the ore along the hanging wall was mined out, and the cribbed chute carried up through the center of a pile of caved vein filling 75 ft. high.

Caves Best Reopened by Working Down From Top

In this series of papers I have described methods of contending with practically every condition that will be met in reopening caved stopes in veins having walls strong enough to remain open when the back caves. I have shown how such caved stopes can be worked out with spliced stulls, even when the cave is 30 ft. or so wide, simply by putting in the stulls so as to obtain a trussing effect. I have also shown that when the walls are fairly strong the ore can frequently be removed simply by catching up the back of the cave securely with a truss structure, and drawing the ore out from under this truss without other support. I have endeavored to demonstrate that if care is taken to keep the mass of caved vein matter from getting in motion, it is possible to trench down through the cave and take out only that part of the vein filling which is rich enough to pay for its recovery.

All the methods detailed were devised by John F. Allen, assistant foreman of the Hecla mine, and are therefore especially adapted to wall conditions as strong as those that generally characterize the Cœur d'Alene veins. But they have a wider application, and no doubt by working out small sections at a time ore can be recovered with equal safety from caved stopes in veins where the walls are considerably weaker, although still strong enough to hold when the back caves.

In another series of articles, to appear later, I shall show in detail how the ore can be removed cheaply and safely, working down from the top, when not only the back, but also the walls. of the caved stope have closed in completely. Moreover, in the projected series of articles I hope to prove that the ore in any caved stope is not only more safely but also more easily recovered by working down through the cave than by coming up through it.

Copper Deposits of the Blue Ridge Mountains

By Marshall Haney*

The Blue Ridge copper region of Virginia comprises two districts, namely, that including the deposits from the vicinity of Front Royal southward, embracing Warren, Fauquier, Rappahannock, Madison, Page and Greene counties, and the district in the southwestern part of the state, including the Floyd-Carroll-Grayson plateau. The existence of copper in the Blue Ridge Mountains has been known since the first settlements. There are evidences of a mining boom just prior to the Civil War, at the beginning of which all operations ceased. Most of the properties then remained idle until the last 15 or 20 years, within which period various attempts have been made to reopen them. These operations were generally conducted by wildcat promoters, which tended to discourage legitimate operators.

In the copper region, the mountains are made up of a central core of igneous rocks, mostly of a dense, black, basaltic type, frequently altered to schistose forms and flanked by syenite and similar rocks. At the base to the west, forming the valley region, is the folded sedimentary series of the Cambro-Silurian age. The sedimentary rocks are not copper-bearing. The ore is confined to rocks of the basaltic type.

In the first district the ore consists chiefly of cuprite and native copper, with small amounts of bornite and chalcopyrite. It occurs in crevices and joint planes in small irregular-shaped lenses of quartz and as disseminated grains through the epodotized parts of the basalt. The native copper is often in nuclear masses surrounded by cuprite. Generally the ore does not extend more than 50 ft. below the surface. It is believed that it has been formed by concentration of material leached out of locally copper-rich portions of the igneous rocks. The shear zones have furnished a place for the gathering of the solutions and favorable conditions for deposition of material.

The three principal mines operated in the last few years are the High Top mine, in Greene County; the Blue Ridge mine, in Madison County; and the Gooney-Manor mine, in Warren County. The High Top mine is the best developed and equipped in this district. It is about eight miles east of Elkton on the summit of the southeast spur of High Top Mountain, at an elevation of 3000 ft. Over 2000 ft. of development work has been done. The ore consists of native copper, cuprite and some malachite.

The Blue Ridge mine is situated at the head of the Robinson River, near the crest of the range, in Madison County, 12 miles east of Stanley. The deposit was extensively worked before the Civil War. The ore consists of native copper, blue and green carbonates and some cuprite. All the workings are close to the contact of basalt and syenite, the ore being confined to the basalt.

The Gooney-Manor mine is near the town of Front Royal. The ore occurs in a vein in porphyry and as a contact deposit between limestone and porphyry. The main body has a width of 7 ft. and can be traced for a distance of 800 ft. The ore averages 3% copper, 1 to 6 oz. of silver, and \$1 to \$8 gold per ton. This property has been carefully developed and is in flourishing condition.

The region in southwestern Virginia is confined to a belt of crystalline rocks passing through Floyd, Carroll and Grayson counties, and is generally referred to as the Floyd-Carroll-Grayson plateau. As to general geology, the "Gossan Lead" is confined to the crystalline schists, its strike conforming to the inclosing rocks. The vein can be traced for 20 miles, with many old workings to aid one. Some of these can be followed for miles at a distance of 20 to 60 ft. below the surface. The wall rock is sericite schist. The vein matter consists of pyrrhotite with stringers of chalcopyrite, generally a series of layers of pure pyrrhotite being mixed with more or less micaceous material. The vein varies in width from 20 ft. to more than 100 ft., and at one point has a proved depth of 735 ft. and a width of 35 ft. The best-developed mines are the Betty Baker, Cranberry, Copper Hill, Vaughan, and Chestnut.

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*Consulting mining engineer, [illegible] County, Virginia.

Patent Examiners Wanted

Men or women who have a scientific education, particularly in higher mathematics, chemistry, physics, and French or German, and who are not subject to the draft for military service, are wanted for the examining corps of the Patent Office. Engineering or teaching experience in addition to the above is valued. The entrance salary is \$1500.

Examinations for the position of assistant examiner are held frequently at many points in the United States. An examination is announced for Aug. 21 and 22, 1918. Details as to subjects, places of holding the same, and other relative information, may be had upon application to the Civil Service Commission, Washington, D. C., or to the U. S. Patent Office. Should the necessity arise, temporary appointment of qualified persons may be made, pending their taking the Civil Service examination. Application for such appointment should be made to the Commissioner of Patents.

Dust Prevention in Transvaal Mines[*]

An important review of the methods used for allaying dust caused by mining operations, and the improvement of underground ventilation. Careful experiments were made, and as a result valuable conclusions drawn concerning the degree of atomization of water most efficient for the removal of extremely fine dust from the air in working places. To prevent the waste of compressed air and the excessive use of water, a type of atomizing apparatus that cannot be tampered with by miners is advocated. The filling of the whole of the mine with atomized water as soon as possible after blasting is advised. Watering down of working faces and walls should be done by atomized water, and only heaps of rock should have streams of water directed upon them. Where water blasts or atomizers are used, there should be a simple and immediate indication as to whether the water blast has been put into operation by the miner or operative responsible.

THE allaying of dust and gases, and the improvement of ventilation, both as regards quantity and temperature of air, should be treated as one subject. A little thought will show that this statement is one of fact. As was pointed out by Dr. Orenstein and E. J. Laschinger in the discussion on a previous paper on mine ventilation, an intense ventilating current can cause a considerable amount of dust to be picked up by the air and carried through the workings; the ill effects of high temperature were also referred to on the same occasion. It necessarily follows that if intense ventilation can cause dust again to circulate after it has been settled, all the subjects mentioned should be considered at the same time.

The use of water has proved to be the best means of allaying dust and some of the deleterious gases and for cooling the air. The use of water in mine workings reduces natural ventilation, and the more efficient the water system for allaying dust and gases and cooling the air the greater the retarding effect on the natural ventilating current. If these statements are accepted as axioms, it naturally follows that some auxiliary means must be adopted to increase the rate of motion of the ventilating current. This may consist of a mechanical device, such as a fan, or the appliances used for allaying dust and gases may be designed to assist the ventilating current to an extent equal to, or in excess of, the retardation caused by the cooling effect of the water used. The obvious means, other than fans, for accelerating the ventilating current, is to have the water discharged in the direction in which the air is flowing, and if the water is atomized by compressed air, the accelerating effect produced by the jet of air and water is considerable.

The discharge of the atomized water in the same direction as the flow of the ventilating current has one ill effect, however, it being the inferior direction for the purpose of allaying dust, which is best attained by the atoms of water meeting the particles of dust. The principle of having the atomized water stream flowing in the same direction as the air current can be carried too far, and at the points where the greatest amount of dust is formed all such streams should be opposed to the ventilation; as there would be only a portion, possibly from one-fifth to one-third, of the jets acting in this direction, the net result, either entirely or to a considerable extent, would be to counteract the retarding effect due to cooling.

WATER BEST ATOMIZED BY COMPRESSED AIR

The water used for allaying dust and gases, and for cooling the air, can best be atomized by the use of compressed air. Water can be atomized in two ways: (1) By utilizing high pressure and causing the water to be split into small particles by striking solid surfaces, or by causing it to issue in thin sheets or small jets as it is impelled into the air; and (2) by using compressed air to split it up. The latter is preferable, as the size of the atoms and the direction of flow can be much more easily controlled. The size of water atom or drop is an important factor in the allaying of dust and gases. Large drops are of little comparative value, as they fall out of the air too rapidly. On the other hand, the water can be too finely divided, creating a "dry fog," which floats in the air for indefinite periods. The mean between the two is the most desirable, and there is little doubt that the correct condition is obtained when, with the ventilating current and water atoms flowing at equal velocity, the water atoms can be seen gradually falling; in any case only a small portion of the water should reach the foot wall within 30 feet of the atomizer.

Without the use of compressed air the issuing water is imperfectly atomized, and the stream of atomized water cannot be directed in the exact direction required. A heavy shower of mixed sizes of drops of water, varying from, perhaps, $\frac{1}{8}$ in. diameter down to dry fog, can be created, and a jet can be led somewhat in the desired direction, but only a small part of the water used is efficiently atomized: the remainder falls to the foot wall within a short distance from the atomizer, and, as it flows away to the pump sump, carries quantities of sludge and grit with it, which collect in the sump and cause trouble with the pumps.

The same defect occurs with numbers of water blasts using compressed air, far too much water being used and no attempt being made to prevent the formation of large-sized drops. The excess use of water is frequently made apparent in winzes, numerous cases in which these have been filled with water from the water blasts being on record. The same excess quantity is used in all other development ends, but, as the water can flow away to the sumps, it is not so apparent.

SIZE OF WATER PARTICLE

The fact that the size of water atom has a considerable influence on the effectiveness of the dust allaying has been proved by tests carried out by the Phthisis Prevention Committee, in September last, in the Apex

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[*] An excerpt from a paper by Arthur C. Whittome and J. H. Veasey, read before the South African Institute of Engineers and published in the "South African Mining Journal," Nov. 10, Dec. 15, Dec. 22, and Dec. 29, 1917.

Section of the New Kleinfontein. Two sets of tests were conducted: First, experiments with different proportions of water to air, determined by using different sized apertures on the water connection, in order to ascertain the quantity of water put into suspense in the air, at a distance of 30 ft. from the water blast or atomizer, by the different sized apertures, the water used varying with the size of aperture; second, experiments to ascertain the dust-laying powers of the atomized water with the different proportions of water to air.

In each case the "Apex" water blast was the atomizer used. The atomizer is so designed that by means of replaceable diaphragms the quantity of air and water used is regulated independently of the whim of the person operating the appliance. In this series of tests a standard ¼-in. diameter air nozzle was employed, the air pressure being about 70 lb.; therefore the rate of air consumption was approximately 80 cu.ft. of free air per minute. Three different sized water apertures, ⅛, 1/32, and 1/64 in. diameter, were employed.

DUST-LAYING TESTS IN MAIN AIRWAY

The dust-laying tests were conducted in a main airway, in which the air was traveling at about 260 ft. per minute. The air was tested for dust (1) just before it reached the water blast, and (2) 100 ft. beyond the blast; thus a period of about 23 sec. was given for allaying the dust. Two Waugh drills, drilling upholes dry, under a special permit from the government mining engineer, were used to create the dust and were set up 65 ft. to windward of the dust-sampling tube. The visible particles of dust had all settled before the first sampling tube was reached, there being no dust observable by the naked eye at that point during the whole of the tests, though quantities of impalpable dust settled during the test on the outside of the sampling sump and surrounding objects. The tests were conducted by A. J. R. Atkin, of the Miners' Phthisis Prevention Committee. The following extracts from Mr Atkin's report show the result of the tests:

> The spray was turned on and allowed to run for two minutes before the drills began working, so that no dry dust was allowed to get into the test length of the tunnel.
>
> The tubes were held horizontally 4 ft. from the floor. Under these conditions falling particles should not have exerted any possible disturbing influence.
>
> The water used for these tubes was that used throughout the mine for sprays and atomizers. Its dust contents were: Dust under 5 mikrons[1] in mg. per liter, 2; dust between 5 and 50 mikrons in mg. per liter, 2; dust under 50 mikrons in mg. per liter, 4; weight of particles under 5 mikrons, 50 per cent.

TABLE I. DUST TESTS WITH ⅛-IN. NOZZLE

	Sample No.	Dust Under 5 Mikrons in Diameter	Dust Between 5 and 50 Mikrons in Diameter	Total Dust Under 50 Mikrons	Per Cent. Particles Under 5 Mikrons
Before	2,847	7.0	18.0	25.0	28
After	2,848	0.9	1.2	2.1	43
Before	2,849	12.0	26.0	38.0	31
After	2,850	Trace	0.6	0.6	Nil.
The average of these results is:					
Before		9.50	22 00	31.50	30.15
After		0.45	0 90	1.35	33.5
Percentage allayed		95.26	95 90	95.71	.

> The first experiment was made with the ⅛-in. nozzle. This produced fairly large drops, perhaps 200 mikrons in diameter, and at the test distance of 30 ft. from the nozzle suspended 2.96 gm. of water per cu.m. of air; the two tests made agreeing as shown: (1) 3.02; (2) 2.90; average 2.96 gm. of suspended water per cu.m. of air.
>
> The effect of the quantity of water consisting of particles of the size produced by the ⅛-in. nozzle is shown by the results given in Table I.
>
> From this it will be seen that with this nozzle 95.26% of the fine dust was allayed, and that the effect was practically proportional to the sizes of the particles, for there was an increase of only 3.15% on the quantity of dust (very fine) after the dust cloud had passed the spray. It is to be noted that this spray is very wetting at a distance of 100 feet.
>
> The second experiment was made with a 1/32-in. nozzle, which produced particles of water decidedly smaller than the ⅛-in. nozzle, and also some particles so small as to be classed as fog. There was no fog apparent with the larger nozzle. Although there was a considerable quantity of water apparent in the air, the spray was not nearly so wetting as with the ⅛-in. nozzle.
>
> The third experiment was made with a 1/64-in. nozzle, which produced a very thick fog. At the test distance of 30 ft. it was not possible to see an acetylene lamp flame, and at 98 ft. from the jet the fog was very thick after the jet had been running for 30 min. The mist thoroughly saturated the atmosphere and had not evaporated 40 min. after the jet was stopped. It did not appear to be very wetting, although there was a large quantity of moisture suspended in the air.
>
> The amount of moisture suspended by this 1/64-in. nozzle at a distance of 30 ft. from the jet is: (1) 4.82; (2) 4.70; average 4.76 gm. of suspended water per cu.m. of air.
>
> The amount of water suspended by this 1/32-in. nozzle is shown by the following result of this test: (1) 4.50; (2) 4.26; average 4.38 gm. of suspended water per cu.m. of air. The effect, in dust, by the water cloud produced by this nozzle is shown in Table II.

TABLE II. DUST TESTS WITH 1/32-IN. NOZZLE

	Sample No.	Dust Under 5 Mikrons in Diameter	Dust Between 5 and 50 Mikrons in Diameter	Total Dust Under 50 Mikrons	Per Cent. Particles Under 5 Mikrons
Before	2,851	15.0	34.5	49.5	30
After	2,852	2.4	1.2	3.6	66
Before	2,853	9.0	55.0	64.0	14
After	2,854	3.0	5.0	8.0	37
The average of these results is shown:					
Before		12.0	44.75	56.75	21.1
After		2.7	3.1	5.8	46.5
Percentage of dust allayed		77.5	93.07	89.77	....

> It will be seen that although 77.5% of the fine dust is allayed, the increase in percentage of fine dust in the total unallayed dust is 25.4%, showing that a spray giving drops of this size has a tendency to leave a larger percentage of the fine dust suspended in the air, although allaying the dust efficiently.

TABLE III. DUST TESTS WITH 1/64-IN. NOZZLE

	Sample No.	Dust Under 5 Mikrons in Diameter	Dust Between 5 and 50 Mikrons in Diameter	Total Dust Under 50 Mikrons	Per Cent. Particles Under 5 Mikrons
Before	2,855	24.0	86.0	110.0	21
After	2,856	8.0	17.5	25.5	31
Before	2,857	19.0	56.0	75.0	25
After	2,858	11.5	14.0	25.5	45
The average of these results is shown:					
Before		21.5	71.0	92.5	23.2
After		9.75	15.75	25.5	38.2
Percentage of dust allayed		54.0	77.8	72.4	....

> The effect on the dust produced by this fog of finely divided water is shown in Table III. It is here clearly shown that although this fine spray suspends a greater amount of water in the air than the others, it is not efficient in allaying the fine dust; 54.0% of the fine dust is allayed, and the usual tendency for the percentage of fine dust unallayed to increase is shown again by the rise of from 23.2% before the spray to 38.2% after the spray. From these results it will be seen that the nozzle with the ⅛-in. orifice is the most efficient dust allayer for fine dust.
>
> The 1/64-in. nozzle produces an extremely thick fog, but it is evident that the particles are too small to settle readily, so they do not allay the fine dust well. With it established that the ⅛-in. nozzle will allay 95.26% of the dust under 5 mikrons in 23 sec., the apparatus shows itself to be of considerable value.

The authors do not claim that these tests are absolutely final, as the series was not extensive enough to establish the exact, or perfect, sized atom of water which should be attained. It may be that had further tests been conducted at 200 ft. from the atomizer the remaining 4.29% of the total dust (or 4.74% of fine) would have disappeared, or, alternatively, if slightly larger jets for both air and water had been used the dust might have all disappeared in the 100 ft. But it was clearly established by the tests that all but 4.29% of the total dust (or 4.74% of the fine) was settled in 23 sec.; therefore such a stream of atomized water playing into a dead end would settle the whole of the dust, no matter how dense it was, in a few minutes. A distinctive feature of the system of finely atomizing water by means of compressed air is that the whole drive is filled with fine particles of water. With the finest atomizing a dense fog is created, which is sufficient to mask the light from a group of acetylene lamps at a distance of 20 or 30 ft. This fog is too finely divided to give the best results, as is seen from the test results. On the other hand, this dense fog is probably the best means for preparing the dust for final allaying, and the authors think that the combination of two atomizers—one creating a dense fog at a point 50 to 100 ft. in advance of the other—would provide the ideal system for allaying dust in a development end. As the whole drive is filled with atomized water, every portion of the hanging and side walls is wetted, even the back or projecting pieces of rock, thus providing the most suitable means of preventing any dry dust accumulating at any part of the working place. The ordinary water blast wets the projecting face opposite to the blast, but not the backs of projecting pieces, and it is the side away from the blast which needs wetting, as the air current, carrying dust, strikes that side. The great proportion of the water used with the ordinary water blast is worse than useless; the large drop not only rapidly falls to the ground, but it carries numbers of useless small atoms of water with it, and thus removes a proportion of the water which would have been used to advantage.

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[1] 1 mikron = 0.001 mm.

Control of Dust-Allaying Appliances Should Be in Official's Hands

The control of all operations of dust and gas allaying, as well as the regulation of ventilation, should rest with one official. Miners should be unable to regulate the quantities of air and water used in water blasts. The authors are satisfied that until these conditions are complied with there will be little further improvement in the dust conditions in mines. If it is conceded that the size of water atoms is of primary importance, then it must be agreed that the ability to regulate the sizes must be taken out of the hands of the miner; he should have an appliance with which he can turn the air and water supplies on or off, but the quantity of these fluids used should be entirely out of his control. It is beyond question that, with the appliances now in general use, there is far too much air used in some working places, and far too little in others, for effective work. The usual air cock in use is 1 in. diameter. This cock can be opened to any degree that the miner chooses. If he opens it full he will use about 1200 cu.ft. of free air per minute for the one water blast, or as much air as is required for from 10 to 12 drills.

Obviously, if all the cocks are opened to their full extent, the air pressure must fall, and the working places nearest to the air mains will have the highest pressure. On the other hand, if water blasts are used with adjustable air orifices, the adjustment being made by one official, and the air supply being either full on or full off, the quantity of air used in the different working places can be controlled to suit the requirements. If similar adjustments for the water supply are combined in the appliance, the necessary quantity and size of water atom are attained without the possibility of interference on the part of the miner. It is obvious that if only a ¼-in. diameter outlet is used, in place of a 1-in. diameter one, about $\frac{1}{16}$ the quantity of air is discharged, and either the air in the air-mains is maintained at a higher pressure, or a greater number of water blasts can be used.

It is equally certain that too much water is used in the majority of water blasts, and the quantity used is detrimental rather than useful. The tests previously referred to show that a ⅛-in. aperture will pass sufficient water to allay large quantities of dust rapidly. The ordinary water blast usually has a water connection varying from ½ to ¾ in. diameter, though sometimes 1 in. diameter is employed. Therefore, the maximum quantity of water used varies between 16 and 36 up to 64 times that used with the ⅛-in. diameter aperture, and less efficient work is done. It naturally follows that if the smaller quantity is required the use of a better quality of water becomes permissible, and it would be feasible to even use Rand Water Board water for water blasts.

Dust and Deleterious Gases Should Be Speedily Removed From the Air

Dust and deleterious gases should be removed from the air as soon as possible after they are generated. This needs no demonstration. If it were possible to carry it to finality, then only those parts of the mine in which dust and gases are created would need to be wetted down. At the present time no effort is made to remove dust and gases from the air at the point where the greatest amount is generated—in the stopes during blasting. The authors are firmly convinced that the final stage in the general laying of dust throughout mines will be reached only when as much care is devoted to stopes as to development ends. It is generally contended that, as the ventilation of stopes is always good, the dust and gases formed therein are carried out of the mine by the ventilating current. This is to some extent true, but almost certainly only partly so.

If ventilation is all that is required, then there are many dead ends which need no water blasts, because their ventilation (by mechanical means) is so good that the whole of the air contents of the drive is rapidly changed; yet, in these days, no one would recommend the discontinuance of the use of water blasts therein. In any case the use of water blasts in stopes should be tested, and the authors are convinced that once they were used they would never be discarded. If such a policy were adopted, there would be water blasts installed at every working place where blasting was in progress. Under such conditions a different policy with regard to water atomizing would develop. At every working face a dense dry fog would be created during blasting, and, at selected points, zones of larger sized atoms would be formed, so that the fog, which would have brought the dust—and those gases which water will allay—into a suitable condition for rapid deposition, would be brought down within a short distance. Such zones should be created, say, 100 ft. from development faces and at the air outlets from all stopes. With this system the minimum quantities of air and water would be used with the maximum effect.

Atomized water is the best means for removing dust and all deleterious gases except CO from air; therefore, the whole of the mine workings should be filled with atomized water as soon as is possible after blasting. It will be conceded that the mine air should be purified as rapidly as possible after blasting. There are only two means of doing this: by an intense ventilating system, and by withdrawing all deleterious matter from the air. Intense ventilation alone is not to be recommended, as the walls are rapidly dried and dust is deposited on them, ready to be returned to the air on the slightest disturbance. It is difficult to provide intense ventilation at all working places, and the ventilating current is usually only increased in the best ventilated part of mines, without great improvement at the development faces, by the installation of fans. Or, perhaps, it is better to say that if the total amount of air circulated through a mine, on the adoption of mechanical ventilation, is doubled, there is only a slight increase in the quantity reaching the development faces. If, however, a complete system of fine atomizing of water is adopted, and the working places and traveling ways are filled with dense fog, the fog being allayed in certain zones, the whole of the dust and gases, except CO, will be brought down in the minimum time without the necessity of intense ventilating currents.

This system, of course, is not a new one. It is the method which has been so frequently recommended, and so seldom adopted in mining—never on the Rand—of filling the mine with atomized water by the use of steam. Steam could not be used in deep-level mines, owing to the difficulty of producing it at the desired points and to the greater trouble which would arise through heating up working places which already are too hot. Assuming that 1 lb. of water if highly atomized will densely fog 560 cu.ft. of air, it follows that 1000 gal. will as densely fog the air in 17.5 miles of 6 by 10 ft. drives, or 57 gal. to the mile. From this can be calculated the amount of water which would need to be highly atomized to fill the working places and traveling ways of any mine. Different mines would need different proportions of the heavier-atom zones for settling fog, some proportion of which would be deposited on the walls of the mine by contact. But it can be easily seen that the amount of water required in any mine is a negligible quantity. The great advantage of atomizing water by the use of compressed air, instead of by first generating and then condensing steam, is that it cools the mine instead of heating it. Nitrous fumes and CO_2 are rapidly absorbed by water, but CO is not to any appreciable extent soluble, therefore the ventilating current must be almost entirely relied upon to remove this gas.

CONTINUOUS MEANS FOR REMOVING DUST NECESSARY

The "deadly" dust is invisible; therefore, continuous means of removing it from the air, and of ascertaining the daily condition of the air itself, should be provided at selected points in the main airways. There are two aids by which the invisible dust can be continuously removed from air: by mechanical separation at definite points, and by the stream of air being intermittently super-saturated with water in the form of fog, the water being deposited at intervals either by contact with already wetted walls or by a shower of larger water atoms. The latter system gives the advantage that the air is slightly cooled at each point where it receives the fog, or rather between that point and where evaporation of fog ceases. A considerable cooling effect could be obtained if at stated intervals in the main airways small water blasts or so-called atomizers were installed and continuously operated, fogging the air to an extent which would not incommode the workmen, but to such an extent as would prevent evaporation from the mine walls or running water, and would, in fact, keep the walls wet, after they had been wetted (subsequent to blasting) by filling the mine with fog. The quantity of water and air required for such atomizers would be small, the apertures in the air cones being not larger than $\frac{1}{8}$ in. and the water-cone apertures, say, $\frac{1}{64}$ in. As these water blasts would be continuously in operation, they would need no cocks, and they would be erected at all points found desirable, including ore passes, ore bins, stope boxes, stope air outlets, and the like. At some of these points the air and water cones could be increased in size so as to provide for the amounts of dust created, say, at ore passes, ore bins, grizzlies, etc. The sizes of the air and water cones can be regulated by the official in charge of the installation, but cannot be interfered with by the workmen. These water blasts discharging in the direction of flow of the ventilating current would continuously assist in accelerating the air velocity.

There is no question that a continuous sampling of the air, at selected main air outlets from working places, would tend to a great improvement in the working conditions of all mines. The present great difficulty consists in the operations of collecting and testing air samples occupying such a long period; even then the results only show the conditions for a few minutes out of the 24 hours. It is hoped that a system for giving a continuous record over the whole 24 hours will be thoroughly tested.

WATERING DOWN OF WORKING FACES AND WALLS

Watering down of faces and walls should be done with atomized water; only heaps of rock should have streams of water directed upon them. One need only to see a street water cart at work to realize the importance of this point. The small jets of water raise clouds of dust. A large jet of high-pressure water, such as is used for watering down faces in mines, must have an even greater effect than the small jets of a water cart. Therefore, clouds of invisible dust must be thrown off the walls by the jet of water; portions of this dust are caught by the stream, but considerable quantities must be held by the air and flow with the ventilating current. The use of streams of atomized water would obviate this, as the stream which dislodged the dust could be made wide and only small quantities at one side of the stream would escape being caught. In any case, hanging and side walls should be wetted down against and not with the flow of the ventilating current, so that dislodged dust would flow into the stream of water and not away from it.

The mechanical ventilation of dead ends should be on a system by which induced currents could be directed to the working faces, while foul air would be exhausted from the working places. There are two systems for the mechanical ventilation of dead ends: (1) fresh air is delivered as near as possible to the working face through pipes, the acceleration of the current being attained either by air jets or fans: (2) fumes and foul air are drawn from the working place by similar means, and delivered to the main return airway. There are advantages for each system. By (2) the foul air is delivered to the upcast shaft without passing through other working places; therefore a minimum amount of dust is deposited after blasting. By (1) the current of fresh air is delivered with velocity at the end of the ventilating pipe and sweeps forward to the working face, driving out foul air and keeping that portion of the working place sweeter than is possible with the exhaust system, by which the air current is drawn along the drive toward the face but is short-circuited immediately it reaches the end of the exhaust pipe, only a small portion of the air reaching the face. At many of such working places there is little fresh air other than that from the rock drills actually delivered to the working face. The authors suggest that the preferable system would be a combination of the exhaust system with a modified pressure arrangement. A short length of air pipe, with an air jet therein to accelerate the air current, should be installed with its outlet as close to the face as is feasible, the inlet being on the windward side of the exhaust pipe end. This would provide the necessary velocity to deliver air to the face, and if the accelerating jet was of the water-atomizing type the air delivered would be fairly free from dust.

SIMPLE INDICATOR OF THE OPERATION OF WATER BLAST REQUIRED

There should be a simple and immediate indication as to whether the water blast has been put into operation by the miner responsible. This check should be available as soon as the miner is out of the mine. One of the complaints most frequently made in connection with developers is that they do not turn on the water blast. The omission to perform this duty has a doubly bad effect, in that the dust is not laid at its point of origin and the working place is not wetted down. The omission of dust laying, of course, involves the possibility of gas remaining in the working place; most of the gassing accidents in dead ends are due to this cause. It is obvious that it is desirable that there should be an absolute check on the surface, showing whether the miner has or has not turned on the water blasts.

It should be a part of each shift boss' duties to test each water blast in his section, ascertaining that it is in good order and pointed in the correct direction. The miner must, under the regulations, test his water blast before lighting up. So that the only cause of trouble which is possible, apart from an actual failure of the air or water supply after testing, would arise owing to the water blast, or its connections or pipes, being damaged or buried or the apparatus being knocked over and the jet of atomized water delivered in the wrong direction. The design of the apparatus and its method of installation should be such that no damage can occur to it and no change of direction of the stream be possible. At the same time the miner should be compelled to turn on the air or water, or else convict himself of the omission.

Sulphur Mining in Mexico*

BY TRINIDAD PAREDES†

On the Huascamán estate, San Luis Potosi, there are a number of mines belonging to an American corporation, and sulphur is extracted at the rate of 800 tons per month and sold at an average price of 50 pesos per ton. The greater part is exported to Europe. In the Sierra de Banderas, Durango, there are other mines, which produce a large amount of sulphur which is sold to a neighboring dynamite factory. In the same locality there are still other mines, at present abandoned, but capable of production if developed. An advantage in this case is that they are near to railroads.

Sulphur has been mined in the district of Viesca, Durango, but the mines have not been developed to any extent. To the south of Venado, San Luis Potosi, there is a small property which has produced four tons a day. To the south of Guadalcázar, in the same state, there is a mine which produced 25 tons a month in 1913. About 80 kilometers from Matamoros, Tamaulipas, there is an important deposit. To the south of Calexico, Lower California, there are considerable quantities of sulphur which can be readily shipped to San Francisco and sold there for $12 per ton. Other deposits in Lower California are at Promontoria and Las Vírgenes.

The value of sulphur exported from Mexico during 1903-1913 reached P. 153,841, and the value of imports P. 919,402.

Mexican Paper Currency

The Carranza government claims that seventy millions of paper currency of the Bank of London and Mexico has now been called in and restroyed, leaving only thirty millions outstanding, according to the *Economist*. This balance is to be redeemed as soon as the process of liquidation permits. The work of retiring and incinerating the paper issues of other banks is progressing rapidly, and many millions have been disposed of in this manner. Little now remains of the different national paper issues, all but a limited amount having been called in and destroyed. All this is said to be in connection with the radical and far-reaching changes in Mexico's monetary system, which, among other reforms, seeks to raise the gold unit value so that it will be substantially above the bullion value of the silver peso. But in the light of the present lack of confidence in the fiduciary money in Mexico, arising out of the paper-money experience of the last three or four years, it is not deemed to be safe to inaugurate the new coinage system with a smaller reserve than 35%, though 40% will more likely be the figure decided on. It is hoped by the government that within a few years "after confidence has been restored and business and banking have resumed their normal proportions," a reserve of 30% will be adequate for the country, and that this would be in the form of gold, only a small part being in silver. It is further proposed that a portion of this reserve should be kept in New York or London, to be drawn against or increased by additional deposits in the settlement of the republic's international trade balance.

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*Abstracted from the "Boletin Minero."
†Mining engineer.

The Wastage of Coke Byproducts

By Frederick MacCoy*

The study of coal wastage has been greatly intensified by the war, but such great stress has been placed on the wastage in mining and manufacturing establishments, that little, in comparison, has been done to prevent another waste of great importance—the loss of valuable byproducts from the bee-hive coke oven. The financial value of this waste in the United States is large. Although the exact figures are hard to get, a reasonable estimate of the value of the byproducts now recovered exceeds $50,000,000 per year, while the wastage exceeds that figure by half. The loss through neglect of coke byproducts has been so forcibly brought out by the war that it is entirely probable that the end of the war will find the United States making use of them as a valuable asset, and no longer dependent upon other nations for many of the necessities of a modern civilization which may be included in the expression "coke byproducts."

BEE-HIVE PLANT AT BLOSSBERG, NEW MEXICO (INSET), AND A MODERN BYPRODUCT COKING PLANT AT GARY, INDIANA

Innumerable products from coal gas and coal tar have been put upon the market, but it is pertinent to mention only a few of the most important coke byproducts represented by cyanides, ammonia, toluol, benzol, nitrates, heating and illuminating gas, and tar. At the beginning of hostilities between Germany and the Allies, practically all of the sodium cyanide used in the recovery of gold and silver came from Germany and Belgium. One small plant in New Jersey furnished a limited supply. Today the shortage has been only partly overcome, with the result that some mines have turned to the flotation process.

In 1914 the United States produced 180,000 tons of ammonium sulphate, and imported 90,000 tons; all of which could have been recovered from the smoke of this country's coke ovens. The United States is now spending $20,000,000 in the erection and equipment of a plant for the production of synthetic nitric acid, when the ammonia produced by American coking plants would more than suffice for the basis of a nitric-acid production far in excess of the estimated capacity of the Government plant.

Toluol and benzol, with their innumerable derivatives, motor "gas," carbolic acid, bases for dyes, solvents for paints, explosives, etc., form a valuable group in the series of byproducts. The bee-hive ovens are wasting enough illuminating and heating gas to light and heat many of our large cities, so recently suffering from the fuel shortage. Coal tar is going up in smoke in sufficient quantities to build thousands of miles of national highways, or to furnish the crude material for many medicines and drugs.

The value of these products was undoubtedly better known by Germany than by any other government, if Belgium be excepted. No doubt this knowledge formed one of the greatest incentives to greedy Prussia for the invasion of the territory of her little neighbor, not only to take what was thought to be the shortest road to Paris, but to secure the output of the numerous byproduct coke ovens, so useful in modern warfare.

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The history of the byproduct industry dates from 1792, when the process of making coal gas was discovered by Murdoch. However, in this process, gas was the principal product, and a poor quality of coke the byproduct. Numerous attempts were made to develop a process for the production of gas from the standard coke oven and its utilization for the heating of adjoining ovens. Some of them met with more or less success, yet no satisfactory process resulted whereby not only a high-class coke could be produced, but a commercial quantity of the byproducts as well, until after 1880.

Experiments by Otto and Koppers in Germany, and by Schniewind in the United States, added much to what was then known about the business, and in 1906 a commission of engineers of the United States Steel Corporation made an exhaustive study of the European systems, with the result that the commission recommended the erection of a bank of Koppers ovens, which were built at Joliet, Ill., in 1908. Although byproduct ovens on other systems had been built in the United States before that time, the coke produced had not satisfied the metallurgical requirements as well as bee-hive coke. Today byproduct coke is the acknowledged superior.

The principal drawback to the more rapid extention of byproduct coking has been the initial outlay required. A byproduct coking plant is an expensive establishment. Before installing a byproduct coking plant not only is a thorough investigation of the available coals required, but the problem of disposing of all finished products must be considered. To produce just such products as can be disposed of readily is an important item in the proper design of the plant.

The byproduct of the ovens comes off in the form of gas, and, as in the production of commercial gas, a separation is made of coal tar as a preliminary treatment. The resulting gas may then either be washed with water to recover the ammonia, or, as in the Koppers process, with weak sulphuric acid to form ammonium sulphate. After the extraction of the ammonia, the gas is again washed, usually with a petroleum oil that distills at approximately 300° C. This wash oil extracts from the gas the benzol, toluol, xylol and solvent naphtha. A preliminary distillation of the wash oil next produces a light oil composed of the absorbed constituents, together with a slight amount of the wash oil. Further distillation then separates the product into its component parts. The light oil composite produces about 70% crude benzol, which is one of the products that is, in my opinion, destined to play a much more important part in the future than in the past. As a motor "gas" it stands upon a par with gasoline, with which it readily mixes. It is claimed by motorists that a mixture of the two is better than either alone.

Alcohol has not been found a satisfactory motor fuel, yet when mixed with benzol it makes an efficient fuel. It is a curious fact that though alcohol will not mix with gasoline, although it mixes with benzol, a mixture of benzol and alcohol may be mixed with gasoline. The coal tar may be used as such, or separated into carbolic oil, creosote, anthracene, and pitch, with a wide range of possible intermediates, the separation of which depends principally upon distillation temperatures. With these as bases, innumerable chemical compounds may be produced. Separation of the principal products is not difficult, but an elaborate and expensive equipment is required for the complete separation. However, many of the byproduct plants do not go any further than the separation of the more easily won byproducts for which there is a ready market.

Corindite, a New Refractory

According to Alexander Bigot in an article in the *Iron and Coal Trade Review*, M. Noel Lescesne has invented and patented a process which consists in heating in a cupola a mixture of bauxite and anthracite, using a forced draft. Under the influence of the fire and the combustion gas, the bauxite is reduced and aluminum carbide is formed, which in the presence of air is transformed almost entirely into alumina, and the heat developed is such that the mass is fused by successive layers—a special contrivance preventing the material from adhering to the refractory lining of the oven. This operation terminated, the mass is cooled by air, and a vesicular fused block is found, in which a large number of small alumina crystals are disseminated in the solidified mass.

Analyses of this fused mass indicate Al_2O_3 68.8%, TiO_2 3.85%, SiO_2 21.40%, iron oxide 5.25%. The fused bauxite has been designated by the name "corindite," on account of the crystallized mass of corundum. Red fused bauxite resembles emery in its composition and is a powerful abrasive. Corindite is crushed and mixed with finely pulverized refractory binders, such as bauxite and kaolin. Lime and magnesia are avoided in the binder. The mixture is molded into bricks, which are dried and baked. Between 1350 and 1400° C, they undergo no shrinkage; between 1700 and 1730° C, they lengthen 0.5%; above 1750° C. they begin to undergo shrinkage, which reaches a limit of 3% at 1850° C. Porosity varies from 9 to 12%. The resistance to wear is great, the new refractory having 3½ times more resistance to wear than good magnesia brick.

Bolivian Exchange

Since the promulgation of a decree by President Gutierrez Guerra of Bolivia, on Feb. 27 last, the exportation of gold from Bolivia has been entirely prohibited, states the *Economist*. The decree was rendered necessary because the national congress closed its sessions without coming to any decision upon the important project submitted for regularizing the operations of the banks which had *billetes* (banknotes) in circulation. Had this step not been taken by the Executive, in all likelihood there would have been an internal crisis through lack of metallic currency. To protect the stock of gold—*oro sellado*—in the banks, there has been kept in force the law of moratoria for all obligations payable in metallic currency, obligations among which were included banknotes issued by the banks of the republic, institutions which, for that reason, had no necessity for making use of their gold reserves. The importation of gold was rendered impossible by the absolute embargo on exportation in all the countries where Bolivian commerce had available balances. Bolivian exportations had left in favor of the country considerable sums.

The Moore-Edmands Process of Precipitating Gold With Charcoal*

By A. W. ALLEN

Up to the present the use of charcoal as a precipitant of gold from aurocyanide solution has not been successful. A new Australian process, involving the use of finely ground charcoal, is described, which, in practice, has shown improvement in results and greater economy over the standard and more expensive zinc method.

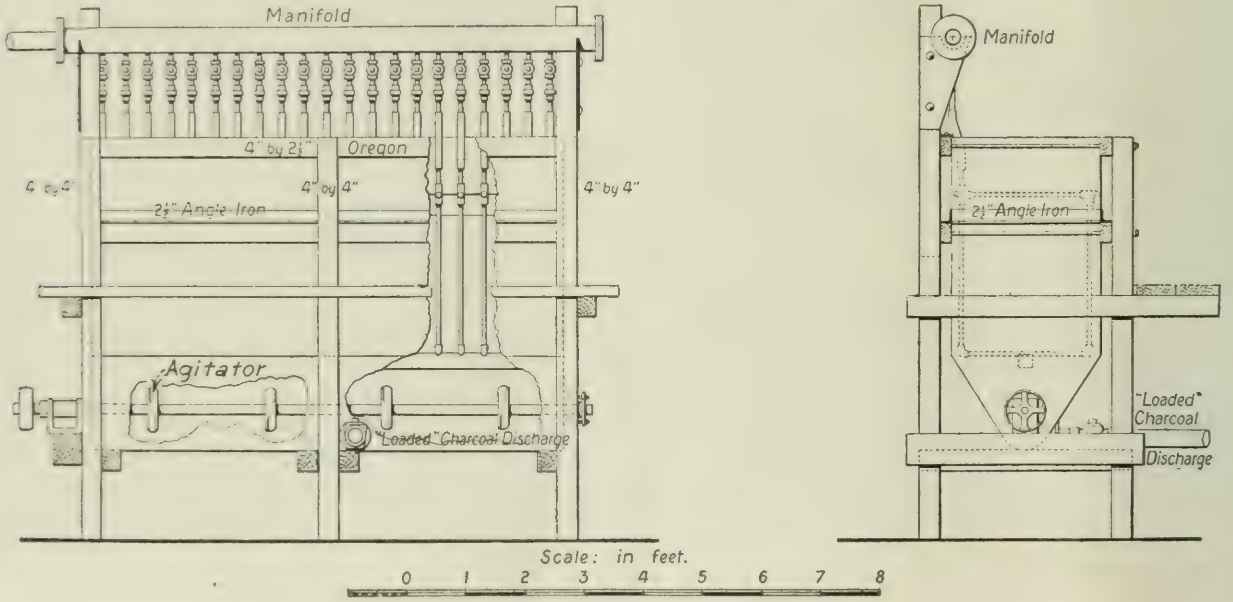
A NOTEWORTHY advance in the metallurgy of gold is due to the efforts and ingenuity of K. Byron Moore and H. R. Edmands, who have resurrected the question of charcoal precipitation of gold from aurocyanide solutions, and, after exhaustive laboratory experiments, have perfected a system of precipitation with charcoal slime which apparently leaves little to be desired. The method has been finally adopted at the Yuanmi mine, Western Australia, and is also being practiced in South Africa. In the former case a foul and complicated cyanide solution containing antimony and arsenic is successfully freed of its gold. With zinc precipitation there was trouble and loss from high tails solution, the cost of zinc was considerable, and, even after extensive refining, the bullion was comparatively low grade. By the adoption of the new charcoal method the effluent from the extractors may be reduced to contain only a trace of gold. The bullion, after simple smelting, is valued at about $20 per oz., as compared with about $17 per oz. for a similar product after zinc precipitation. The saving in the cost of recovery of the gold is about 25c. per ton of ore treated.

After a year of operation, a statement of result was published by H. G. Walton.[1] No fouling agent similar to the double zinc cyanide appears in the solution; and such a result would automatically effect a saving in cyanide consequent on a permissible reduction of cyanide strength in the solution. No figures are available in this connection, but in a later publication by H. R. Edmands[2] it is to be noted from comparative results of the use of zinc dust and charcoal that the necessary cyanide strength in the case of zinc was five times as much as when charcoal was used.

The principal features of the new Moore-Edmands process are as follows:

The charcoal used is water quenched when red hot, washed, and wet ground in a small ball mill to as fine a product as possible.

A special form of extractor is used, consisting of a miniature vacuum filter of what is known outside Australia as the Butters type. The suspended frames are 2 ft. 3 in. x 2 ft. 9 in., and there are 21 to each extractor. The filter media are, respectively, coconut matting as a support, filter canvas, and an outer protective layer of calico. The extractor is shown herewith and contains four propeller agitators in the bottom of the hopper, attached to a horizontal shaft.



THE MOORE-EDMANDS EXTRACTOR

Solution and charcoal pulp are pumped to an extractor, and the vacuum is started as soon as the leaves are properly submerged. Fresh solution is added concurrently with the formation and maintenance of cake, and the supply of liquor is such that a continuous stream passes through the charcoal. The propellers are kept in operation, and percolation is continued for 24 hours or other predetermined time. The vacuum is then released, the charcoal cakes are dropped to the hopper bottom of the extractor, emulsified, and re-formed on the filter leaves by the application of vacuum. This cycle of operations is continued at intervals as long as the charcoal possesses sufficient activity to precipitate the gold. The extractors are worked in series, the one whose cakes are approaching gold saturation receiving the richest solution, the tailings from this going to the second extractor, and being finally impoverished by contact with fresh charcoal.

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*Excerpt from an article in "Chem. & Met. Eng.," June 15, 1918.

[1] Report of the Department of Mines of West Australia, 1916.

[2] Bull. Inst. Min. & Met., London, March, 1918.

WASHING OF CHARCOAL-GOLD PRECIPITATE

The final emulsified charcoal pulp, loaded with gold, is delivered to a clean-up press, washed, and dried with compressed air.

CALCINING

Burning of the charcoal is carried out in braziers, 18 in. x 18 in. x 18 in., and made of ½-in. aperture stout wire screening. The operation is carried out in a locked steel chamber and takes about 48 hours.

SMELTING

The flux adopted is as follows:

	Parts
Precipitate	100
Borax	40 to 50
Sand	50
Salt	10

Plain graphite crucibles are used and they have a long life.

FINENESS OF BULLION

A comparison of results with charcoal and zinc precipitation is as follows:

	Charcoal	Zinc
Gold	954.4 fine	825.2 fine
Silver	7.0	21.9
Base	38.6	152.9

WEIGHT OF CHARCOAL REQUIRED

Walton[3] states that one ton of charcoal will precipitate 770 oz. of gold by this method, and that the weight of calcined ash is about one-third of the original weight of the charcoal. Edmands[4] gives the percentage of gold in the calcined ash as from 10 to 14%. The enormous increase in the precipitating power of charcoal by fine grinding is indicated by the fact that, by the old method of percolation through extractor boxes, five tons of charcoal was needed to precipitate about 700 oz. of gold.

The charcoal used at the Yuanmi mine is an otherwise waste product from producer-gas manufacture. The wood used is locally known as mulga scrub and is a variety of the acacia family, which includes several wattles indigenous to Australia. It is possible that the character of the wood, which in some species contains a considerable amount of tannin, has a favorable effect on the final result. Different woods have widely different precipitating values when made into charcoal and used for the recovery of gold from cyanide solutions.

The sole drawback to the method appears to be the amount of material to be smelted. The actual smelting entails no difficulties, and there is little corrosion of crucible. The latter might even be reduced by an alternative flux. In medium- or large-sized plants such low-grade precipitate is best smelted in large tilting furnaces—an arrangement permitting the periodic pouring of slag only, the gold being allowed to accumulate in the bottom of the crucible, where it refines. This method minimizes the temporary loss by shotting, which occurs when small charges of gold are poured through a large bulk of cooling slag. The furnace also acts as a safe during night operations, when there is less available supervision and when minimum handling of bullion is advisable.

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[3] Ibid.
[4] Ibid.

Callow Pneumatic Machine Notes

When siderite occurs in the ore, a considerable amount of trouble is often experienced on account of the rusting of the siderite to the cloth through which the air is blown to make the froth. Indeed, it is because of this difficulty, as well as because of the greater speed and ease with which the cloth of the pneumatic bottom can be changed, that individual pans are now used almost universally in the bottom of Callow flotation cells. At the Bunker Hill & Sullivan plant, where there is much siderite in the ore, it has been found that the life of the cloth on the pneumatic bottoms can be increased to 4 months, or 33%, by using quilted mats the top surfaces of which are impregnated with rubber. These are made by the Goodrich Rubber Co. and cost only 20% more than ordinary canvas mats. There is an additional advantage in that wood pulp does not stick to the rubberized surface as it does to plain canvas.

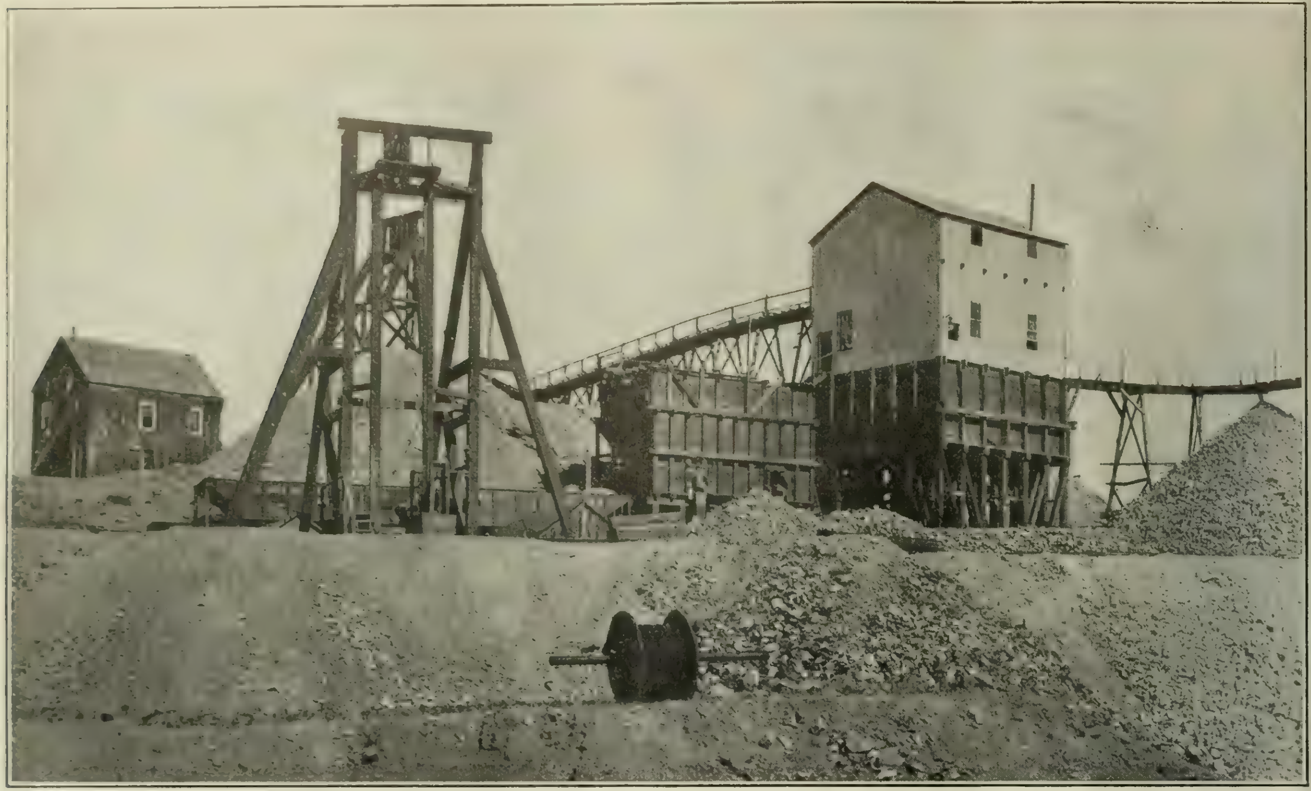
Screens are not used in the Callow pans at most of the plants in the Cœur d'Alene district. After removing them from the machines on the Gold Hunter plant, some trouble was experienced in getting an even flow of air from the pans; but no one could explain why. This was remedied by bolting a ½-in. iron cleat to the under side of the longitudinal center brace running across the cover frame, which in turn is bolted to the pan holding the cloth mat. The air pipe was then tapped, so as to feed the air to the pan at the center of the lower edge of the bottom. Ears are also bolted to the cover plates at the Gold Hunter plant, so as to make it easier to lift the pans out after they have been disconnected from the air pipes that feed them. At most of the mills the cloth is fastened to the pan by means of these cover plates, but at the Bunker Hill & Sullivan plant the cloth is caulked into grooves with rope and no cover plate used, for as soon as it gets wet the rope swells and grips the cloth securely in place.

Priority Administration Simplified

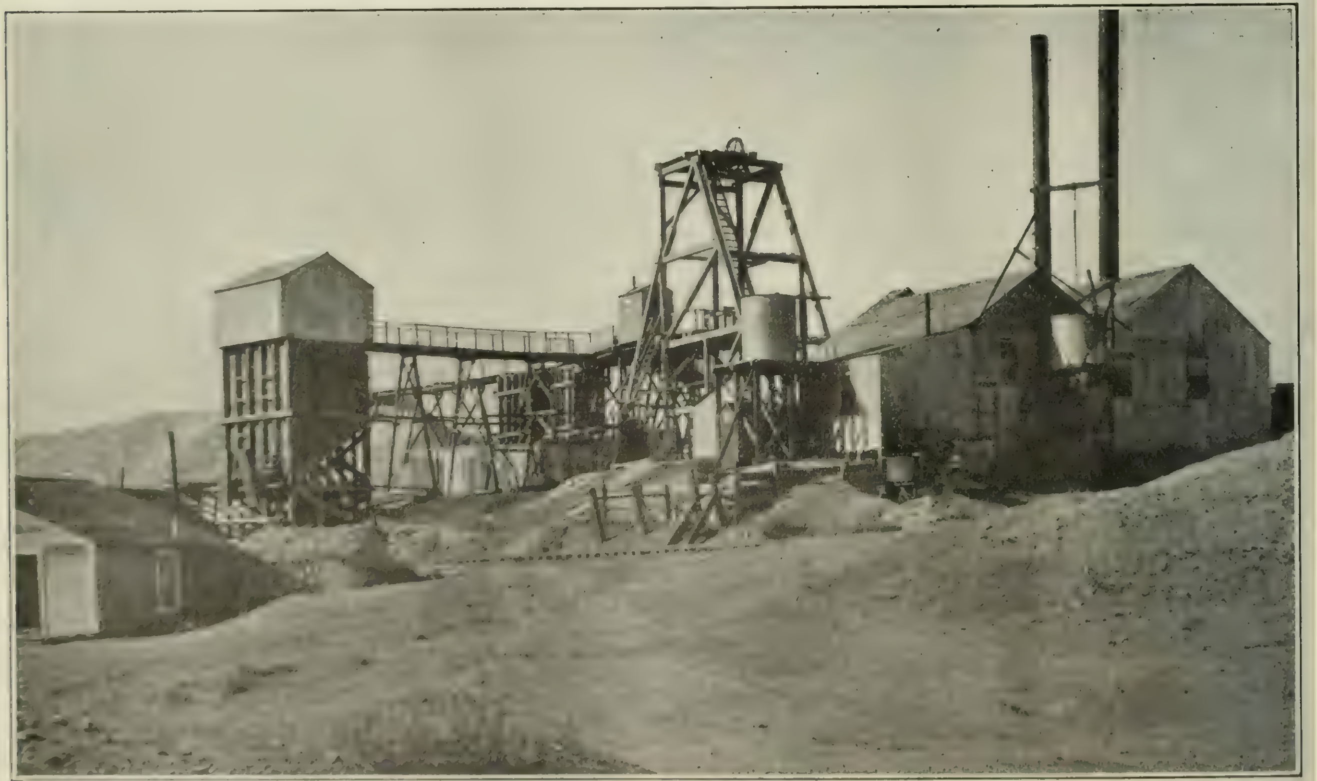
Fundamental changes have been made in the War Industries Board's rules and regulations governing priority in production. Extended automatic classifications have been provided and new classes entitled to preference created. These changes, it is believed, will simplify the administration of priorities, will make it less burdensome to the applicant, and at the same time will give greater assurance that war requirements will be met promptly. A sentence from the announcement telling of the change reads as follows:

"In requesting priority, the petitioner should join with the committee in applying the test: to what extent, if at all, will the granting of this application contribute, directly or indirectly, toward winning the war, and how urgent is the need?"

Ore Bins and Surface Plants in Nevada



SURFACE PLANT AT JIM BUTLER MINE OF THE JIM BUTLER TONOPAH MINING COMPANY



SURFACE PLANT AT OLD MIDWAY MINE AT TONOPAH IN 1910

ORE BINS AT MOHAWK MINE OF GOLDFIELD CONSOLIDATED MINING CO., GOLDFIELD

ORE BIN AT COMBINATION MINE OF GOLDFIELD CONSOLIDATED MINES CO., GOLDFIELD

John Duer Irving*

In Memoriam

CAPTAIN JOHN DUER IRVING

BY PROFESSOR JAMES F. KEMP*

WE MEET this afternoon to pay our tribute of affectionate remembrance to one who was dear to us all. While more than three thousand miles of blue ocean lie between us and the spot of ground in Flanders made sacred to us by his grave, we cherish none the less the old-time kinship and friendship which have brightened the years that are past and which will give courage and strength to the years which are to come. Here in the chapel of the old Colonial College, which was not only his alma mater, but his father's, and his father's father's, and of his kinsfolk for yet another generation back, we most fittingly recall his life, his works and his friendship. But not alone is his own alma mater paying her tribute of remembrance. Another and still older Colonial college, Yale, now, like Columbia, grown to be a great university, claims our friend for her own. As his teachers here recall the bright and earnest face which looked up to the desk from the student's seat, so there the students who came under his instruction remember the devoted work of one who made their advancement and growth his highest aim.

Even as Yale gave to the new-born Kings College, now Columbia, its first president, in the day of small beginnings, now we of Columbia in this later day of larger growth are glad that our alma mater could place in Yale one who embodied the best traditions and spirit of his college, and one whose character and work will be a treasured possession held in common.

But there is more to be said. The greater part of the last two years of our dear friend's life was passed as an officer of the 11th Regiment of Engineers in the Army of our country. Surviving officers and men are in France, but organized kinsmen of the rank and file of the regiment are in America. They join with Captain Irving's family and old friends in his two universities to do honor to his memory. Theirs is a tie no less deep and sacred, based as it is in love of our country, for whose service he has given all that man could give; and for which, inspired by his example, we, too, each in his or her sphere, would gladly do no less.

The life of Captain Irving divides itself into several successive and closely interwoven periods. There is the formative time of his boyhood, around which influences were cast shaping in plain and obvious way his later career. There follow the years in college and university, of distinct and definite preparation. Then came the years of experience in the field in the service of the U. S. Geological Survey, likewise and no less of preparation. Next comes the call to teach, the irresistible impulse to be of more direct and personal service to his fellows; and as time passed the opportunity to address, at the same time, a wider audience as editor. Suddenly into these useful, inspiring and congenial pursuits woke the growing conviction that the world in which we lived was not what we had thought it; that our ideals of government, our rules of openness, loyalty and truth in the relations of life, the very conditions of our existence, were in danger and would need the supreme effort to defend them. We slowly realized that the Robber Barons had not passed away centuries ago. The call to preparation for military service came in the summer of 1916. Plattsburg welcomed Professor Irving, and made him first Private Irving, and then for good service Sergeant Irving. The following spring anticipations proved realities, and Sergeant Irving became Captain Irving of the 11th Engineers, and one of the first to sail for "somewhere in France."

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*An address delivered at a memorial service in St. Paul's Chapel, Columbia University, [illegible]

John Duer Irving was born in Madison, Wis., on Aug. 18, 1874. His father, Roland Duer Irving, was at the time professor of geology, mineralogy and metallurgy in the State University of Wisconsin. Roland Irving, the father, had entered Columbia College in 1863, but trouble with his eyes compelled him to suspend his studies in the classical course in his sophomore year, and to replace study with some months of life and travel in England. Ultimately his eyes became stronger, and he entered the School of Mines, completing the course for the degree of Engineer of Mines, in the third class graduated, that of 1869. The class of eleven engineers of mines contained other future geologists. It numbered on its roll Henry Newton and Walter P. Jenney, of the early survey of the Black Hills, where John, future son of Roland, was in the course of years to make his doctor's dissertation, and, with its publication, his really serious entrance into the profession.

Roland Irving was a favorite student of Professor J. S. Newberry, affectionately known to all his students as "Uncle John," and after some experience in mining and smelting joined the Ohio Survey under Dr. Newberry. The work in Ohio was largely performed during the vacations of the University of Wisconsin, to whose chair Roland Irving was called in 1870. Later his residence in Wisconsin led to two events of prime importance in the history of American geology. He began the study of the Gogebic iron range and caught the clue to the origin and stratigraphy of the iron ores in all the Lake Superior ranges; and he later undertook the mapping and description of the copper-bearing rocks of the Lake Superior region. The formative years of the son John were passed in a home where the father, Roland, was preparing the famous monographs on these two subjects. Not alone did John's father work upon their preparation, but the skillful hand and fine sense of color of his mother were placing on paper the beautiful illustrations of the microscopic mineralogy of the copper-bearing rocks, and all in the very early days of microscopic rock study in America. Year after year I have shown these beautiful plates to my classes with a word of appreciation of Mrs. Irving, who so skillfully aided her husband with his monographs.

In John's fourteenth year, illness, preying on a constitution never over-strong, deprived him of his father, and left with him the almost sacred duty of following in the footsteps and continuing the work of one interrupted at thirty-nine in mid-career. Mrs. Irving with her three children moved to the East among her kinsfolk, and John was prepared for Columbia College, to represent the fourth generation of his name upon the alumni rolls. His boyhood period closed and his college and university life began.

He entered in 1892 and took the prescribed courses of the time. The vacation of 1895 following his junior year was passed with one of Professor Osborne's parties, in searching for Tertiary vertebrates in the Brown's Park beds of northeastern Utah. On the observations there obtained was based the first contribution of John Irving to geological literature. Following his senior year, he went with me to the Adirondacks and had a month or two of experience with the old-time crystalline rocks in the mountains around Elizabethtown. The vacation after his first year of graduate study we found a place for him in the field party of Dr. Whitman Cross in the steep and rugged mountains of the San Juan region of southwestern Colorado. About this time I made a visit to the northern Black Hills of South Dakota and became impressed with the extremely interesting problems presented by the local geology, which, as I have stated, had been covered by the pioneer work of Roland Irving's old classmates in the School of Mines, Henry Newton and Walter P. Jenney. A large-scale map had been prepared by Professor Frank C. Smith and Dr. Macgillicuddy, of the Dakota School of Mines, at Rapid City, and by the generous coöperation of these two friends we were enabled to start our John on the field work for his doctor's dissertation. With its completion and the taking of his doctor's degree in 1899, the second period of his life merged into the third period—that of active work in the outside world. The change is always a trying one to a young man and brings an experience in meeting which the steadying hands and advice of his old professors perhaps do their best service.

Combined with a most creditable passing of the civil service examinations, his dissertation on the Black Hills brought to its author an appointment in the ranks of the U. S. Geological Survey, and assignment to the party then undertaking the investigation of the mineral resources of this area. The study of the mines placed our young Dr. Irving in close association with the most respected of American mining geologists, that fine, true, Nature's nobleman, Samuel Franklin Emmons, and in the end made of our John, Dr. Emmons' closest helper. Years afterward when Dr. Emmons passed away, leaving in fragmentary and uncompleted state the great new monograph on Leadville, it was John Irving who finished the manuscript and forwarded it to the Survey ready for the printer.

Following the field experience in the Black Hills, John Irving was busied in association with F. L. Ransome in the Globe district of Arizona; with J. M. Boutwell in the Park City district of Utah; with W. H. Emmons in the Needle Mountains quadrangle of Colorado, and with Howland Bancroft at Lake City in the same state. He also did mapping of coal-bearing quadrangles in Indiana, under M. L. Fuller, and in Pennsylvania, under M. R. Campbell. While on the Survey and spending the winters in Washington, John Irving entered heartily into the life of the younger men and was active in the so-called Association of Aspiring Assistants of the Survey, whose initials were a sort of caricature of the American Association for the Advancement of Science.

But the desire to teach, partly inherited, partly acquired, was very strong, too strong to be longer suppressed, and with its gratification in 1903 John Duer Irving took up after ripe preparation the teacher's part of his career. The opportunity came to me to suggest to my old friend Professor Wilbur L. Knight, of the University of Wyoming, one who might substitute for him during a year's leave of absence. The offer proved agreeable to Dr. Irving, and he undertook the work, retaining, however, his connection with the Survey for the free time of the vacations. The following year he was called to be assistant professor of geology at Lehigh University, and was promoted to the full chair in 1906. In 1907 he was called to be professor of economic geology at the Sheffield Scientific School of Yale, where he shared in developing the mining course made possible by the gift of the Hammond Laboratory. This professorship Dr. Irving held up to the sad event which has brought us together.

In 1905, while John Irving was at work at Lehigh University, the plan was developed of establishing a magazine which might be the special means of expression and record for the vigorous young school of American students of ore deposits and applied geology, which had then become a marked feature of our scientific life. We gathered a little band willing to risk a part of their worldly possessions in the venture, with no thought of return. John Irving was our choice for managing editor. To his untiring efforts, ably aided by the unselfish work of W. S. Bayley as business manager, we chiefly owe the thirteen volumes of this most valuable and interesting journal. As we turn its pages we see from time to time the subjects which specially appealed to its editor. His work in the mining districts emphasized the importance of oreshoots and local places of value in veins, and he seeks to classify and systematize their causes. He is again impressed with the importance of a comprehensive study of special problems wherever one particular case of them may be illustrated, as contrasted with the generally localized investigations carried on by one individual. The committee which has been for several years studying secondary enrichment with L. C. Graton in charge carries out exactly this idea. John Irving's extended Leadville experience, in the mines where S. F. Emmons first formulated the ideas of replacement of rock with ore, leads him to seek to establish criteria whereby replacement bodies may be identified. Thus as we turn the pages of the magazine we see how year by year an active and thoughtful mind was philosophically pondering now this, now that, important phase of his special branch of science.

And then, while in the full exercise of his many useful activities, rose above the horizon the dark cloud of the Robber Barons' war. In the spring and early summer of 1916, I know from intimate talks, that John Irving felt the danger menacing his country, and others like it, from the growing threat of the worst features of mediævalism. Being unmarried, he believed that, even though he was past forty years of age, it was his duty to go to Plattsburg and enter the officers' training camp. He took up its routine earnestly and seriously and he wrote with great pride of the satisfaction which his promotion to be a non-commissioned officer gave him. When the camp closed he entered his name as one available for service if conditions called for him. In the spring of 1917 those conditions materialized. He took his officer's examination, was appointed captain and was granted leave of absence by the authorities of Yale. At first he expected to serve as topographic engineer or as an interpreter of the airplane photographs. He jestingly referred to himself as "skyographer." Actually he became a recruiting officer for the 11th Regiment of Engineers, in whose ranks are so many of our friends and colleagues. With them, he sailed for France in July, 1917. Of his special field of work we are not fully informed, because of the censorship, but my own letters from him inform us that he was early engaged in railway construction and worked just as long hours as one possibly could in building the arteries of supply and nourishment of the Army. His duties last fall we know brought him under shell-fire, and he learned to keep his nerve amid these trying conditions. Like so many of our boys, he writes jestingly of them, taking the dangers in the light-hearted way of our countrymen as being all in the day's work.

Later, when tunneling and the exploding of mines beneath the enemy's works achieved such importance, he was transferred to the engineers' school at headquarters, and was busy with a seemingly endless procession of classes to be instructed in the rudiments of mining engineering. His letters show that the calls were hard, exacting and exhausting. He speaks of never having worked so hard in all his life. Probably his vitality ran low, and his powers of resistance and recuperation were exhausted. We only know that on the 26th of July, despite every effort, pneumonia could not be resisted, and that one more name was added to the honor roll.

As we all look back over this brief sketch of the many activities of a busy and useful life, we see that it was filled to the very limit. Those of us who knew John Irving well, know that the duties and calls were met faithfully and with a high sense of responsibility. Many of them were essentially unselfish. The magazine *Economic Geology* was a labor of love. The time of Professor Irving was never so valuable but that a student could command advice and guidance. The full strength and more of Captain Irving was given to his country. And yet we know that the calls often bore heavily on a physique none too robust. Although tall and broad-shouldered of stature, our friend had some delicacy of constitution which asserted itself at times of special stress and which gave warning that certain limits must not be passed.

Though I have spoken of his scientific work, I have not mentioned that many talks while we have been off together on the trips which meant much to us both revealed to me ambitions in literary expression and composition which were in keeping with the high tradition of his family, bound up, as they are, with one of the very first of our really great men of letters. Insistent calls prevented John Irving from realizing all that was in his mind; but the ambition certainly gave lucidity and clearness to his scientific writings.

It is, however, as friend that we like best to recall him, and in these respects we know well that while his work lives after him, the fine sweet inspiration of his life will endure still longer. We live in the most trying times with which we have all been confronted for nearly three generations. Faith is called for as seldom before in our experience. We must have the grim and unshaken holding on to calm belief in the triumph of right and in the subordination of cruelty and unbridled selfishness to the control of law and justice. A decent consideration for the rights of others and observance of them must not perish from the earth, nor must the rule of abominable materialism be permitted to exercise its sway over victims unable to protect themselves. For these high causes John Duer Irving gave his all. Useful and inspiring as he was in life, he rises to yet greater heights in his supreme sacrifice, and to us who yet remain he is a sermon whose moving appeal causes to sound aloud the deepest chords of our nature.

We men of engineering training are almost if not quite military in our general attitude toward life. We are repressive of emotion; not that we do not feel, but that we are anxious that our feelings should be real and genuine, and not the light thing that comes and goes like a fickle breeze. Tonight we can give full and deep expression to the very profound emotions which these services evoke. At such times prose fails us. My old classmate and dear friend in the School of Mines, Frank Dempster Sherman, whose verse has an appeal seldom equaled, has left these lines with us as if they had been written of John Duer Irving:

Lord, in whose hand I am but dust,
  Make Thou of me a vessel whole,
  Worthy to guard the precious soul
Thou gavest me in trust.

Keep me unmarred by strife and sin
  Throughout the brief span of my years.
  Let joy's bright sun and sorrow's tears
Keep pure the flower within.

Grant, if Thou wilt, mine eye to see
  It grow to beauty at thy feet;
  To find at last the blossom sweet
Of immortality.

And when this body that is mine,
  This earthly frame, which Thou hast made,
  Is dust and with the earth dust laid,
Lord, take the flower for thine.

BY WALDEMAR LINDGREN

A WEEK AGO a cable message reported the death of John Duer Irving, Captain in the 11th Regiment of Engineers and professor of economic geology at Yale University. The announcement will bring the deepest sorrow to his many friends and a sense of great loss to geologists all over the world, for Irving was one of the most gifted of those who have devoted their lives to this science. Always intensely patriotic, he was one of the first who joined the Plattsburg Camp in 1916, receiving his commission as captain in 1917. Soon afterward he left for France with one of the first units, and he had since been continuously on duty in the field. During the last months he was instructor in a school of mining as applied to the war in France. Hard work and unremitting attention to his duties told at last on a constitution which was not as strong as his broad shoulders and commanding stature seemed to indicate, and on July 26th he succumbed to an attack of pneumonia.

Captain Irving was born on Aug. 18, 1874, at Madison, Wis., the son of Roland Duer Irving, the noted geologist. It seemed natural and fitting that he should follow in his father's footsteps. His technical education was completed at Columbia University under the guidance of Professor J. F. Kemp, with whom he formed a deep and lasting friendship. In 1899 he received his doctor's degree there, and soon afterward joined the U. S. Geological Survey and spent several years under the direction of S. F. Emmons—the second great geologist who was to help in shaping Irving's career. A professional paper on the Black Hills, written in conjunction with S. F. Emmons and T. A. Jaggar, embodies the results of the studies of these years. In 1904 he was appointed professor of geology at Lehigh University, and in 1907 was transferred to Yale, at which university he held the professorship of economic geology until his death. As a teacher he inspired his students with a strong love for geological science, and many are the geologists of a younger generation who have had the help of his guiding spirit in their studies. For in Irving was combined, as in few men, a depth of learning with a most charming and unassuming personality.

In 1905 when a small group of economic geologists decided on the venture of publishing a journal devoted to the practical side of the science, the question arose as to who should be intrusted with the editorship of that publication. After a short deliberation, Irving's name was proposed and unanimously agreed upon. Irving accepted, and for thirteen years his name was indissolubly connected with the journal of *Economic Geology*. Under his leadership the doubtful venture became a success, and the thirteen volumes embodying the research of American and foreign geologists in the practical field form a worthy monument in honor of the devoted editor more impressive than any granite or marble. It was a work which brought no pecuniary benefit; it was undertaken from pure love of the science, and no one can fully appreciate the amount of often seemingly thankless labor which it involved.

In 1911 Professor Irving wrote a paper on the criteria of replacement in ore deposits, based on studies in many fields. This paper, published by the Canadian Mining Institute, by the American Institute of Mining Engineers, and by *Economic Geology*, attracted general attention and remains a classic elucidation of a most difficult subject.

Many years ago Irving was selected by S. F. Emmons as his collaborator in the new Leadville report which was to complete and bring up to date the description of these wonderful deposits. In joint authorship they wrote a bulletin published by the U. S. Geological Survey on the "Downtown District," or the lower part of the Leadville district. After the death of S. F. Emmons, the preparation of the monograph was entrusted to Professor Irving, and occupied many years of his time. Always refusing to be superficial, Irving devoted arduous work to the deciphering of the complex structures, and finally, just before his departure for France in 1917, the manuscript was completed and placed in the hands of the U. S. Geological Survey for publication.

Many other investigations, too numerous to mention, were undertaken by Irving. In conjunction with Mr. Howland Bancroft, he published, also as a Survey bulletin, a description of the Lake City mining district in Colorado, and many papers in *Economic Geology* bear witness to his keen insight into geological problems.

Besides these scientific investigations, Irving carried out at various times many private examinations of mining properties in the United States, Alaska, and Canada.

His friends may be permitted to think with sorrow and regret of his passing away at the early age of forty-four years, before he could complete his life's work. But those who knew his gentle and noble spirit best, who knew his indomitable courage and his devotion to duty, also know that he gladly and cheerfully offered the supreme sacrifice to the country he loved so well.

Nitrate Deposits in Amargosa Sink Reported On by Geological Survey

Discovery of large deposits of nitrate of soda in Amargosa Valley, Inyo County, Calif., was reported to the Secretary of the Interior in December, 1917, and he at once called upon the Geological Survey to make an examination. The Survey had already been systematically exploring other well-known nitrate deposits along the Amargosa River above Death Valley, among them those called the Upper Canyon, Lower Canyon and Saratoga deposits. The examination of the new deposits lasted from Dec. 26, 1917, to Apr. 4, 1918.

The results of the work may be briefly summarized as follows: In all, 78 trenches were dug, which had a total length of 3700 ft. and an average depth of 2 ft. 11 in.; 959 pits were dug to an average depth of 1 ft. 7 in.: 1085 samples were taken, from which 930 analyses were made. In the so-called Upper Canyon field, at Acme Siding, 98 acres is estimated to contain 1480 short tons of sodium nitrate, but an overburden of about 100,000 tons would have to be removed in order to extract the "caliche" containing this nitrate. In the so-called Lower Canyon field, 70 acres is estimated to contain 510 tons of sodium nitrate, the recovery of which would involve the removal of an overburden of about 50,000 tons. These two tracts are the largest and best of the ground examined, and, taken together, include 168 acres, which, if workable, might yield 1980 short tons of sodium nitrate, the recovery of which would involve the removal of 150,000 tons of overburden. The results of examinations at other places do not justify estimates of tonnage of nitrate.

The Survey's explorations have led to the following conclusions:

1. The nitrate in the Amargosa district occurs in a blanket of so-called "caliche," about 5 in. in average thickness, which lies about 9 in. below the surface of the ground. The nitrate is accompanied by other salts, chiefly sodium chloride.

2. The soil above and the bedrock below the deposits contain insignificant amounts of nitrate.

3. The high dip and the great thickness of the strata covered by the prospecting make it improbable that deeper beds of nitrate occur in this region.

4. The "caliche" in general contains an average of less than 2.5% of sodium nitrate, the areal distribution of which is uneven.

5. The Zabriskie field, in which the newly found deposit was reported to lie, contains no commercially valuable nitrate.

6. The Upper Canyon and Lower Canyon fields, the most promising in the Amargosa district, together contain, according to careful estimate, about 168 acres of niter-bearing deposits, which, if worked regardless of cost, might produce about 1980 short tons of refined nitrate.

7. The quantity of nitrate available in the Amargosa district is so small and the cost of production would be so great that the district as a whole cannot be regarded as a source of commercial nitrate.

8. No further work on the areas already examined is justified, except, perhaps, as purely scientific research.

9. The occurrence of "caliche" nitrate deposits in the Amargosa district, rather than the usual cave or disseminated deposits, makes it seem possible, though improbable, that really valuable deposits of nitrate may occur elsewhere in the same general region.

10. Prospecting should be continued until all similar deposits in other districts have been tested sufficiently to determine their value.

Extensive Bauxite Deposits in British Guiana

As long ago as 1897, and again in 1910, Professor Harrison reported the existence of extensive deposits of bauxite of exceptional purity in British Guiana, stated Sir Walter Egerton in a paper recently read before the Royal Society of Arts. The discovery attracted little attention, however, until five years ago, when the Northern Aluminium Co. of America applied for leases of areas containing such deposits. The British government stipulated that any company working the deposits must be under British control. After long negotiation, a company has been formed by the Americans interested, to meet government requirements, and the first cargo of bauxite has left the colony. This company has acquired large areas of land from private owners and leases of a considerable extent of Crown land in the vicinity of Wismar, at the head of navigation on the Demerara River, near the terminus of the little railway connecting the Demerara and Essequibo rivers. Ships drawing 16 ft. can reach the workings 60 miles above Georgetown. The bauxite deposits have recently been traced almost from the Venezuelan boundary right through the colony to the Dutch border. Further deposits have been located in Dutch and French Guiana, and the Guianas probably contain the most extensive deposits in the world, and some in very accessible positions. Should the industry develop on a large scale, local electric treatment of the raw material with power obtained from one of the great waterfalls is probable.

Producers of Tube-Mill Pebbles and silica linings are given in a recent bulletin of the U. S. Geological Survey as follows: Beach pebbles—Robert Burns & Co., Oceanside, San Diego County, Calif.; Frederick E. Browne, 619 I. W. Hellman Bldg., Los Angeles, Calif.; Encinitas Pebble Co., P. O. Box 499, San Diego, Calif.; John T. Momand, Encinitas, Calif.; Thebo & Tingman, Encinitas, Calif.; Artificially rounded rhyolite—Omer Maris, Manhattan, Nev. Cubical or partly rounded 3- to 5-in. quartzite blocks—Jasper Stone Co., 204 Lytle Bldg., Sioux City, Iowa, Silica linings—S. W. Chiles, 123 Garrison St., Bethlehem, Penn.; E. L. Lull, American Flint Co., Iron City, Tenn., and Jasper Stone Co., 204 Lytle Bldg., Sioux City, Iowa.

Chronology of Mining, July, 1918

July 2—Price of copper advanced to 26c. by the War Industries Board.

July 3—International Nickel Co. began production at its Port Colborne, Ont., works.

July 4—Meeting of chief gold producers of British Empire at London to discuss value received for their product.

July 6—Department of Labor refuses to permit importation of Mexican labor to work in Arizona coal mines.

July 8—International Mining Convention held at Revelstoke, B. C.—Branch of American Mining Congress formed at Oklahoma City, Oklahoma.

July 9—Control of sulphur production taken over by the War Industries Board.—Chemicals Division and Explosives Division created by the War Industries Board.

July 15—Meeting of petroleum producers held in San Francisco, California.

July 16—Control of production and distribution of chlorine gas taken over by the Government.

July 18—A. Mitchell Palmer, Alien Property Custodian, announced taking over of the Becker Steel Co. by the Government.

July 19—Gold mining listed as an essential industry by the War Industries Board.

July 20—Importations of manganese ore from Asia and Australasia prohibited.

July 22—Meeting of stockholders of Mother Lode Copper Mines Co., of Alaska, at Seattle, Wash., ratified sale of all assets of the company to the Mother Lode Coalition Mines Co.—Seizure of certain metal firms, among them being L. Vogelstein & Co. and Beer, Sondheimer & Co., was announced by the Alien Property Custodian.

July 29—First meeting of the American Zinc Institute held at St. Louis, Missouri.

July 31—Telegraph and telephone systems taken over by the Government.

Going Some—the 27th

A squad of A Company recently returned from a tour of duty at the front, after spending six weeks doing construction work. All came back safe and sound. They reported that they found front-line work very interesting and exciting, and they were able to show what mining men can do. They are going to establish a record on the log book of the A. E. F.; every man has made up his mind to that.

The second battalion of the regiment, under Lieut.-Col. M. E. Gilmore, has been transferred from Camp Meade to Camp Leach. He now has over 800 men. A large number of these were recruited in the Joplin district.

The first battalion had to leave without the instruments for the band; but the second battalion has got them, the band is now organized and is playing.

At a recent meeting of the men of the zinc industry in St. Louis, at which the American Zinc Institute was organized, the chairman, Victor Rakowsky, in asking, after the dinner, for subscriptions to defray the expenses of the meeting, proposed that any residue (a common word in the metallurgy of zinc) should be turned over to the fund for the 27th Engineers. This proposal was enthusiastically received, and later Mr. Rakowsky announced that the committee conducting the meeting would be able to turn over at least $1000 to the Comfort Fund for the regiment. The men of the zinc industry always do a good job when they put their hand to it.

A warm friend of the regiment, the manager of a large mine in the Northwest writes that he has started a subscription list among his men and there should be a remittance from them immediately after their next pay day. This is a fine idea. Let mine managers everywhere start the ball rolling among their employees. A little from each man will make a big total for the mine. Let us see what mine will do the most in this way.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
Wm. H. Kinnon	30.00
A. P. O'Brien	10.00
Total	$15,947.11

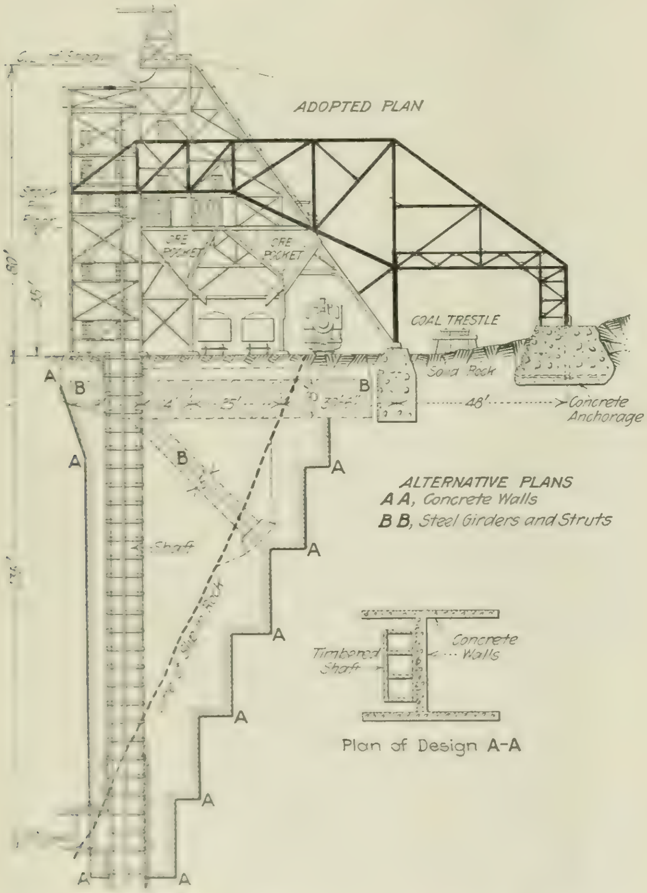
Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Owing to the large volume of work involved in administering the fund, contributions are acknowledged only by publication in the *Journal*.

Details of Practical Mining

Steel Cantilevers Hold Headframe Over Mine Shaft*

Supporting the headframe over a mine shaft by cantilever trusses was the expedient resorted to at the "A" shaft of the Pioneer mine of the Oliver Iron Mining Co. at Ely, Minn., because of unstable ground.

This shaft was sunk in the early '90s, and was then equipped with a timber-frame shafthouse. It had been impossible to explore the ground in advance to such an extent as to determine thoroughly the nature of the underlying rock, but no change of alignment was experienced until 1900, when a slip in the formation was noticed about 135 ft. below the collar of the shaft. The depth at that time was 1110 ft. The alignment was maintained without difficulty, however, by trimming the timbers and occasionally replacing a shaft set.



HEADFRAME OF MINE SHAFT IN LOOSE ROCK IS CARRIED BY CANTILEVER FRAMES

A steel headframe was built in 1909, up to which time the settlement at the surface had not been serious. In this structure the rear columns were placed 70 ft. from the shaft and were supported on independent concrete piers founded in good solid ground. The front columns and ore-pocket columns were supported on a concrete base, 50 x 65 ft. and 3 ft. thick, reinforced at top and bottom with steel rods, so that when settlement occurred the entire front portion would move uniformly, thus causing no undue stress in the steel members.

The bases of the rear columns were provided with a hinged joint. The bases of the front columns and ore-pocket columns were fitted with brackets so that jack-screws could be placed under these to raise the columns and thus take up any settlement of the ground. From 1909 to 1912 the settlement due to the slip in the shaft amounted to 9 in., which was taken up by jacking the front columns of the shaft at different times and putting blocking under the bases. This was all accomplished without any distortion of the shafthouse members.

Movement of the ground became much more serious in 1912, and it was apparently unsafe to continue mining operations near the shaft without making provision to support the shafthouse. Consideration was given to three different methods for supporting the shafthouse and pockets.

The first plan was to excavate the entire portion between the line of slip and the shaft and construct a vertical concrete wall with two wings, all founded on solid rock. This would extend from the first level in the shaft, 135 ft. below the collar, to the under side of the reinforced-concrete base supporting the front portion of the shafthouse, as shown by dotted lines *A—A* in the drawing. The wall would carry the entire load of the foundations, tracks, cars, front portion of shafthouse and ore in shipping pockets, and would support the rear portion of the mine shaft from the first level to the surface. The second plan was to excavate beneath the reinforced-concrete base and place two horizontal steel girders under it, as shown by dotted lines *B—B*. The rear ends of the girders would be anchored on good ground back of the slip, and the ends over the shaft would be supported by structural steel struts or columns placed at an angle of 45° and seated on solid rock.

The third plan, which was adopted, was to construct a steel cantilever support, having its footings on permanent ground back of the slip. This carries the portion of the shafthouse above the stockpile trestle, which consists of skip dumps and headsheaves. All main columns of the shafthouse were disconnected at splices at the stockpile floor elevation, except the rear batter-brace columns, which have a firm footing. The cantilever support thus maintains the headsheaves and skip dumps in permanent position, and the front part of the shafthouse, including the stockpile floor and shipping pockets, now cut loose from the upper portion, will be kept in position by jacking up and blocking the column bases as may be required by ground settlement.

Adoption of this plan was based upon the fact that its first cost was the lowest, and that this structure was above ground, where it could be erected readily and inspected easily. As the rear columns of the cantilever support are on solid rock and have an uplift, the pier excavation was made in the shape of a prismoid and the concrete was poured without the use of forms. The concrete pier was made large enough for its weight to balance the uplift due to the weight of the shafthouse portion; the bond of the prismoid in the solid rock is an additional safety factor.

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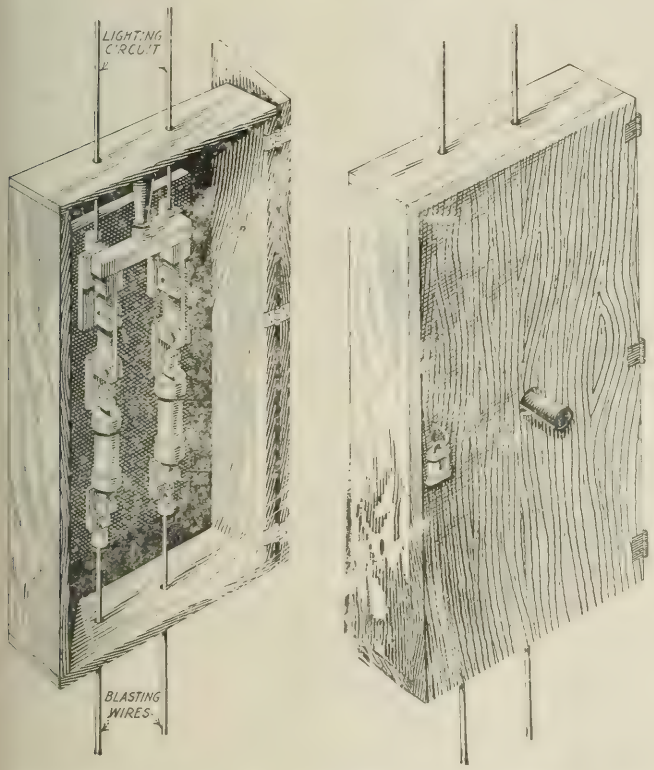
*Engineering News-Record, May 23, 1918.

As the mine shaft is constructed of timber sets and is considerably larger than the skips and cages, there is sufficient room for lining the timber guides without retimbering or enlarging the shaft. The cantilever support has now been in service for practically five years, and has kept the upper part of the shafthouse in accurate alignment. The lower portion has settled two feet, which has been taken care of by jacking up and blocking the front column.

Blasting With the Lighting Circuit

By Thomas J. Pascoe

The following method of blasting, which is practiced in a mine in the vicinity of Norway, Mich., is sure to explode every hole: The current is taken from a 110-volt lighting circuit, and the charge is fired by means of a single-throw knife switch, connected as shown in the illustration. The switch is provided with fuse plugs. To explode 15 holes, a 10-ampere fuse is required. The blasting wires are so connected with the switch that, by closing the latter, they are cut into the lighting circuit.



LIGHTING CIRCUIT MAY BE USED FOR BLASTING. BOX SHOULD BE LOCKED WHEN SWITCH IS OUT

The switch is placed in a wooden box, with a hole cut in the door, as shown. When the door is closed, the handle of the switch projects outside. This is done so that the miner may know positively that the switch is not in contact with the live wires before he attempts to connect his blasting wires to the charge. Otherwise a serious explosion may occur.

The miners prefer the method detailed to the old way with batteries, as it never fails to explode every hole at the proper time. The switch box should always be kept locked, and the key be given to the man responsible for the blasting. The knife switch should be placed with the live connections up. Then in case the door should be left open, and the handle drop, it would not come in contact with the live wires.

New Method of Fastening Wire Cable Ends to Forged Sockets

Many riggers who have experienced difficulty in making a satisfactory joint when placing a forged socket on the end of a wire cable will doubtless be interested in a new method developed by John T. Willison, of Ambridge, Penn. Mr. Willison, who was testing 19-strand cables for tensile strength, was particularly interested in making a joint which would be stronger than the cable itself. After trying several methods unsuccessfully, the joint failing in each case before the cable was loaded to capacity, he finally conceived the idea of securing the cable in the socket with iron cement in the way shown in the illustration.

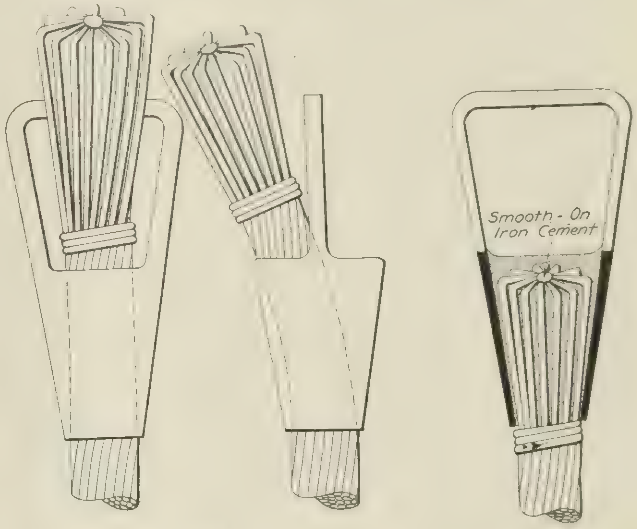


FIG. 1 FIG. 2

METHOD OF FASTENING WIRE CABLE ENDS TO FORGED SOCKETS

The cable end was first passed into the socket, as shown in Fig. 1. One of the outside wires was untwisted and wrapped tightly around the others. Above this wrap the remaining wires were untwisted and belled out as shown, and the ends turned down. "Smooth-On" Iron Cment No. 1 was mixed with water to a smooth putty-like consistency, and the socket packed closely with this material. The cable was then pulled firmly into place and the cement allowed to metallize. In metallizing, the iron cement expanded sufficiently completely to fill the spaces between the wires and between the cable and the socket shell and to wedge the joint scurely. A firm union resulted, which, on test, proved to be stronger than the cable itself.

Company Reports

Bunker Hill & Sullivan Mining And Concentrating Co.

The 30th annual report of the Bunker Hill and Sullivan Mining and Concentrating Co., covering the fiscal and calendar year 1917, shows a larger tonnage mined than in any previous year and larger sales of silver and lead. In addition to a record production, considerable development was done and the smeltery began operations.

Ore reserves blocked out total 3,457,419 tons. The operating data are summarized in the accompanying Table I. At the Caledonia and the Sierra Nevada Consolidated properties, operations were continued. At the Alhambra, the experimental work proceeded with fair results.

TABLE I. BUNKER HILL & SULLIVAN OPERATING DATA, 1917

Tons mined	493,030
Mill ran, days	355.70
Tons milled	493,030
Assay of feed, lead %	10.6496
Assay of feed, oz. silver	4.317
Tons concentrates	103,981.84
Average assay concentrates, % lead	45.1967
Average assay concentrates, oz. silver	16.2794
Contents, concentrates, tons lead	46,996.499
Per cent. extraction, lead	89.51
Contents, feed, oz. silver	2,128,436.87
Contents, concentrates, oz. silver	1,692,765.17
Per cent. extraction, silver	79.54
Value of feed	$10,878,283.04
Value of concentrates	$4,943,782.37
Economic extraction, %	45.44
Tons milled per 24 hours	1,386.08
Tons concentrates produced per 24 hours	292.33
Tons lead produced per 24 hours	132.12
Mining cost per ton mined	$2.385
Milling cost per ton milled	$0.600
Concentrate cost per ton shipped	$0.227

The returns from lead and silver shipped were $9,546,874, and miscellaneous income increased the receipts to $10,158,497. Operating costs and charges totaled $6,306,423, which left $3,852,074 as the year's operating profit. Deductions of $1,634,690 for depletion of ore deposits and $$325,804 for income and excess-profits taxes left $1,891,580 as net profit. Dividends paid during the year totaled $2,043,750, and the gross surplus as of Jan. 1, 1918, was $44,-

Unit costs of exploration and mining are shown in Table II, and those of milling in Table III:

TABLE II. UNIT COSTS OF EXPLORATION AND MINING, BUNKER HILL & SULLIVAN, 1917.

	Cost per ft. Exploration	Costs Per Ton Stoping	General	Total
Superintendent and foremen	.....	.....	$0.023	$0.023
Shift bosses	$0.172	$0.039	.....	.040
Machinemen	1.825	.130	.001	.136
Chuck tenders	1.044	.046	.....	.049
Miners	0.242	.181	.....	.181
Shovelers	1.743	.357	.....	.362
Carmen and trammen	0.173	.042	.....	.043
Motormen	.....	.021	.....	.021
Timbermen and carpenters	1.692	.168	.007	.180
Hoistmen and skipmen	0.253	.007	.....	.034
Pumpmen	.....	.....	.....	.011
Pipemen	.....	.....	.003	.003
Nippers	.....	.013	.....	.013
Supplymen	.....	.032	.012	.044
Repairmen	.....	.....	.010	.010
Timekeeper	.....	.....	.004	.004
Contractors	3.422	.....	.....	.011
Concretemen	.....	.....	.001	.001
Miscellaneous labor	.....	.....	.002	.002
Powder	3.172	.085	.001	.095
Fuse and caps	0.491	.017	.....	.019
Illuminants	0.059	.006	.....	.007
Lubricants	.....	.001	.....	.002
Timber and lagging	1.236	.224	.002	.230
Miscellaneous supplies	1.735	.072	.015	.106
Machine shop repairs	0.871	.027	.002	.041
Electrical repairs	.....	.009	.003	.016
Building repairs	0.022	.....	.008	.008
Tool shop repairs	0.421	.013	.....	.014
Electric power	.....	.002	.....	.029
Compressed air	1.256	.085	.....	.090
Heating	.....	.....	.012	.012
Surveying	0.236	.005	.009	.015
Train service	.....	.....	.014	.014
Tramming ore	.....	.....	.....	.051
Tramming men into mine	.....	.....	.....	.003
Tramming supplies into mine	.....	.....	.....	.004
Contingent expense	.....	.....	.053	.053
Legal services	.....	.....	.005	.005
Depreciation	.....	.....	.084	.084
Administrative expense	.....	.....	.089	.089
Free light, water and rent	.....	.....	.001	.001
Taxes and insurance	.....	.....	.172	.172
Total normal expense	$20.065	$1.582	$0.533	$2.328
Extraordinary expense	.....	.....	.057	.057
Total	$20.065	$1.582	$0.590	$2.385

TABLE III. MILLING COSTS, BUNKER HILL & SULLIVAN, 1917

	Costs in Dollars per Ton: Crushing and Conveying	Screening	Jigging	Grinding	Concentrating	General
Superintendent and foremen	....	....	....	....	....	.014
Shift bosses and sampler	....	....	....	....	....	.011
Crushermen	.003	....	....	....	....	....
Conveyormen	.006	....	....	....	....	....
Machinemen	....	.014	.025	.024	.025	....
Oilers	....	....	.009	....	.009	....
Roustabouts	.001	.002	.001	....	....	.002
Laborers	.006	....	....	....	....	.002
Watchmen	....	....	....	....	....	.010
Experimental labor	....	....	....	....	....	.003
Screens	....	.003	.003	.001	....	....
Belts	.014	....	.001	....	.003	.002
Buckets	.011	....	....	....	....	....
Roll shells	.002	....	....	.002	....	....
Ring dies	....	....	....	.001	....	....
Mullers	.001	....	....	.001	....	....
Crusher parts	.003	....	....	....	....	....
General machine parts	....	....	....	.001	.004	....

	Costs in Dollars per Ton					
	Crushing and Conveying	Screening	Jigging	Grinding	Concentrating	General
Pebbles	....	....	....	.006	....	....
Miscellaneous supplies	.009	.005	.013	.007	.014	.009
Liners	....	....	.002	....	....	....
Trommel screens	....	.009	....	....	....	....
Flotation supplies	....	....	....	....	.003	....
Machine shop repairs	.001	....	....	....	.004	....
Electrical repairs	....	....	....	....	....	.002
Building repairs	.001	....	.003	.001	.008	.012
Mill shop repairs	.003	.004	.003	.002	.007	.001
Electric power	.028	.003	.015	.025	.020	....
Water and water power	....	.001	.003	....	.004	....
Electric light	....	....	....	....	....	.005
Heating	....	....	....	....	....	.021
Assaying	....	....	....	....	....	.007
Train service	....	....	....	....	....	.002
Contingent expense	....	....	....	....	....	.011
Depreciation	....	....	....	....	....	.043
Administrative expense	....	....	....	....	....	.018
Taxes and insurance	....	....	....	....	....	.036
Fire protection	....	....	....	....	....	.003
Experimental supplies	....	....	....	....	....	.003
South mill operation	....	....	....	....	....	.026
Totals	.066	.041	.078	.071	.101	.243

Dome Mines Co.

The Dome Mines Co., Ltd., operating a gold mine in the Porcupine district of Ontario, reports for the year ended Mar. 31, 1918, a net deficit of $45,869. This poor showing was a result of the mine's having been closed during four months of the year. Labor conditions, in the mine especially, owing to a large proportion of enemy aliens being employed in that department, grew steadily worse, and finally necessitated the shutdown. The results of operations during the first eight months are shown in the accompanying tabulation.

OPERATIONS AND EARNINGS OF DOME MINES CO. FIRST EIGHT MONTHS OF 1918.

	Total	Per Ton
Tons ore milled	247,000	$4.272
Earnings		
Amalgamation bullion	$ 735,655.16	2.978
Cyanidation bullion	295,103.14	1.195
Total recovery	$1,030,758.30	$4.173
Operation and maintenance:		
Mining, including hoisting	234,534.94	.949
Development redemption	117,299.38	.475
Crushing and conveying	26,912.39	.109
Milling	234,473.29	.949
Executive expense, N. Y. & Toronto	7,591.32	.031
Administrative and general expenses at mine	47,331.84	.192
Taxes and insurance	18,036.94	.073
Total operating cost	686,180.10	2.778
Net operating earnings	$344,578.20	$1.395
Other revenue	10,445.58	.042
Net profit	$355,023.78	$1.437

The net profit indicated for the period of operations was wiped out and a deficit for the year created by a net loss of $118,564 during the four months' inactivity and charges of $282,329 for plant depreciation. One dividend of 25c. per share and aggregating $100,000 was paid. Ore reserves are estimated at 1,950,000 tons, averaging $5.10 per ton.

New York & Honduras Rosario Mining Co.

Favorable results, although not as satisfactory as those of its banner year, 1916, are shown by the report of the New York & Honduras Rosario Mining Co. for the calendar and fiscal year 1917. The company operates a silver mine with important subsidiary gold values at San Juancito, Honduras. The year's income totaled $1,676,846; operating and other charges, including $62,896 for New York administration expenses, were $1,075,966, leaving $600,879. Reserves for depreciation, insurance and taxes totaled $94,005, leaving net earnings of $506,874. Dividends aggregating $300,000 were paid during the year, and $220,325 was set aside for mine depletion. The average price obtained for silver was 84.1c. per ounce.

Ore mined during the year was 141,218 wet tons, and 125,900 dry tons was milled. The average content was 15.03 oz. silver and 0.117 oz. gold per ton. Recovered silver was 1,670,612 oz. and gold 13,790 oz., representing extractions of 88.3% and 89.7%, respectively. The accompanying tabulation shows comparative operating costs in pesos for 1916 and 1917:

NEW YORK & HONDURAS ROSARIO OPERATING COSTS IN PESOS PER TON, 1916-17.

	1917	1916
Tonnage milled	125,900	128,030
	Cost per Ton	
Mining	8.33	8.23
Milling	5.67	5.53
Administration	2.29	2.39
Totals	16.29	16.15
Increase	0.14	....
Value of peso in U. S. currency	46c.	39c.
Average rate of exchange	219	259
Cost per ton in U. S. currency	$7.43	$6.30

It is evident that the rate of exchange plays an important part in the costs, because though on the peso basis the cost per ton as compared with 1916 was only 14 centavos higher, reduced to a gold basis it was increased by $1.13 per ton.

Silver King Consolidated Mining Co.

Satisfactory operation in all departments was secured during 1917 by the Silver King Consolidated Mining Co., according to its annual report. The company operates a silver-lead mine in the Park City district, Utah. Progress made in the development of a new ore zone was particularly gratifying.

The fiscal period has been changed to correspond with the calendar year, and for that reason the report covers only 11 months' operation. Ore shipped totaled 10,260 tons, 9014 tons being crude ore, the rest concentrates, of an average value of $67.79 per ton. Ore sales netted $642,447 and dividends aggregated $383,287. Production of metals was as follows: Silver, 451,627 oz.; lead, 5,016,627 lb.; gold, 403 oz.; and copper, 248,771 pounds.

The Gold Output of the United Kingdom for the year 1916 amounted to 207 oz., recovered from the treatment of 1338 tons of ore from a mine in Merionethshire.

Events and Economics of the War

Early in the week American forces took Sergy and Seringes on the Marne front, and the battle resolved itself into gun duels and rear-guard actions the last days of the month. Allied troops advanced on a 10-mile front from Buzancy to Fère-en-Tardenois. The Germans have retreated behind to the Vesle. American troops took Fismes by assault, and obtained a footing on the south bank of the Vesle in this sector.

The Soviet at Archangel has ousted Allied envoys. Field Marshal von Eichkorn, German dictator in the Ukraine, was assassinated by an alleged agent of Czecho-Slovaks. Bonar Law has asked the Commons for a £700,000,000 vote of credit, and Sir Eric Geddes announces a net gain in shipping tonnage over submarine depredations of 100,000 per month.

Senator Reed, of Missouri, urges one-man control of aviation by creation of an air minister. McAdoo has announced a three-weeks' campaign for the 4th Liberty Loan, Sept. 28 to Oct. 19. Provisions extending draft ages from 18 to 45 years recommended to Congress in War Department's new man-power program.

Combing Non-Essential Industries For Labor

The need for an additional million men for work in vital war industries has led to the establishment of Government control of unskilled labor, and the adoption of labor bureaus where the agents in charge will have full power to withdraw men from non-essential industries as occasion demands.

No advertising for unskilled labor in future will be permitted by firms or individuals who employ 100 or more persons engaged in the work of essential productions. All efforts to secure employees must be made through the nearest Government bureau. It is also not permissible to recruit labor through the recognized agencies without a permit.

Will License Exports to Mexico

Applications for licenses for exporting to Mexico the various commodities mentioned in the State Department's press bulletin of July 12 will now be considered by the War Trade Board, it has been announced. The list of articles given in the bulletin referred to includes coke, which will be licensed if drawn from certain specified districts; articles of iron and steel manufacture except where the need of conservation compels restriction of such exports; articles for the exploitation of mines, especially cyanide, dynamite, caps and fuses; and copper in manufactured form, as well as zinc. Licenses for the last two metals will be granted to as great an extent as the conservation measures of the United States will permit. There is a shortage of ferromanganese in this country, and licenses for this commodity cannot be granted with much freedom. Licenses for mining machinery, where required for production of metals, will be granted liberally, it is stated.

Mexico has been receiving cyanide needed for metal production. All countries have been rationed with respect to this commodity, as there is not enough to go around. Export licenses have also been granted for dynamite, caps and fuses, as needed for mining purposes. The other articles on the State Department's list are corn (30,000 tons); ammonia for ice making and refrigerating; agricultural machinery; common soap; and certain foodstuffs, as well as a considerable amount of railway equipment.

Spain a Producer of Potash?

Discovery that Germany does not hold a world monopoly on potash, says a press dispatch from Amsterdam, comes as a blow to innumerable economists who repeatedly have assured the Germans that the Fatherland could impose its own terms of peace because the world, and especially America, was bound to come to Germany for fertilizers.

The government has just presented a report to the Reichstag containing the warning that Spain has unexpectedly entered the market as a large producer of potash, and the German mine owners are urged to organize their forces to meet the new situation. *Germania* says: "Our supposed independence as regards the fixing of our own prices is gone."

War Enhances Tin's Importance

Tin is rapidly coming into its own, if indeed it has not already arrived, owing to various causes brought about by the war. Tin importations into the United States, according to a compilation by the National City Bank, of New York, averaged 12.9c per lb. in value in 1897, 27.23c. in 1900, 30.52c. in 1910, 39.97c. in 1917 and 59.4c. in April, 1918, and responded to a recent jump of $50 a ton in London with quotations in the New York markets of $1 for "spot Banca," though the import prices above quoted relate to the cost or selling price of the tin in the markets from which imported into the United States, and not those in the New York markets.

Despite the advance in price, tin continues to be greatly in demand in this country, chiefly for making tin plate, the production of which in the United States has grown from 42,000,000 lb. in 1892 to 1,000,000,000 in 1903, 2,000,000,000 in 1912 and 2,766,401,227 lb. in 1917. About 90% of the tin imported into this country since 1893 has gone into tin plate. Imports of tin have grown from 35,000,000 lb. in 1890 to 70,000,000 lb. in 1900, 101,000,000 lb. in 1910 and approximately 140,000,000 lb. in 1917, plus 10,000 tons of tin ore, valued at about $7,000,000. This importation of tin as ore is a comparatively new feature in America's tin supply.

Steel Corporation Advances Wages

The United States Steel Corporation declared the regular quarterly dividend of 1¼% on July 31 and an extra one of 3% on the common stock, thus continuing the annual rate of 17%. It also issued a statement showing net earnings of $153,273,641 and increased wages to an extent that will add at least $25,000,000 a year to the payroll. The action as to the wage advance came as a surprise.

Since the beginning of the war common labor in the mills of the Steel Corporation has received seven advances in pay. The $2 a day level which prevailed up to February, 1916, was advanced in that month to $2.20. The successive stages of the advance up to the latest announcement have been as follows: February, 1916, $2.20; May, 1916, $2.50; December, 1916, $2.75; May, 1917, $3; October, 1917, $3.30; April, 1918, $3.80; August, 1918, $4.20. At the new rates of pay that became effective on Aug. 1, common labor will be receiving more than twice as much as at the beginning of 1916. Before the increase just granted, the average daily wage of all the employees of the Steel Corporation, excluding those in the administrative branches, was figured at around $5, against $2.88 in 1914.

Fuel Oil for Great Britain

The best method of obtaining fuel oil in Great Britain from home sources is by the carbonization of cannel coal, according to a report just issued by a committee appointed by the Minister of Munitions to investigate the question. Cannel coal could be carbonized in existing vertical retorts at gas works, although no largely increased quantity of oil can be obtained from this source during the war, owing to the difficulties of labor, coal, and transport.

The report indicates that other sources of supply will be available in the future. These include drilling for oil in Great Britain, further development of the Scottish shale-oil industry, and increased carbonization of raw coal. In the latter connection it is declared that about 1,250,000 tons of fuel oil might be obtained from every 20,000,000 tons of coal carbonized.

Labor Board Sidesteps Minimum Wage

A resolution has been adopted by the War Labor Board marking the end of a long discussion of the question of establishing a fixed amount as the minimum to be paid to any workman in the United States. The period of the war, it declares, is not a normal period of industrial expansion, from which the employer should expect unusual profits or the employees abnormal wages; it is an interregnum, in which industry is pursued only for common cause and common ends.

The board should be careful, continues the resolution, in making conclusions and recommendations during this period, based on approved views of progress in normal times, which, under war conditions, might seriously impair the present economic structure of the country. The declaration of its principles as to a living wage and an established minimum, the board holds, should be construed in the light of these considerations.

Australian Association Would Exempt Base Metals From Taxation

The Mining Association of Western Australia, with headquarters in Perth, has been organized to keep the importance of the mining industry before the public and to impress upon the people and the government the necessity of fostering its development at this time, according to the *Chem. Eng. and Min. Review*, of Australia. At a hearing before the State Treasurer, it was contended that treatment charges in eastern Australia were excessive, and should be reduced, and that, so far as taxation was concerned, the base metals, such as copper, tin, lead, etc., should be placed on the same exemption list as gold. It was suggested that if base metals could not be exempted, the exemption of £1000 allowed to be deducted in respect of the war-time profits tax on new industries should be increased to £10,000, or, alternatively, that the rate of profit which was exempt should be increased from 10 per cent. to not less than 15 per cent.

Brazil Ready To Lease Monazite Sands

The Brazilian government has announced its readiness to execute leases for mining and exporting monazite. This mineral is found on the seashore almost exclusively. The leases offered by Brazil include the seacoast and such other lands along the shore as belong to the federal government of that country. The Consulate General at New York announced that he would receive bids for them until Aug. 6.

Ordinarily, Brazil is unimportant as a producer of monazite, which is a source of the thorium and cerium used in the manufacture of gas mantles. Much of the thorium so used was formerly obtained from Austria and Russia, but the war has forced the Allied governments to turn to other sources.

Mexico Modifies Oil-Land Tax

Recent agreement between the Mexican government and representatives of other countries will result in modifications of the oil decree of Feb. 19 last. Lands which have been legally leased and manifested but not denounced will be declared free land if not denounced within two months of a declaration by the owner or lessor who makes the manifestation. Lands legally leased can be denounced by the last concessionnaire or by an intermediary if manifestation previously has been made. Grants of land may be reduced at any time and a new title issued.

Penalties are provided for non-compliance with the new regulations, which are effective from Aug. 1. The tax on a hectare of land is reduced from the 5 pesos called for in the February decree to 3 pesos. The government will accept, in payment of title, fees and taxes, credits which the companies have advanced for the dredging of the Panuco River. Oil lands are still held to be in the same category as mineral lands, in that the government retains original title to the subsoil.

Priority assistance is to be withheld, by the War Industries Board, from employers who use competitive peacetime methods in the procurement of labor, resulting in the withdrawal of labor from war industries.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

Bureau of Mines Appoints Gold-Mining Committee

Before tendering any advice for the relief of gold mining, the Bureau of Mines will gather accurate information. A committee consisting of Hennen Jennings, Charles Janin, H. D. MacCaskey, J. L. Mackenzie and F. L. Ransom has been appointed to investigate the matter. A questionnaire will go to all those engaged in gold mining in the United States, and one of the principal points it is hoped to establish is the loss of output which will probably result on account of present conditions.

In the meantime, members of Congress and Government officials are being importuned to make provision for a bounty on gold production. Some are urging that the Secretary of the Treasury should recommend that gold-mining operations be relieved of all state and county taxes. The Director of the Mint is in conference almost daily with those interested in maintaining gold production. It is believed that the Committee on Ways and Means is fully alive to the situation, and that a way will be found which will allow excess profits to apply on such gold operations as are regarded to be proper subjects of taxation, at the same time allowing immunity in cases where the accumulated profits of years become suddenly available.

Object to Proposed Modification of War-Minerals Bill

Friends of the War-Minerals bill as originally drafted are objecting to the proposal to limit the measure to the corporation idea. The good being done by the Food Administration, they declare, would be tremendously lessened if its activities were limited to the wheat corporation. They believe that a buying and selling corporation would interfere importantly with private industry. The licensing feature also is regarded as essential. The case of platinum is cited as an example that adequate powers do not exist for the handling of minerals, when so many difficulties are being experienced with a metal which would be among the easiest to control.

Activity in Chrome-Ore Production

Prospecting is being conducted actively in the chrome deposits of Lancaster County, Penn., and Chester County, Md. This district supplied all the chrome used in the United States from 1828 to 1883. J. H. McGuire, of the Bureau of Mines, who has made a personal inspection of the region, is hopeful that it soon again will become a producer of chrome. Search is being made for chrome sands in the beds of streams.

As no records of the old mines are in existence, there is considerable doubt as to which of them were exhausted and which were closed by their inability to compete with foreign ore. This uncertainty in many cases is deterring prospectors from reopening old shafts, many of which are several hundred feet deep. The old Wood shaft, in Lancaster County, was sunk to a depth of more than 700 feet.

Some hope is entertained that North Carolina may increase its chrome production, and there are many evidences of the interest that mining men are taking in the possibility of developing the industry further.

Complaint is reaching the Bureau of Mines from producers of chrome ore in Oregon that western production of chrome is being generally referred to as California production. Oregon producers claim to be responsible for one-third of domestic production of chrome ore and contend that they should have credit for it.

Common Labor Scarce at War Plants

A shortage of 25,000 common laborers exists among 600 war plants, according to returns made by the first 600 plants to reply to a recent questionnaire sent out by the Department of Labor. If this proportion of shortage is maintained at all war plants, the lack of unskilled labor presents a more serious problem than had been anticipated. During August and September it is expected that the demand for unskilled labor in the war industries will almost double.

Contract labor may be brought into this country from Mexico when it is destined for employment in any mining enterprise. This is an extension of the recent order of the Secretary of Labor which permitted the importation of Mexicans for use in agricultural work and in the mining of lignite coal. The present extension also allows the use of Mexican common labor in connection with construction work being done by or for the Government in the erection of buildings in Texas and in portions of Arizona, New Mexico and California.

Unforeseen difficulties made it impossible for the Department of Agriculture to bring into the United States the entire 120,000 tons of nitrate of soda which was purchased in Chile by the War Industries Board. Owing to the difficulty in securing ships, and from the fact that two of the ships assigned to the transportation of the nitrate were wrecked, it was possible to bring in but 75,000 tons. The nitrate which reached this country was sold to farmers at $75.50 f.o.b. ports.

Fine Crushing of High Siliceous Manganese Oxide Ores from Arizona, California, Nevada and Utah, so as to liberate the manganese oxide from the adhering siliceous gangue, has given encouraging results in the concentrating experiment being conducted at the Lake Superior station of the Bureau of Mines. Flotation tests are being made on rhodochrosite ores from Butte and 70% of the sphalerite contained in the ore is being recovered as a flotation product, the rhodochrosite and quartz remaining in the tailings. The object of the experiments is to determine the best kind and the amount of oil to be used.

Field Artillery Central Officers' Training School

A field artillery central officers' training school for civilians between 20 years and 8 months and 40 years of age, and for enlisted men of the army, has been established at Camp Zachary Taylor, about six miles southeast of Louisville, Ky. The course will be about 12 weeks, and it is planned that new classes will start from time to time, as demanded by the needs of the service and the number of approved applicants. This will be hereafter the only training school in the United States for candidates for commissions in the field artillery, which includes both heavy- and light-horse and motorized artillery.

Civilians entering the school must agree to serve in the Army for the period of the war, if they fail to receive commission—those within the draft age by voluntary induction and those above the draft age by voluntary enlistment. Civilians will be kept in a separate organization for quarantine and preliminary training for about a month after induction or enlistment. Thus the course for them will be virtually four months. Enlisted men sent to the school from various organizations throughout the country as described hereafter will immediately enter the school upon arrival.

Both enlisted men and civilians, after entering the school, will be relieved from time to time, as they demonstrate unfitness to be officers, and will be transferred to other organizations. Successful candidates will be either commissioned second lieutenants immediately upon graduation or designated officer-candidates and sent to replacement depots, where their education and training will be continued and where they will be given practical experience in drilling, training recruits and handling men. As the needs of the service demand, the officer-candidates not commissioned immediately upon graduation will be commissioned second lieutenants from replacements depots, according to demonstrated ability and qualifications, and thereafter promotion to higher grades will be by selection.

RECORD OF APPLICANT MUST BE ABOVE REPROACH

The field artillery is in urgent need of a large number of officers. The object of this school is to train a body of men fitted to fill the more responsible positions of command, and every effort will be made to select men of exceptional character and proved ability. Though it is desired to give an opportunity to all eligible citizens to apply, no man should make application whose record is not in every respect above reproach and who has not the fundamental characteristics to inspire respect and confidence.

Officers are needed who have had a scientific and technical education, but this is by no means the requisite to selection of candidates. It is essential, however, that every candidate should now have or be fitted, through previous study, to reacquire at the school a thorough understanding and working knowledge of arithmetic and algebra, to include quadratic equations and plane geometry. Civilians must be graduates of a high school or have pursued an equivalent course of instruction. A knowledge of trigonometry to include solution of triangles and logarithms is desirable.

All candidates must be citizens of the United States. No one is eligible who was born in a country with which the United States it at war or in a country allied to such a country, unless he emigrated to the United States before the age of five years. Older men of mature judgment, gained through experience in business and professional life, are especially desired. Such men need not hesitate to enter because on graduation they cannot be commissioned higher than second lieutenants, as promotion will be by selection and should be rapid if they demonstrate ability. Enlisted men of all branches of the Regular Army, National Army and National Guard, except the Coast Artillery Corps, Signal Corps and labor units, are eligible, but they must possess the qualifications given above for civilians and in addition be recommended through the commanders of the divisions, departments, depot brigades, or camps to which they belong.

FORM PROVIDED MUST BE USED IN APPLYING

All civilians will be required to make application to attend this school by filling out a blank form provided, in which they agree to enlist for the duration of the war, if over draft age, or be voluntarily inducted if within draft age, and to report at this school when ordered. After filling out these forms, both classes of civilians will be examined by a reputable physician at their own expense, or by an Army medical officer, whose report will be entered on the application in a place provided therefor. A second examination will be required before entering the school unless this preliminary examination was made by an Army medical officer. Thereupon the application will be forwarded by the applicant to the nearest officer on duty as professor of military science and tactics, or other designated agency, together with three testimonials from reputable persons as to good character.

As soon as possible thereafter the applicant will be notified to appear at his own expense for examination before the professor of military science and tactics or other authorized agency. He will be rated and his application will be forwarded, together with a recommendation, to the school. Applications thus received at the school will be reviewed and approved or rejected, and applicants will be notified of the action taken.

Approved applicants above the draft age will be required to report at the school for enlistment immediately upon receipt of subsequent notification to do so, but will receive reasonable prior notice. Approved applicants within the draft age will be required at a subsequent date to appear before their local board within 24 hours after receipt of summons from said board and agree to accept or refuse individual induction. If they accept, they will be inducted into the service and sent to the school within seven days.

Enlisted men are required to make application to attend the school through their division, department, depot brigade, or camp commanders, and will be ordered to the school from time to time when called for by the headquarters at the school.

All civilians while at the school will receive the pay of private, first class ($33 per month). Upon graduation as officer-candidate they will be appointed to the grade of sergeant and receive $38 per month. While at the school and after being graduated as officer-candidates, food, clothing, bedding, etc., will be furnished. A man with a wife must allot not less than $15 a month to her. To this the Government adds $15, if there are no children; $25, if there be one child; $32, if two, and $5 a month for each additional child.

Men within the draft age will be sent to the school at the Government's expense. Those above the draft age will be required to travel to the school at their own expense, but will be reimbursed to the extent of 3½c. per mile. When commissioned second lieutenants, they will receive $141.67 per month, and allotments will automatically cease. Quarters will be furnished officers, but not for their families. Married second lieutenants, in addition to the above, will receive commutation of quarters amounting to $24 per month, making their total compensation $165.67 per month. Officers are required to pay for food and clothing.

Upon entering the school, candidates will not be allowed to keep in the barracks any luggage but a handbag or a barracks bag. They should not bring trunks with them. Civilian clothing may not be worn at the school, and must be sent home after arrival or otherwise disposed of. All applications should be addressed to Field Artillery Central Officers' Training School, Camp Zachary Taylor, Louisville, Kentucky.

Utah Mining Congress Offers Views On Proposed Western Wage Regulations

The following telegram was prepared by a committee appointed at a meeting of Utah mine operators on July 29 and was immediately forwarded to W. B. Wilson, Secretary of Labor, at Washington, D. C. The committee consisted of G. W. Lambourne, Imer Pett, C. W. Whitley and L. D. Anderson.

At a meeting today of operators representing more than 90% of the metal output of this state, it was voted unanimously to submit for the consideration of your department our views with respect to proposed wage regulations affecting Western metal mines. The meeting was the result of the recent visit here of Verner Z. Reed and E. P. Marsh, of the President's Mediation Commission, who courteously granted an interview to a committee of metal-mine operators on July 27. The impression gained from the meeting and subsequent press announcements was that the mediators would recommend to your department that a zone be created embracing eight Western mining states, including Utah, Arizona, Montana and Nevada; that a uniform scale of wages be applied throughout this zone and that a Government commission be appointed to reinstate wage differentials with power to make its findings retroactive wherever necessary. The operators were urged by the commissioners to feel entirely free to present directly to your department any objection to their plan which from the operators' intimate knowledge of the business they might be in a position to make.

We are in sympathy with the suggestion to "set the price of labor," as the Government has fixed the price of our products, but we believe that the price of labor should be based on conditions where the labor is employed and not on conditions elsewhere. Realizing the complex nature of this problem, we suggest the careful consideration of the following points before any final decision be reached: First, Utah differs from Montana, Arizona and Nevada in that a great many of its mines are dependent on lead and zinc ores. Although the price of lead and zinc is low compared with copper, the lead-zinc mines are obliged either to pay the wage scale prevailing in the great copper mines of the state, face endless labor difficulties or close down. If required to meet the still higher wage scale of Montana, Arizona and Nevada, the only possible course for many will be to suspend operations. The numerous wage increases in Utah since the beginning of the war have already forced some mines out of business and made the situation of many others exceedingly precarious. The rate of output of lead and silver from the Utah smelteries has suffered a reduction of 15% compared with the corresponding period last year. A further curtailment will be the inevitable effect of a still further advance in their expenses. Second, the wage differential between Utah and Montana, Arizona and Nevada has always existed. This condition is due to natural causes and was created largely if not wholly by the miners themselves as the result of differences in climate, living conditions, character and surroundings of work and other circumstances. It is not that the Utah operators are trying to pay a lower wage than is paid in other states, but, on the contrary, that the working miners of those states demand a wage differential as a premium to offset what the miners themselves have determined to be less favorable living and working conditions in Montana, Arizona and Nevada. Third, the wage scale of the Utah mines is already disproportionately high as compared with the scales established by the Government for identical labor in shipyards and on railroads. To again change the mine rates will cause a tremendous upheaval in the entire industrial organization of the states affected, cause extreme dissatisfaction among the Government railroad employees and plunge the whole labor question in all of the Western mining states into chaos.

We feel that these consequences would have been foreseen by the Presidential Mediation Commissioners had they had time to familiarize themselves with all phases of the situation and that their recommendations would then have been different in many respects. We would respectfully request that you acquaint Messrs. Reed and Marsh, as well as the boards of your department which may be interested, with the contents of this statement.

Every one present at our meeting was deeply sensible of the disinterested and patriotic purpose of the mediators and of your department, and it was the universal desire to aid in every way possible in stabilizing the industrial situation. All wished to deal as generously with their employees as was consistent with the maintenance of the production and financial support required by our country in these crucial days.

Metal Production of Western States

Advance figures for the mine production of gold, silver, copper, lead and zinc in 1917 by the states of Arizona, California, Utah, Oregon and Washington have been compiled by the U. S. Geological Survey. In the original tables from which the accompanying compilation has been made the production is given for each county.

METAL PRODUCTION OF WESTERN STATES

	Arizona	California	Utah	Oregon	Washington
Number of producers	484	*a*	334	76	136
Ore produced, tons (2000 lb.)	15,770,193	3,003,250	15,358,481	142,438	172,119
Gold, oz.	245,173	971,734	162,305	72,165	23 816
Silver, oz.	6,983,913	1,775,431	13,479,133	125,656	282,320
Copper, lb.	712,166,891	48,153,139	246,674,153	2,474,487	2,199,518
Lead, lb.	23,465,445	21,868,628	178,521,958	(*a*)	9,789,687
Recoverable zinc, lb.	20,894,860	10,872,716	21,286,871	(*a*)	1,195,567
Total value	$209,393,802	$37,685,985	$99,328,155	$2,270,874	$2,289,285

(*a*) Information not given.

Verbal Modification of Written Leases

By A. L. H. Street*

Under the statute in force in most states, to the effect that an agreement not to be performed within one year is not enforceable unless evidenced in a writing signed by the person to be bound, modification of a mining lease by reducing the royalty to be paid should be stated in writing. But, under uniform rulings of the courts that where one party to an agreement has materially performed his part of the contract this will cure original invalidity of the agreement arising from want of written obligation, an oral modification of a mining lease will be sustained in favor of the lessee where, on the faith of the modification, he has sunk shafts and paid royalties. The points were decided by the Springfield, Mo., Court of Appeals, in the recent case of Last Chance Mining Co. *vs.* Tuckahoe Mining Co., 202 *Southwestern Reporter*, 287.

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Editorials

Labor's Responsibility

THE reports of railway operations under Governmental direction furnish food for serious reflection. In spite of the advantages theoretically derivable from coördinated management—which were the basis of optimistic hopes and promises six months ago—the railways are making a poorer financial showing than they were previous to the taking-over. The reason is increased costs, especially for labor. The income from the increased freight and passenger rates has not yet exhibited itself in the reports, however.

But here we have an expression of what is going on in all industry. Labor demands and gets increased wages on the ground of increased cost of living. Then the products of labor—food, hardware, transportation and everything—have to be advanced in price, and the cost of living rises further. So things go around in a vicious circle. The price-fixing policy of the Government does not stop it, but rather aggravates it. When the Government itself takes over an industry, for example transportation, it finds itself obliged to advance prices in just the way that it refuses to let the producers of commodities do. Who can shut his eyes to the prospect that a continuance of this policy will break down production, just as it broke down transportation?

This is labor's day. The demand for labor is great and the supply is short. Labor is economically justified in taking advantage of this situation and getting all it can. But labor is making its great mistake in not taking advantage of its opportunity by working hard and saving. Never before, in the history of the world, did labor have such a chance to rise in the economic scale, to better its conditions of living, to provide against sickness and old age. Many workers appreciate this and are acting accordingly. But too many, in every industry, find in high wages and great demand for their services the excuse to work only part time and to work inefficiently. Complaints of company managers that they have to keep 15,000 men on their payroll in order to get the work of 10,000 for full time, and that the output per man even on full time has diminished seriously, are far too common. The evidence respecting this subject is too sweeping and too conclusive to permit of there being any mistake about it.

This disastrous situation results from interfering with the law of supply and demand in the case of capital and keeping hands off in the case of labor. The aim is by price-fixing to restrict the earnings of capital and to tax severely what can be realized, while those of labor are unrestricted and untaxed. This theory disregards the elemental facts that capital works all the time and constantly studies to improve efficiency, creating annual savings that go to swell the wealth and power of the nation, while labor wastes, both in extravagant consumption and in failure to produce efficiently and by indulging in idleness.

Appeals to patriotism have ameliorated this evil in the cases of shipbuilding and coal mining and no doubt in other things. An offsetting factor also is the constant effort of the administrators of industry to increase the mechanicalization and efficiency of their methods, although the shadow of the tax gatherer is an ever-present, deterring influence. But everybody knows that the general attitude of labor is that of indifference and slackness, not owing to any lack of patriotism (quite the contrary), but due to ignorance of the fundamental principles of economics and, unfortunately, to human nature. The opportunity of labor to improve its working conditions is something to be viewed with approval. The opportunity of labor to increase its wages is something that is economically natural and beyond cavil. But the wastefulness of labor, especially of its time, and the indifference of labor, especially in its interest, are things that cannot be condemned too strongly. Already there are pessimists who say "Labor is going to get all." If it ever succeeds in that it will find that it gets nothing. Such an economic demolition as that of Russia is the only outcome of such a course.

Some states have passed laws to the effect that "all able-bodied men between the ages of 18 and 50 must work at least 36 hours each week at some useful occupation," under penalty of $100 fine, or three months in jail, or both. But why only 36 hours per week and not 44 or 48? Does not the 36-hour provision legalize the mischievous habit of part-time work, which is so emphatically playing into the hands of the Huns?

The American Zinc Institute

THE meeting of the zinc producers of the country in St. Louis last week, at which steps were taken to organize an American Zinc Institute, was in all respects successful. It brought together both miners and smelters, who came from all parts of the country, and sheet-zinc rollers as well, and enabled them to become acquainted with each other and discuss the problems that concern them all. In the present condition of their industry, these problems are serious, and they must have careful consideration, to be followed by joint action in the proper directions, if serious disaster is to be averted.

A pleasing thing about the recent convention was the good-fellowship that was exhibited and the moderation of thought that was expressed. There was no haranguing about grievances between miners and smelters, no invocations of Governmental assistance in the way of price-fixing or otherwise, and no talk about forming a sort of a cartel and regulating production, even if the Government might be disposed to connive in such an illegal proceeding. On the contrary, the keynote was distinctly for nothing but legitimate coöperation in the direction of research, experimentation and increasing the use of the product; and, in another direction, the increasing of efficiency in production. These are the straight paths that have a sound economic foundation and are free from pitfalls and quagmires.

The zinc industry can do much for itself in these ways. The prime question that comes first before it is for the organizing committee to frame a broad constitution and a simple system of business procedure. The next great question will be for the board of 21 directors, representing the whole industry, to decide whether it is going to approach the problems in a big way or a little way. If they are well advised they will choose the former, remembering the adage of "Nothing venture, nothing have," and remembering, further, that these are days when time is too precious for any of it to be lost by dilly-dallying.

Captain Irving

PROFESSOR KEMP and Professor Lindgren have fittingly furnished the memorials of the good gentleman and gallant soldier of whose loss we heard last week. It was proper that these should be written by fellow-geologists who were very near to him and could esteem his professional attainments better than any one else. But the entire craft of mining engineers knew of him and gloried in his being an officer in the 11th Engineers, which was one of the first regiments to go over and distinguished itself so famously at Cambrai. The thought that we shall not see our friend again cuts another wound in our bosoms, such as we felt when we heard of the death of Lieutenant Hague. These wounds, and others yet to come, will heal, but that we have had them will be an inspiration to all of us, and the memory of these friends will linger with us as flowers of chivalry.

War-Time Economies

IT HAS long been realized that charcoal would precipitate gold or a gold compound from aurocyanide solution; but, in spite of the low first cost of charcoal and the comparatively high cost of zinc, practically nothing has been done to adapt the cheaper material as a precipitant. The money spent on research along practical lines in the metallurgy of gold has been insignificant, and nearly all the advance made has been due to the individual and unaided efforts of a few metallurgists who have made time, in the midst of their complex duties, to devote to research. It was, however, only when the cost of zinc became almost prohibitive that two metallurgists set to work and evolved a scheme for using charcoal satisfactorily, in place of zinc or aluminum. The Moore-Edmands process, described in this issue, resulted; and, although initiated as a war economy, it is reported to give better precipitation than the zinc or aluminum method, with a greater saving of gold, and cleaner solutions, with an economy of chemicals. A sound objection will be advanced against the use of charcoal in any known system, in that the silver, often associated with gold in nature, is not precipitated satisfactorily. The objection is insufficient to condemn the new process, and there are doubtless many institutions where research is being carried out and where the problem might be solved, if this is not done by private individuals.

Precipitation with lump charcoal had undesirable features, and the majority of metallurgists were complacent in their convictions that there was no possibility for successful application. In most cases zinc was giving good results; in others, the more expensive aluminum was used. When difficulty was experienced it was considered inevitable, and the wasteful addition of cyanide, to a degree far above that needed for the effective solution of the gold, was frequently advocated to mitigate precipitation troubles.

Besides the introduction of charcoal as a precipitant, other instances could be cited to prove that economy is not invariably its own reward. The results are often far-reaching in their economic significance, and beyond the vision of those whose conception of efficiency is to get the most at the least expense. Economical traits should be encouraged to the utmost, both for the value of the habit acquired and for the gain in net results, which often extends far beyond a saving in money or material.

The Demand of the Gold Miners

THE gold miners of the country are going to meet soon at Reno, Nev., to discuss the serious situation in which they find themselves. It looks as if their ideas would crystallize in a demand for a bonus of $10 per oz. upon gold production. As compared with the increased cost of labor and supplies, that is modest enough, although, if taxation be also abated, it may not be so bad. However, the asking for this is one thing and the getting of it is another.

It is clear that if aid be not extended to the gold miners the production of gold will decline very rapidly. The economists and financiers will have to decide whether they are willing that should happen, or not. Our own Treasury Department has already expressed itself very emphatically in the negative, but it has not said whether it wants to keep gold mines in operation sufficiently to pay a bonus to them.

In a previous article on this subject we pointed out that the payment of a bonus on new gold production would be equivalent to creating a premium for gold. It might, however, be managed so that the condition would not necessarily be such. Thus the Government might enter into an agreement to pay to what are distinctly gold mines a bonus of $10 per oz. upon their production, not to exceed the average annual rate of a series of recent years. In some such way clandestine deliveries might be excluded and the plan be resolved into a class subsidy, analogous to what there used to be on certain steamship services. The whole thing might be unsound and uneconomic—indeed would be—but in these days we have come to think that in many bad practices the end justifies the means.

Socialism and Sedition

NATURE is a hard task-mistress. She has never let it be easy for people to get their living. Since the appearance of the human race on this planet, it has had to struggle for existence. The struggle was harder, and there was more anguish and suffering, in the Stone Age than there is now. But, although conditions on the whole are easier in the 20th century than they were in the 19th, and the same may be said of the previous centuries in precession, there are many people, probably the majority, who have a hard time of it, Heaven knows; who are unhappy, who excite the sympathy of the kindly hearts among the classes that are more fortunate. But sentiment cannot be allowed to run away with common sense, without courting economic and national disaster. The proletariat and sentimentalists may rage against capitalism and pray for abolition of the system. But overthrow the system, reduce the captains of industry and the subordinate leaders to the ranks, then the mass of the people would soon starve to death, for they would not know what to do. Look at Russia, where leadership has been discarded, where deliberate efforts have been made, not only to extinguish property rights, but also to eliminate the intelligent classes of people, lest once more they may rise in position and prosperity above the masses.

In the United States there is nothing that prevents any one from rising to the top. Most of our great industrial leaders are men of humble ancestry, who began work in overalls, but who worked hard and used their brains. Most men do not use their brains; most men do not even want to work. The root of economic evil in this country today is that too many men will not work full time. There is too much of the four-days-per-week idea, instead of six days and full efficiency. There is too much poisonous socialistic nonsense, which is operating to reduce our national efficiency. Karl Marx, a German, created the germs of this infection. The Hun leaders propagated them and disseminated them among foreign countries, taking good care to suppress them at home. It was a shrewdly malevolent policy, and appreciating that, we should combat it. Socialism and sedition, in these days, are pretty much the same thing.

BY THE WAY

The letter to his friends which D. M. Riordan composed upon the approach of his 70th birthday, and which we published in this column of the *Journal* of July 9, inspired one of his friends to address to him this splendid combination of philosophy and poetry:

> My dear friend:
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> In the days when grouches are in order, when we are complaining because the Government needs our boys and our money and is taking both; when we are very sad if we have no money or boys to give; when we kick if we have to go ourselves and damn our luck if we are too old and infirm to go, it is good to see a little sunshine playing over the old rockpile and to feel that there is still some optimism in the air. It is good to know that there is one fellow, who, having seen all sides of life, having seen the ore pinch out in the bottom and every blooming face in waste, is now smiling and by example telling us to pack our troubles in the old kit bag and forget them; is telling us that the pinches are only local, and never mind how long we have worked, we've got 20 years of good going ahead of us. I say it's good to be poked in the ribs by such a fellow and poked hard, too.
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> Your letter of appreciation to the Almighty reminds me that He stakes out the claim that we must work, and darned unpromising the claims sometimes appear on the surface. But if we will only work them with the tools that He has given us, it will be found that they are all pretty good 'claims, after all, and that the mint returns are just about in proportion to our work. Some of us surely make a darned poor fist of it. We are inclined to fool ourselves; we get out a lot of rock and keep the stamps a-dropping and making the devil of a noise; we put on lots of quick and rub the plates hard and make big clean-ups. But in the end the amalgam must be retorted, and, while we may have fooled ourselves with the stuff we have put away in the safe, we can't fool the Lord. If we have done poor work, there will be nothing but copper and dirty sulphides to hand in. If we have been men and done the work of men, there will be a little bar of gold, and the Father will say "Well done, thou good and faithful servant. Enter thou into the Kingdom of the Lord."
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> It is my hope that I will not have to try to fool the Lord, but that I may have just a little of the real metal in my bar—enough to get through the Gates; so that when D. M. Riordan walks in wearing a nice new Stetson and expert boots he will say: "Well, bless my soul! How the hell did he get here? It's sure enough my old friend B——."

This is the sort of talk that the young fellows ought to treasure. The oldsters appreciate it, for they know that it embodies the essence of experience, the sterling silver of friendliness and the refined gold of character.

There are some people in the financial district who are of the opinion that, before attempting to take the beam out of the eye of the profiteering meat and steel and copper trades, the Government had better take a look in the glass to see whether or not there is a mote in its own eye, says the *Evening Post*. If that is done in the case of the railroads, some people are declaring, the Government will find that it is doing the very thing that is being charged against the wicked meat, steel, and copper makers.

As an indication of what is possible in the conversion of industry to meet war requirements and of the changes which can be made in the product of a factory, a few radical instances are given as illustrations by the War Industries Board. For instance, a Pennsylvania factory that formerly made linoleum is now machining 4.7-in. shells. A Duluth horseshoe manufacturer is turning out trench picks for the Army, and a New Jersey terra-cotta tile concern is making dummy drop-bombs. A Milwaukee factory, the former output of which was rowboat motors, is making hand grenades and trench pumps. In Rhode Island, a manufacturer of finger rings has turned his activities to making adapter plugs. A Detroit stove concern is producing trench bombs and anchor parts, and a New York shirt waist manufacturer is making signal flags.

A mining engineer was working a laborious passage across the Mexican Sierras on muleback, accompanied by a *mozo* whose taciturnity he was unable to influence. The American's knowledge of Spanish was scant, as he was new to the land of *tortillas* and *frijoles*, and all his efforts at conversation were abruptly terminated by the Mexican's *"mañana"* (by and by, tomorrow) in reply to all questioning as to when they would reach their objective, or *"quien sabe"* (who knows) in answer to all other inquiries. Chancing to pass through a mountain village they found that a funeral was in progress. The *mozo* held an animated conversation with several acquaintances, apparently anent the sad occurrence. Seeing what appeared to be a favorable opportunity for conversation, the American asked him who was dead. *"Quien sabe?"* was the reply. The American thought a moment, and then added: "Would that *mañana* could die too."

Personals

Have You Contributed to the Association of the 27th Engineers?

Kirby Thomas, of New York, is making examinations at Sudbury and Gowganda, Ontario.

G. H. Bolin, state mine inspector for Arizona, has returned to Phoenix from Los Angeles.

A. P. Watt has been elected to membership of the Mining and Metallurgical Society of America.

John A. Percival, of New York, is expected early in August in the Pacific northwest, and will inspect mines.

Herbert G. Officer has been commissioned a second lieutenant, Aviation Service, and is now on duty at Washington.

W. H. Howard returned to Salt Lake City recently after a long trip through the Southern States and those of the Pacific Coast.

A. E. Drucker has recently completed a series of leaching and electrolytic zinc investigations for the Consolidated Interstate Callahan Mining Company.

E. Redding, formerly with the Chino Copper Co. at Santa Rita, N. M., has accepted a position with the Oliver Iron Mining Co., Eveleth, Minnesota.

Jerome L. Drumheller, of Spokane, is in Alaska inspecting the initial run of a dredge for gold and platinum recovery on Willow Creek, Susitna River.

B. B. Gottsberger, general manager for the Miami Copper Co., recently left Miami, Ariz., on a vacation trip to Los Angeles and other coast points in California.

H. I. Ellis has been engaged on development work for the Bunker Hill & Sullivan Co., in the Heath district, central Idaho, and was recently in Homestead.

James S. Douglas, who has returned from France, where he had been for about a year engaged in Red Cross work, was recently at Phoenix, Ariz., en route to Jerome.

Frederic Keffer has returned to Spokane, Wash., after having been in New York a month investigating a new electric process for the production of nitrates and ammonia.

J. S. Coupal, of the Engineering Management Corporation, New York, has just returned from a three months' trip in Venezula on investigations of magnesite and copper properties.

P. C. Carmichael, formerly captain of the Alexandria mine at Chisholm for the M. A. Hanna Co., has been appointed superintendent of the Hobart mine, at Gilbert, Minn., for the same company.

D. McKenzie, until recently superintendent of the Ruth-Hope mines, Slocan, B. C., has taken charge of work begun by the Rosebery-Surprise Mining Co. on the Ivanhoe group of mines, near Sandon.

Oscar V. White, for many years superintendent of the Slocan Star silver-lead mine at Sandon, Slocan, B. C., is now directing development work on the Wakefield property, near Silverton, British Columbia.

Van H. Manning, director of the Bureau of Mines, has returned from a trip to Montana impressed with the achievements of the Anaconda Copper Mining Co. with its new ferromanganese smeltery at Great Falls.

N. O. Lawton, general superintendent of the Vermont Copper Co., South Strafford, Vt., is examining mining properties in Pennsylvania this week and will be in New York City for a few days on his return to Vermont.

L. C. David, general superintendent for the [illegible] Companies on the Mesabi and Cayuna ranges, has resigned, and will ac[illegible] general superintendent for the Pickands Mather Co., with headquarters at Gilbert.

F. B. [illegible], of San Francisco, re[illegible] West Kootenay, B. C. [illegible] the Minerals Separation flotation plant re[illegible]

Nelson P. [illegible] [illegible] and later [illegible] of the U. S. [illegible]

W. J. [illegible], of the firm of [illegible] Washington and Alaska.

Clarence Hall has been appointed chief of the newly created explosives division of the Bureau of Mines. For a number of years Mr. Hall was chemist for the Aetna Powder Co., and, until recently, president of the National Chemical Manufacturing Co., of Pittsburgh.

W. H. Nicholl, formerly underground manager of the Lonely Reef Mine, Rhodesia, is with the Royal Engineers on the western front. Mr. Nicholl served through the African campaign, and, after the disbanding of his regiment, volunteered for active service in Europe.

T. Griffith Taylor has received the David Syme research prize, awarded in Australia, for a thesis based on the correlation of Australian physiography, meteorology and climatology. Dr. Taylor's work in geology is also well known, especially in relation to the glacial geology of Antarctica, which he studied while a member of Captain Scott's expedition.

H. R. Edmands, who, in conjunction with **K. Byron Moore**, developed the method of precipitating gold from cyanide solutions by the use of pulverized charcoal, sailed from Western Australia for South Africa, after having completed a charcoal precipitation plant at the Riverina, South gold mine. Mr. Edmands has accepted a position with the Globe & Phoenix Gold Mining Co., Ltd., of Rhodesia.

Captain William J. Richards, during the last 18 years general superintendent of the iron ore mines of the McKinney Steel Co., on the Menominee and Gogebic ranges, has retired from active service, but will continue his connection with the company in an advisory capacity. He has been succeeded by Emerson D. McNeil, who was in charge as general superintendent of the properties of the McKinney Steel Co., on the Mesabi range, Minnesota.

Obituary

Chauncey P. Goss., Sr., president of the Scovill Manufacturing Co., died at his home in Waterbury, Conn., on July 19, aged 80 years. He entered the office of the Scovill company in 1862 and had been president and treasurer since 1900.

Edgar A. Fisher, Lieut. A. E. F., was drowned in France early in July. Lieut. Fisher was a mining engineer and was connected, at various times, with the Ray Consolidated Copper Co., the Braden Copper Co., and the Cerro de Pasco Copper Corporation.

Henry Shaler Williams, emeritus professor of geology at Yale University, died in Cuba on the 31st ult. He was born in 1847, and two years after being graduated from Yale, in 1868, became professor of natural science at Kentucky University. From 1892 to 1912 he was professor of geology at Yale. Professor Williams contributed extensively to geological literature and held the position of associate editor of the "American Journal of Science" and the "Journal of Geology," and he was actively concerned in the development of the oil fields of Cuba.

Societies

The American Mining Congress announces the holding of a meeting at Reno, Nev., Aug. 12, 13, and 14, to discuss the crisis in gold production, to consider the most suitable method of relieving the plight of the gold producers and at the same time insure the maintenance of the industry.

A meeting was held recently at the Engineering Societies Building, 29 West 39th St., New York, at which Capt. W. H. Stayton, U. S. N. (retired), National Director of the Navy League of the United States, delivered an address on "Ships," and dealt with the vital question of adequate shipping and the successful prosecution of the war.

The American Institute of Mining Engineers and other societies coöperated in the holding of a memorial service for the late John Duer Irving, professor of economic geology at Yale, who died on active service in France recently, at the Columbia University chapel an the 4th inst. Professor Kemp delivered an address, and a uniformed detachment from the School of Mining Engineers and a unit from the 265th Electrical Engineers were in attendance.

The National Research Council, acting as the department of science and research of the Council of National Defense, has appointed a committee to investigate the fatigue phenomena of metals. Professor H. F. Moore, of the engineering experiment station of the University of Illinois, is chairman. The committee is charged with the responsibility of developing a knowledge of the strength and durability of metals subjected to repeated stresses, such as ship structures, crank shafts of aircraft engines, and heavy ordnance. It is expected that much of the experimentation required will be done in the laboratories of the University of Illinois at Urbana under the personal direction of Professor Moore.

Industrial News

Dorr Company removed its New York offices to larger quarters in the Architects' Bldg., 101 Park Ave., on August 1.

George A. Armes, until recently chief engineer of the Union Iron Works Co., San Francisco, is now with the Moore Shipbuilding Co., Oakland, California.

The "Revista Mark R. Lamb" has taken the place of the "Revista Minera." The current issue contains much information with regard to mining equipment and products of special interest to South American mining operators. The "Revista" is printed in Spanish.

The Cottrell Engineering Co., of Los Angeles, has brought out a dry concentrator which has attracted attention in the dry mining districts of California and Arizona. The machine introduces a new principle of air flotation, supplementing a high-speed jigging motion; and simplicity of construction, economy of operation, and high metal extraction are claimed. The company, which manufactures both dry and wet concentrators for its own use, will soon begin operations on a silver-lead property near Tucson.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Antifriction Bearing—Orlando W. Hart, Fall River, Mass. (U. S. No. 1,270,821; July 2, 1918.)

Cadmium-Evolving Process — Woolsey McA. Johnson, Hartford, Conn. (U. S. No. 1,271,172; July 2, 1918.)

Carbide: Process of Making High-Percentage Calcium Carbide—Duke Robert Russell, Chicago, Ill. (U. S. No. 1,271,229; July 2; 1918.)

Electric Furnace—Edgar F. Collins, Schenectady, N. Y., assignor to General Electric Company. (U. S. No. 1,271,280; July 2, 1918.)

Furnace Lining—Otto Joseph Thomas Gustave Richard Martin, Vancouver, British Columbia, Canada. (U. S. No. 1,271,052; July 2, 1918.)

Holder for Miners' Lamps—James M. Roberts, Fredonia, Ky. (U. S. No. 1,271,368; July 2, 1918.)

Mining and Loading Machine—Edmund C. Morgan, Chicago, Ill. (U. S. No. 1,271,197, 1,271,198 and 1,271,199; July 2, 1918.)

Smelting and Refining Furnace—Otto Joseph Thomas Gustave Richard Martin, Vancouver, British Columbia, Canada. (U. S. No. 1,271,051; July 2, 1918.)

Refractory: and Process of Making Same—James O. Handy and Robert M. Isham, Pittsburgh, Pa., assignors, by mesne assignments, to Allen S. Davison Company, Pittsburgh, Pa. (U. S. No. 1,270,818 and 1,270,819; July 2, 1918.)

Roller Bearing—Orlando W. Hart, Fall River, Mass. (U. S. No. 1,270,820; July 2, 1918.)

Rotary Pump—Albert Edward Shiner, London, England. (U. S. No. 1,271,377; July 2, 1918.)

Tailings-Disposal Apparatus—Irwin S. Clifford and Fred C. Tompkins, Miami, Ariz. (U. S. No. 1,271,134; July 2, 1918.)

Tin Smelting—Method of and Apparatus for Smelting Tin—Edmund N. Morrill, Warren, N. H., assignor to Andes Exploration and Smelting Corporation. (U. S. No. 1,271,200; July 2, 1918.)

Tungsten Manufacture—Production of Metallic Tungsten Powder. Frederick G. Keyes, East Orange, N. J., assignor to Cooper Hewitt Electric Company, Hoboken, N. J. (U. S. No. 1,270,812; July 2, 1918.)

Editorial Correspondence

SAN FRANCISCO—July 29

Economical Spacing of Oil Wells was the chief subject of discussion at a recent meeting of operators at San Francisco. The consensus of opinion was that four acres to the well is too small an area for economical expenditure of materials and labor. The maximum space considered was 10 acres, and that will probably be the area ultimately determined upon. The fact was plainly brought out that no definite planning had been done by operators, although this branch of the oil-well industry involves the expenditure of large amounts. The subject is held to be of sufficient importance to require further careful discussion and consideration.

Fires in the Klamath National Forest, in Siskiyou County, now under control, numbered more than 100 from June 9 to 12 and did approximately $150,000 damage. They were started by electrical storms and were as numerous as is usual in August, owing to the exceptionally early dry season. The number of men available for fire fighting has been greatly reduced by the war demands, and this is in a measure responsible for the early start of the fires. Indians in the region gave valuable aid. In the Shasta Valley region, west of Marble Mountain, the June fires were less damaging, as they were confined chiefly to the smaller growths. Owing to the isolation of the region and the cost of securing men and materials, the principal efforts of the forest supervisors were confined to the saving of the timber-size growths. Reports of incendiary origin of the fires had no foundation in fact.

The Natural Soda Products Co.'s Plant on Owens Lake, Inyo County, lost its main building by fire on July 7. A 50,000-gal. tank that was to be used for storing water for fire-fighting purposes, but had not been connected by pipes, owing to shortage of labor, was also destroyed. A concrete oil tank, filled with oil, and a number of carbonating tanks, eight furnaces, four lime kilns, a boiler house and a pile of coke valued at $10,000 were saved. The company carried $100,000 insurance on the entire plant. There is also insurance of $400,000, covering use and occupancy, so that some return will be made for loss of operation while the plant is being reconstructed, which will require six or eight months at least, owing to the delay in obtaining materials and machinery. The buildings will be reconstructed of concrete, which will greatly reduce the fire risk, so that the permanent loss is confined chiefly to the portions of machinery destroyed and the loss of production caused by delay in resuming operation. The output of the plant had been increased from about 4000 tons in 1916 to a possible 25,000 tons in 1918. The company employs 100 to 150 men, who will lose no time during reconstruction.

Road Construction to Chrome Regions of Smith River, Del Norte County, is under investigation by Albert Burch, of the War Industries Board, and his assistant, Mr. Caldwell. Some extensive road building has been carried on at the expense of chrome miners in this region, and it could be improved by Government or state aid. It is understood that the Government will, in so far as legally possible, give assistance to the miners of the special war minerals, in the matter of roadbuilding. The state might have done more of this sort of work in the expenditure of the $18,000,000 road fund if the political disposition of the manipulators of state funds had leaned more toward the encouragement of mining industry in the state than toward the advancement of the automobile industry out of the state. But it is hardly to be expected that the politicians should give more heed to the requirements of the mining and other industries of California than to the demands of tourists. The miners they have always; but the tourists they have not, unless they go after them. And just now, the Government is advising the curtailment in public improvement expenditures. So, if the miners require roads to get their ore or metals to shipping points, let the Government build them.

Relief of the Gold Miners of California is announced in the daily press to be a part of the summer programme of the State Mining Bureau. The state mineralogist purposes to come to their assistance by collecting the necessary data relating to the expense of gold mining and submitting the facts to the Secretary of the Treasury, with the object of securing relief. If the results of the data-collecting campaign can be made to show that the cost of mining gold is greater than the cost of mining other metals, or will evolve a method of increasing the purchasing power of gold without reducing the costs of all metal mining, the Secretary of the Treasury may receive some interesting figures from the state mineralogist. There is no questioning the fact that the gold miners have been hard hit by the high costs of labor and materials. Nor is there any doubt that gold is an essential product in time of war, as in time of peace. No one has disputed these facts. Indeed, the Government has declared gold to be an essential. But the evil cannot be cured by collected data on costs of gold mining. However, the miners of gold know the cause of the present condition of the industry. They know it to be the result of a combination of causes: the high cost of labor and materials and the low purchasing power of gold, together with the propaganda that has persistently set forth the idea that the Government intended placing gold toward the bottom of the list of essential minerals and metals. In fact it is, as the mine owners are well aware, near the bottom of the list of industrial metals. The owners of gold mines know they are confronted by a most difficult combination of conditions. And they know, further, that the Government cannot make labor nor materials any cheaper for gold mining than for copper, lead, manganese or any of the other metals and minerals. Apparently the state mineralogist thinks the gold miners are merely handicapped by the high costs of mining, and that if he will tell the Secretary of the Treasury all about it, the Secretary of the Treasury will put an immediate stop to the absurdity of making the gold miner pay as much for his labor and materials as the copper miner pays. But when he presents his data and is asked how much greater is the cost of gold mining than other metal mining, he may wake up to the fact that he has been spending state money for collecting a lot of useless figures. Of course it is possible that some of the smaller mine owners may be impressed with the idea that the State Mining Bureau is going to relieve them of some of the "enormous expense." But even that is doubtful. So it is not likely that the result will be an appreciable gain in votes for the gubernatorial candidate most favorable to keeping the present state mineralogist on the job. The state mineralogist is reported to have suggesed still another method of relief—the subsidizing of gold production. That would be much better and much simpler. At any rate not any more foolish. And it would have the merit of saving the state the unwarranted expense of collecting useless data.

DENVER—Aug. 2

Leasing Operations in Colorado mines may be curtailed during the coming year on account of the steadily increasing freight rates, smeltery charges, cost of supplies, and the demands of the excess-profits tax. Last year's metal output in Colorado compared favorably with the value of the agricultural products, but this year many mining operations, which involve the risk of capital in underground development, will prove less attractive on account of the factors conspiring to cut down the profits properly demanded in connection with speculative ventures. Prior to Government control of railroads, some of the transportation companies succeeded in raising freight rates on ore hauled from the mines to the smelteries. Following Government control of these same roads, an additional raise in rates was made, in some cases amounting to considerably more than 25% of the old rates. The smelting charges then increased from 30 to 45%. These increases, together with the great increase in cost of mine supplies and labor, were accepted by mining men as necessary evils at this time, and an effort has been made to make the best of the situation. However, the excess-profits tax is so designed that in the case of leasing operations where there is little or no capital invested the Government at once requires 60% of the net earnings of the lessee. Mining men are trying to secure some relief from this situation, and are attempting to obtain a special ruling through the Internal Revenue Office to cover the case of mine leasing. The problem appears to be the making of an estimate of the amount of capital that would have been invested by the lessee if it had been necessary for him to sink a shaft to the depth of his discovery and perform the development necessary to make his orebody available for extraction. This estimated expense would constitute the lessee's capital investment, and the excess-profits tax could be adjusted upon that basis. Operators understand that there is no immediate relief, but that the tax must be paid according to the law, with the hope that an adjustment may be secured later through an appeal in Washington. As to the present freight rates, it is admitted that some of them are too high, and the question of an adjustment is pending before a sub-committee of the Freight Traffic Commission consisting of H. A. Johnson, John Vallery and Fred Wild, of Denver, and J. C. Burnett, of Topeka.

A Bonus on Gold is to be the subject for discussion at a joint meeting of the Colorado Chapter of the American Mining Congress and the Colorado Metal Mining Association to be held in the office of the latter body in the Tabor Bldg., Denver, on Aug. 8. Constant decrease of the amount of gold produced in this country has spurred the Government to take cognizance of a situation that mining men have foreseen for several months. Government officials now realize that gold mining is not a nonessential industry, and that a continued decrease in gold production might result in actual peril to Federal credit. Recently, all the large gold-producing companies of the country have received a telegram from the Bureau of Mines seeking accurate information regarding the present status of the gold-mining industry. The telegram is as follows: "The committee formed by the Secretary of the Interior to study the gold situation asks your earnest coöperation, and requests that you prepare to provide promptly a complete yearly statement for the last five years, showing detailed operating costs, number of tons treated and the recovery; also production and costs for the six months of 1918, and the estimated production for the whole year; also a detailed statement showing how costs have increased, and what, in your opinion, can be done by the Government to assist gold mining. All statements will be treated as confidential, for Government purposes only, and accuracy is absolutely necessary. All figures given must be subject to confirmation afterward. Letter and blank follow. Hennen Jennings, Chairman, Bureau of Mines." At the meeting to be held in Denver the mining men will decide what they shall expect of their delegates at the meeting to be held at Reno, Nev., Aug. 12, 13 and 14, at which all the larger mines and associations of metal producers will be represented. The Reno meeting was called by Governor Emmet D. Boyle of Nevada. It is probable that at that time the mining men will recommend that the Government place a bonus of $10 per oz. on all gold produced, and also abolish all Federal and excess-profit taxes on mining development. It is claimed that further production is hampered by such special taxes, and that to entice mining interests to undertake further development every inducement will have to be used. Mining men argue that all mine development is to some extent a gamble, and that the winners receive such a small profit that the taxes have completely discouraged all efforts to open new sources of gold production. In all districts where gold occurs in pockety deposits, requiring a relatively large amount of underground development work in proportion to the ore opened up for mining, practically no mining development is being performed. Many of the gold-producing camps of Colorado have lost from 25 to 60% of their population in the last year, through the closing of mines and the lack of profit in leasing operations under present cost of labor and mining supplies, and without a compensating change in the value of the product.

SALT LAKE CITY—Aug. 1

Cost of Production of Low-grade Ores in this state is being considered by the Utah Chapter of the American Mining Congress with a view of furnishing information to be placed before the War Industries Board. There is hope that relief will be granted in the matter in the raise of freight rates on ores. Other things affecting the mining industry will also be given consideration.

Utah Iron and Steel production at Midvale will soon reach 4000 to 5000 tons of steel bars monthly. This company is completing the installation of an additional openhearth furnace, and this is expected to begin operating about Nov. 1. The plant is being worked to capacity, largely on Government contracts, and the greater part of the product is shipped to the Pacific Coast for use in ship construction.

A Higher Wage Scale for the camp of Alta, in Little Cottonwood canyon (the advance amounting to 50c. per day), went into effect on Aug. 1, and brings the wage scale of this camp up to that in force at Bingham and Tintic, which is $4.75 for muckers and $5.25 for miners. Among the companies affected are the South Helca, Wasatch Mines, Michigan-Utah, Sells, Columbus-Rexall, and Emma Copper. A shortage of labor has been hampering the mines somewhat in their effort to bring to market the largest possible tonnage during the favorable shipping season, at present in full swing.

GOLDFIELD, NEV.—July 29

Underground Employees of the Goldfield Consolidated and other mining companies of this district struck for an increase of $1 per shift in wages on June 25. They had been receiving the same scale as before the war, and as living costs have increased at least 25%, their demands were not unreasonable. Before quitting work, the men gave the operators a reasonable period for consideration of their demand. No violence has so far occurred and none is expected. The operators argue that their present limited profits will not permit of such an increase in wages. A few of the smaller mines are again working after granting the men a bonus in addition to the old scale of wages. It is thought that Goldfield Consolidated will institute a combination of the leasing and bonus systems. About 300 men are idle, and many are leaving for other camps where higher wages are being paid.

JOPLIN, MO.—July 29

Installation of Skidoo Bells in the hoistrooms of all Oklahoma mines has been ordered by the state mine inspector. A law requiring this safeguard for the men underground has been on the statute books of the state for a number of years, but it has not been enforced. In recent months accidents have emphasized the need of enforcement, and the present order of the state inspector is the outgrowth of a feeling among the mine operators themselves and the miners. Installation of the bells will make it possible for the hoistman at any time to sound a warning to the men at the bottom of the shaft.

BUTTE, MONT.—Aug. 1

Mines of the Boulder River Chrome Co., 35 miles from Big Timber, in Sweet Grass County, on the Boulder River, and said to be the richest chrome properties in America, have been sold to Oscar Rohn, general manager of the East Butte Copper Co., for $500,000. Mr. Rohn will invest $200,000 in addition to the purchase price. It is said that the Boulder River properties are the only workable chrome deposits in the United States outside of California. Hitherto nearly all the chromium used in manufacture in this country has been imported from Rhodesia, New Caledonia and China.

DULUTH, MINN.—Aug. 1

Determining if Mining Companies shall pay the established state royalty of 25c. per ton on the lean ore or on the concentrates is the basis of a suit soon to be begun by the state and one which involves more than 25,000,000 tons of lean iron ore. To test the law the Pickands-Mather Co., operating the Majorca mine at Calumet, will begin mining a quantity of wash ore and then will offer payment of royalty based on the output of concentrates. The state auditor has refused to accept this and it has been decided that a suit will be started by the state against the mining company.

Two Hundred Striking Laborers from the Great Northern Allouez iron-ore docks were arrested July 30 on state warrants after refusing to await consideration of their grievances by the War Labor Board. Five hundred ore-dock workers struck June 27 after allowing the dock officials two hours in which to grant a raise in pay of about 10c. an hour. The docks are operated under the direction of the Railroad Administration, and it was impossible to grant the increase without Government sanction, officials said. Representatives of the Council of Defence, the railroad company and the Labor Council conferred with the strikers, asking them to return to work pending action in Washington.

An Association of Independent Operators among the Lake Superior iron-mining interests is being contemplated. Those promoting the movement draw attention to the fact that productions of independent operators are estimated to equal 25% of the entire output of Lake Superior district, yet so far they have not received adequate prices for their ores. It is claimed that the iron-ore price, for the last 14 years, compared with price of pig iron, has been a little better than 25%, whereas the present price is less than 15%. Though the recent advance of 45c. a ton is satisfactory to operators working open-pit mines, it is said to be entirely inadequate as applied to ores produced from underground mines, as it does not cover cost of production, which has increased during the last three years. As a result, some underground properties are being closed. Shipments, for example, have been discontinued from Cuyuna-Duluth mine on the Cuyuna range, because the present price of ore has made it impossible for the company to mine and sell its product in the open market.

SPOKANE, WASH.—July 28

A Gold Convention is to be held here at an early date to discuss methods of aiding production of that metal. If possible, Government representatives will be secured for counsel. Building of motor roads into inaccessible gold districts, remission of excess-profits tax and remission of the increase in freight rates on shipments containing gold ores are most favored here as means for aiding gold production. All gold districts of the Pacific northwest will be urged to send delegates.

General Labor Strike in the Slocan and Ainsworth mineral divisions of British Columbia was threatened by mining unions, but concessions by operators settled the issue. J. D. McNiven, Provincial wage officer, aided in securing a settlement. The men asked 50c. a day increase, a closed shop and eight hours a day for outside men. Operators agreed to the wage advance, but, in turn, will increase the board rate from $1 to $1.25 a day. They will grant an eight-hour day, but not the closed shop and will not collect union dues.

Continued Development of Magnesite Properties, steady shipments of copper, lead and silver, accompanied by discoveries of tungsten and chrome, all in Stevens County, have stimulated mining activities in all parts of this county, whose richness is just beginning to be realized. Attention has recently been directed to the Deer Trail section, in the southwestern part of the county, where two companies are shipping steadily and a third expects to be doing so early next month. One truck is making two trips a day from the High Grade mine, owned by the Reardon Copper Co., hauling three to three and a half tons a load. The distance to the logging road is 10 miles. The ore goes to the smeltery at Trail. Two trucks are hauling from the Deer Trail day and night, making eight trips a day, hauling about three tons to the load. The distance is about 12 miles to the logging road.

TORONTO—July 29

Increased Activity in the Boston Creek District in which there are now two producing mines, the Miller Independence and the Patricia, led the Temiskaming & Northern Ontario Ry. to establish a station service. The station buildings will be situated at Mileage, 153 miles from North Bay.

To Stimulate the Production of Platinum the Hon. Martin Burrell, Canadian Minister of Mines, has arranged for the purchase of platinum at the Dominion assay office, Vancouver, B. C. This will be a great convenience to miners, especially to small producers who have hitherto had to seek a market in the United States.

SUDBURY, ONT.—July 28

Prospecting for Platinum has been stimulated in the Ontario districts by the price of $105 an ounce and the reports of various platinum discoveries made from time to time, but which have been little exploited or investigated heretofore. The Vermilion gold mine, near Worthington, in the Sudbury district, at one time yielded considerable platinum in the ore. It was here that the then new mineral "sperryite," an arsenide of platinum, was discovered nearly 20 years ago. Platinum has been found south of Porcupine in a serpentine belt, and further search is being made of the serpentine area which extends north from Mattagomi Lake to the Frederick House river crossing of the Grand Trunk Railroad. Platinum is also reported as occurring in pyrrhotite near the Moose Mountain iron mine north of Sudbury.

The Mining News

ALASKA

ALASKA SHIPMENTS of domestic copper ore, matte, etc., to the United States during June were 11,[illegible] gross tons, having a copper content of 3,980,197 lb. and valued at $[illegible].

ARIZONA

Cochise County

HIGGINS (Bisbee)—Daily shipments of high-grade copper ore being made by lessees.

MARKS-MEYER (Bisbee)—Cut vein of copper glance and carbonate at 46 ft. in incline shaft.

Gila County

RAY HERCULES (Globe)—New mill installed has capacity of 1200 to 1800 tons per day.

FORTUNA (Miami)—Orebody cut by diamond drill carries silver, gray copper and lead. Tunnel in over 900 feet.

Greenlee County

ARIZONA COPPER (Clifton)—Copper produced in June was 3,700,000 pounds.

ASH PEAK EXTENSION (Duncan)—To sink to 300 level and crosscut vein. Ore carries gold-silver in quartz. Test car has been shipped preparatory to arranging for mill. John Horrigan is superintendent.

HARDY (Duncan)—Installed two Joplin-type jigs; shipping two cars manganese per month. Joe Hardy is owner.

PHILLIPS SPAR (Duncan)—Work to be started at once and shipments of fluorspar made to San Francisco and Chicago. James P. Porteus is consulting engineer.

Maricopa County

DRAGON (Wickenburg)—Mining equipment being installed.

Mohave County

WASHINGTON-ARIZONA (Kingman)—Shaft has been sunk. Vein to be followed to a depth of 500 feet.

MOSSBACK (Oatman)—Shaft has been retimbered.

Pima County

GUNSIGHT (Ajo)—Lead and silver ore truck at 160 feet.

NEW CORNELIA (Ajo)—New shaft has eached 250 ft. and station is being cut. New flotation plant has been started.

SWANSEA (Phoenix)—To add 200-ton otation plant.

BULLION BAR (Tucson)—To be quipped with a small stamp mill.

Pinal County

PIONEER (Kelvin)—Additional mining quipment to be installed and development work continued through the old shaft.

TERRELL (Kelvin)—Important strike of gold ore made recently at 125 ft. Plans being made to install hoisting plant and make shipments.

TROY-ARIZONA (Kelvin) — Resumed perations Aug. 1. To work Alice tunnel nd Buckeye shaft where sulphide ores were encountered many years ago. Work o be resumed in the Climax shaft upon rrival of new pumping equipment.

RAY SILVER-LEAD (Ray)—Control acuired by C. E. Addams. Working force ncreased and development of new orebodies being pushed. To double shipments oon.

SOUTH RAY (Ray)—Shipping carborate ores to Hayden.

SILVER KING (Superior)—Regular hipments made to El Paso smeltery. Marcy mill being installed preparatory to reating large tonnage of low-grade ores on the dump.

Santa Cruz County

WORLD'S FAIR (Patagonia)—Equipment for 100-ton concentrating plant has been ordered.

Yavapai County

GADSDEN (Jerome)—Main shaft down nearly to 1200 level, where station will be cut.

GREEN MONSTER (Jerome)—Has abandoned work in Gorge tunnel. To sink Dorohy May shaft from 765 ft. to 1000 level and develop.

JEROME VERDE (Jerome)—Crosscutting from northeast drift of Columbia 1050 level to cut iron body shown by drilling.

ARKANSAS

Boone County

HARRISON (Harrison)—Rebuilding 75-ton mill recently burnt down and plans to purchase entire new machinery, excepting crushers. George Constant is superintendent.

GLORIA (Zinc)—Mill improvements to be made. Company has acquired new leases near mill and will build tram. George Miller is in charge.

WYERCOZIM (Zinc)—Has purchased lease on the Royal and other zinc mines from Boo-Gra-Loo Mining Co., and started operations.

Independence County

CLAUSE (Cushman)—Purchased by C. G. Shuman and M. L. Richards, of Chicago, and A. B. O. Dutcher, of Wichita, Kas., who will start erection of a washer immediately.

CALIFORNIA

Calaveras County

DAVENPORT MINES (Angels Camp)—Company organized to operate placer mines.

Eldorado County

TWIN VEINS (Oakland)—To develop six mining claims near Omo.

Humboldt County

CHROME SHIPMENTS from Eureka in the first half of July amounted to six carloads; five were brought down from Del Norte County by water; one carload was brought in from the Pecwan Creek mines in the northern border of Humboldt County. The first carload mined at Horse Mountain has been hauled by motor truck to Korbel for rail shipment from Essex.

MANGANESE SHIPMENTS by rail from points nearest to the mines have been in progress for several weeks. Two carloads were shipped in the first half of July from Fort Baker mines via Carlotta on the Northwestern Pacific. Regular shipments being made from mines in Fort Seward region, the Doak mines being the principal producers.

Napa County

CORONA QUICKSILVER (Napa) — Negotiations for sale of property being considered by directors. If deal is made, new development to be by tunnel driven for drainage and the possibility of opening up new orebodies.

Nevada County

ALLISON RANCH (Grass Valley) — Shaft unwatered to No. 9 level and unwatering proceeding in drifts. Development to follow.

EMPIRE (Grass Valley)—Construction of electric railway from Empire mill to Pennsylvania mine nearing completion.

Placer County

LIBERTY HILL (Dutch Flat)—Building large restraining dam in preparation for hydraulicking.

WISCONSIN (Dutch Flat) — Recent equipment of small stamp mill earning profit.

Plumas County

MANGANESE SHIPMENTS from Crescent Mills region started by Noble Electric Steel Co. to smeltery at Heroult, Shasta County.

MANGANESE DEPOSIT on Mount Hough being developed by Smith brothers, of Nevada City. Shipments have started.

JUNEDAY (Crescent Mills)—Recently equipped with electric power, compressor and machine drills.

San Bernardino County

ATOLIA. (Atolia) — Company expects to show large production this year. Other tungsten mines and prospects in the Atolia and Randsburg district are active. More than 20% of the tungsten produced in this country comes from these two districts.

San Luis Obispo County

MANGANESE DEPOSITS have been discovered near Atascadero, in serpentine formation near belt of jasper traversing the district.

CHROME CLAIMS on Thompson Reid ranch leased by Charles Seeley. Development to be undertaken soon.

COLORADO

Boulder County

GOLDEN AGE (Springdale)—Ore being delivered to mill by 3½-ton Bethlehem truck doing the work of three teams, and operating satisfactorily over steep mountain grades.

EVANS (Summerville)—High-grade silver ore opened up by Nicholls brothers.

VICTORIA (Summerville)—Silver ore opened up by development work under direction of F. M. Pickard.

Clear Creek County

COLORADO CENTRAL (Georgetown)—Begun operation of concentration plant and will ship to smelteries.

TERRIBLE (Georgetown)—Making regular shipments of lead ore carrying silver.

Teller County

INDEX (Cripple Creek)—Lessees shipping ore from 700 and 900 level. Shaft to be sunk to 1100 level and station cut.

IDAHO

Boise County

NATIONAL (Placerville)—Repairs to mill completed. To mine ore on 800 level and sink winze from 1500 level.

Shoshone County

CONSOLIDATED INTERSTATE-CALAHAN (Wallace)—Resumed operation of mill Aug. 1.

SENATOR (Wallace)—Hard ground delaying drift being driven for vein.

EAST CALEDONIA (Wardner)—Has suspended operations until more favorable conditions obtain.

KANSAS

Joplin District

CHILTO LEAD (Baxter Springs)—To build 250-ton mill; needs sludge tables, compressors, belts and crushers.

GRAHAM-VAN DYKE (Baxter)—Sinking two shafts on Cooper land. Plan building mill.

QUAKER VALLEY (Baxter)—Operating new mill six miles northeast of Baxter. Adam Scott, of Joplin, is superintendent.

CRESCENT (Miami)—Pushing work on Blue Rock 250-ton mill, on lease southwest of Waco, Mo. Plant to be ready in 60 days. L. E. Smith, of Kansas City, is president.

EARLY BIRD (Miami)—New mill now in regular operation.

SOUTHERN (Miami)—Operating mill one shift. Mining at 222 ft. and still above best ore deposits.

ELOOSA LEAD AND ZINC (Treece)—To build 300-ton mill and requires tables, engine, boiler compressors and ore cars.

LAWYERS (Treece)—To build 250-ton mill and expected to purchase sludge and slime tables, crushers, boilers, drills, ore cars and track. George O. Pearson is superintendent.

MIAMI-TEXAS (Treece)—To remodel 250-ton mill and expect to purchase tables, compressors, conveyors, ore cars and track.

MICHIGAN

Copper District

BEAR LAKE—(Calumet)—New machinery ready soon.

FRANKLIN (Demmon)—Starting drift on 1900 level of No. 2 shaft.

HANCOCK (Hancock)—Two new lodes opened carrying good average copper.

AHMEEK (Kearsarge)—Fire at shafts No. 3 and No. 4 continues to burn. Shafts have been sealed, and men are employed at other shafts.

WINONA (Winona)—Drift on 1500 level is 200 ft. from No. 4 shaft. To raise to 1400 level.

MINNESOTA

Mesabi Range

STATE MINE SHIPMENTS made a record during week ended July 21, when 204,411 tons was shipped. Missabe Mountain shipped 36,912 tons and Leonidas, 21,000 tons.

DEAN (Chisholm)—Todd-Stambaugh interests have leased two forties south of Hartley mine and are sinking shaft. Charles H. Claypool is superintendent.

SNYDER (Nashwauk)—Check drilling being done by Todd-Stambaugh interests.

MISSOURI

Joplin District

GRANBY CONSOLIDATED (Granby)—Building two mills at an estimated cost of $130,000. Need but have not purchased tables, motors, compressors, tracks, boilers and engines.

BADGER (Joplin) — Building 250-ton mill; to purchase sludge and slime tables, engine, boilers, crushers and ore cars. A. Foster is manager.

BUTTE-KANSAS (Joplin)—Both shafts being sunk to deeper level at new property. Steady operation maintained at Acme mine.

CREEK (Joplin)—Shaft in ore on Culbert lease at Four Corners. L. W. Vidler is manager.

A. F. HOLT (Oronogo)—Building 200-ton mill to replace one destroyed by fire. In the market for sludge and slime tables, compressors, drills and crushers.

MT. NEBO (Seneca)—Building 200-ton mill; to purchase sludge and slime tables, crushers, conveyors, air compressors, boilers and engines.

CENTRAL ZINC (Waco)—Remodeling 400-ton mill and expects to purchase tables, compressors, boilers, crushers, cars and track. Frank Danglade is superintendent.

CRESCENT (Waco)—Building 250-ton mill and will purchase gas engine, crushers, rolls, tables and jigs. Glen Smith is superintendent.

MIAMI-WACO (Waco)—To build 250-ton mill; requires crushers, compressors, drills and sludge and slime tables. W. P. Cunningham is superintendent.

MONTANA

Lewis and Clark County

CRUSE CONSOLIDATED (Helena)—Sinking below 300-level at Helena mine.

MONTANA MANGANESE-SILVER (Helena)—Operating Far West group of claims in Skelly district. Shipping ore to East Helena smeltery.

NEVADA

Clark County

SULTANA (Goodsprings) — To be reopened; hoisting equipment and air compressor being overhauled. Mine owned and operated by Henry Robbins.

Elko County

GOVERNMENT OIL-SHALE TESTING PLANT to be built soon at Elko. Stated appropriation of $60,000 made for this purpose. May build plant on oil-shale land near Catlin interests.

Humboldt County

ROCHESTER COMBINED (Rochester)—Drifting both ways on vein and stoping in Magazine tunnel. New ventilating equipment installed in main tunnel, and raising being done. Ore bins at mill to be filled before motors are received and installed. Electric locomotive to be installed in main tunnel for ore haulage.

Lyon County

BLUESTONE MINING AND SMELTING (Yerington)—Fire recently destroyed assay office. Loss of building slight, but equipment and supplies of considerable value. Several cottages for employees to be built, and other improvements made.

NORTHERN LIGHT (Yerington)—Development under way. Small shipments of copper ore made.

Mineral County

LUCKY BOY (Hawthorne)—To be reopened soon, and if sufficient milling grade ore is developed, a flotation unit will be installed.

SILVER DYKE (Mina)—To build 30-ton mill to concentrate high-grade scheelite ore.

Nye County

BIG PINE (Manhattan)—Resumed milling of oversize ore dump after delay of few days.

JEFFERSON CANYON (Manhattan)—Operating old Kanhorat property under management of S. H. Brady. Mill being overhauled and changes made to increase capacity.

MANHATTAN CONSOLIDATED (Manhattan)—Raise on east orebody from fifth level to be extended from point where ore was first exposed in south crosscut.

UNION AMALGAMATED (Manhattan)—Station on bottom level completed.

WHITE CAPS (Manhattan)—Raise from fourth level is expected to connect with shaft orebody.

TONOPAH DISTRICT ore production for the week ended July 20 totalled 10,237 tons, of an estimated gross milling return of $174,029. Producers were: Tonopah Belmont, 2101 tons; Tonopah Mining, 3600; Tonopah Extension, 2389; Jim Butler, 353; West End, 1143; Halifax, 58; Montana, 238; MacNamara, 315 and Cash Boy, 40 tons.

"SLIME FARMERS" in Tonopah district have suffered heavy loss on account of recent rains. Work of these men consists in carefully leveling off tailings dumps of milling plants, and loosening surface lightly with disk harrows. Capillary attraction causes contained cyanide solution to come to surface, where it is evaporated by sun. Thin layer is periodically swept off top of dumps or ponds, which has been greatly concentrated. Stated that $15,000 to $20,000 is collected every season in Tonopah district by this method. Recent heavy rains have spoiled two or three months' work, and operation must be repeated.

JIM BUTLER TONOPAH (Tonopah)—Receipts for ore shipped during six months ended June 30 were $294,353.70; operating expenses, $131,708.61 and net earnings, $162,645.09. Total net income amounted to $169,527.69.

TONOPAH EXTENSION (Tonopah)—Receipts from mine and mill operation during June were $152,257.54; current expenses, $85,116.91; leaving an operating profit of $67,140.63.

Storey County

UNWATERING OPERATIONS at North End mines progressing steadily. New high-tension power line installed, giving more dependable power service. Unwatering Andes shaft under way and extensive development planned. New pumps to be installed in Combination shaft and unwatering pushed.

CONSOLIDATED VIRGINIA (Virginia City)—Developing on 2100 level. Considerable tonnage produced from 2000 and 2100 levels.

MEXICAN (Virginia City)—High-grade quartz opened on 2300-ft. level by winze. Drifting to be done soon. Deeper development work planned.

SIERRA NEVADA (Virginia City)—Raise from [illegible] level continues to open ore.

UNION CONSOLIDATED (Virginia City)—Long drift on [illegible] ft. level opening good-grade ore; drift to be continued to Union vein. Good ore being produced on 2200, 2300 and [illegible] levels.

Washoe County

EXPERIMENTAL OIL-SHALE PLANT at University of Nevada, Reno, operating successfully. Shut down temporarily to make minor changes. Alexander M. Boyle is engineer in charge.

NEW MEXICO

Grant County

EIGHTY-FIVE (Lordsburg)—A 300-ton concentrator has been designed and completed by J. W. Crowdus, of El Paso.

LAST CHANCE (Lordsburg)—To begin installing machinery Aug. 1st.

LORDSBURG GOLD AND COPPER (Lordsburg)—To sink 300-ft. shaft and will require power and hoisting equipment. E. L. Armstrong is superintendent.

McGEE BROS. (Steins)—Sinking shaft. Plan to purchase 600-ft. belt-driven compressor.

WATERLOO (Tres Hermanos)—Main shaft down 100 ft. To sink additional 100 ft. and drift 300 ft. Vein is 10 ft. wide and carries lead and silver. Concentrator to be built.

OKLAHOMA

Joplin District

BIG JIM (Commerce)—To build 200-ton mill. Construction to start Aug. 15. Will need tables, engine, crushers, compressors, jigs and conveyors. G. W. Nesmith is superintendent.

LONE STAR (Hockerville)—To build 300-ton mill. Construction to start Aug. 10 and will purchase crushers, belts, drills and compressor. B. F. Madden is superintendent.

DEVELOPMENT (Lawton)—Remodeling 250-ton mill and increasing capacity to 500 tons. Will require tables, compressors, crushers and ore cars. E. E. Jayne is manager.

HIDDEN TREASURE (Picher)—New shaft ore at 265 feet.

VANTAGE (Picher)—Operating after shut-down due to lack of water.

LEAD CAVE (Quapaw)—Remodeling 200-ton mill and expect to purchase tables, belts, cables and ore cars.

McCURDY (Quapaw)—To operate mill soon.

RED ROSE (Quapaw)—Started new concentrating plant on a lease northeast of Quapaw.

MAXINE (Tar River)—Constructing 400-ton mill; to purchase crushers, compressors, belts and tables. W. C. Miller is superintendent.

OREGON

Baker County

AZURITE (Homestead) — Considerable zinc-lead-silver-copper ore blocked out. Difficulty of effective separation has retarded development. Property under bond to Bills Mining Co. controlled by Aleck Bills, Harry Gilchrist and E. W. Bain. Milling equipment, including rockbreaker and 5-compartment Joplin jig, being installed. Operators plan to make marketable zinc product and to store tailings for future treatment. More equipment to be added if present installation proves satisfactory.

BLUEBELL (Homestead)—Old tunnels being cleaned out, and contract has been let to Diamond Drill Contracting Co., of Spokane, for extensive drilling.

IRON DYKE (Homestead)—Shipping copper concentrates regularly and operating 125-ton flotation plant. Electric storm on July 11 burned out two motors. Present output below normal, on account of labor shortage.

RAND-McCARTY (Homestead) — Oxidized ore has been found in the upper workings, and tunnel being driven to cut lode below water level.

RIVER QUEEN (Homestead)—Operated by F. Alers under lease from Haas brothers. Seven cars of good copper ore have been shipped.

UTAH

Beaver County

MAJESTIC (Milford)—Shaft at Old Hickory to be sunk to 500 ft. before prospecting is started.

Juab County

TINTIC SHIPMENTS for week ended July 20 amounted to 172 cars.

MAY DAY (Eureka)—Company operating on 700 level, and lessees in several other places.

UNCLE SAM (Eureka)—To be worked by lessees.

ZUMA (Eureka) — Improvements to equipment made and sinking of winze from 500 level resumed.

IRON BLOSSOM (Silver City)—Accident to shaft during week ended July 20 retarded shipments, but mining was carried on as usual and ore stocked underground.

Piute County

ATLAS PRODUCT (Marysvale)—Company recently organized to exploit alunite-bearing claims six miles from Marysvale.

San Juan County

BIG INDIAN COPPER (Lasal)—New 200-ton mill to treat copper ore being warmed up.

NEW FIND OF URANIUM ORE reported at Wray Mesa southwest of the Paradox section, and not far from San Juan.

Tooele County

DEVELOPMENT OF DEEP CREEK DISTRICT through operation of new railroad justifies improvements to town of Goodwin, formerly Gold Hill, terminus of the railroad, and through coöperation of various companies interested town water-system is to be installed and first-aid hospital established.

WESTERN UTAH EXTENSION (Goodwin)—Ore carrying copper-silver and gold opened on 200 level, and extension of find being sought on 300 level. Manganese ore being developed at Helmet mine.

BELCHER (Tooele)—To install Forrester grinder and 50-ton Dykes concentrating plant.

WASHINGTON

Thurston County

SPOKANE TIN AND TUNGSTEN (Olympia)—Incorporated by F. C. Bailey, F. A. Ross, J. M. Fitzpatrick, E. E. McClintock, A. K. Booth, of Spokane, and O. T. Lathrop, of Lethbridge, Alberta. To develop a property near Kiesling.

CANADA

Ontario

NEWRAY (Porcupine)—Arrangements completed with the Northern Ontario Light and Power Co. for construction of transmission line to supply power to mine.

NORTH DAVIDSON (Porcupine)—Fifth drill hole being started. Two previous holes show good gold content.

PLENAURUM (Porcupine)—To diamond drill from 1000 level.

PORCUPINE CROWN (Porcupine) — Supplies being sold and mine to be closed.

WEST DOME (Porcupine)—To close down.

CHAMBERS-FERLAND (Cobalt)—No. 2 shaft being dewatered for resumption of operations.

McKINLEY-DARRAGH (Cobalt) — To reopen Savage property an account of high price of silver.

PENN-CANADIAN (Cobalt)—Has option on Indian-Peninsula molybdenum mine. To install 30-ton mill.

PETERSON LAKE (Cobalt)—Mill closed temporarily. Changes to increase its capacity in progress.

SAVAGE (Cobalt)—Three machines employed to secure milling rock.

THREE STAR (Cobalt)—Work resumed on property (formerly Calumet & Montana). Vein carrying low silver content to be developed.

BURNSIDE (Kirkland Lake) — Shaft down 252 ft. to be sunk 400 feet.

KIRKLAND LAKE GOLD (Kirkland Lake)—Mill expected to be in operation by fall. Practically all machinery is on the ground.

OTISSE (Matachewan)—Exploration being pushed by Ontario-Colorado Development Co. To install another diamond drill and explore at depth.

MILLER INDEPENDENCE (Boston Creek)—Rich ore found in shaft on vein at 100 feet.

BOURKES (Bourkes Station)—Shaft down 35 ft. to be continued to 100 level.

EBY SYNDICATE (Lawson Township)—Deposit of barite discovered.

WHITE RESERVE (Maple Mountain)—Crosscutting at 140 level was opened up. Veins carrying cobalt, niccolite and traces of native silver.

FIDELITY (Skead Township)—Shaft sunk 20 ft. on gold-silver vein.

Quebec

INDIAN PENINSULA (Amos)—Penn-Canadian Mining Co., of Cobalt, has obtained controlling interest. Preparing to install first unit of 100-ton mill to treat molybdenum ore with Groch flotation system. Balmer Neilly is manager.

MEXICO

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper production during June was 1,322,720 lb. Copper ore averaged 3.24% copper

The Market Report

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
1	4.7530	99⅝	$48\frac{13}{16}$	5		99⅝	
2	4.7530	99⅝	$48\frac{13}{16}$	6	4.7530	99⅝	$48\frac{13}{16}$
3	4.7530	99⅝	$48\frac{13}{16}$	7	4.7530	99⅝	$48\frac{13}{16}$

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Aug.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
1	*26	†	8.05	7.75	7.90 @7.95
2	*26	†	8 05	7.75	7.92½ @7.97½
3	*26	†	8.05	7.75	7.95 @8.05
5	*26	†	8.05	7.75	8 05 @8.10
6	*26	†	8.05	7.75	8.07½ @8 12½
7	*26	†	8.05	7.75	8.07½ @8.12½

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
Aug.	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
1	122	122	137	394½	394½	29½	28½	54
2	122	122	137	399	399	29½	28½	54
3								
5								
6	122	122	137	399	399	29½	28½	54
7	122	122	137	399	399	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at \$4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK, Aug. 7, 1918

The metal markets have gradually worked into such a state of chaos and despair, resulting from the meddling of the War Industries Board, that there is a feeling that things cannot be any worse. Zinc and antimony have been immune, for the high prices prevailing for them before our entry into the war produced an ample supply, but of copper, lead and tin there is not enough, and with such a situation the official mind is to discourage production, without any thought of the benefit there might be in trying stimulation.

Copper—Both this week and last week were rather eventful, owing to conferences between the producers and officials of the War Industries Board. Last week there were conferences on the subject of adjusting contracts and pending business that were disturbed by the sudden and unexpected raising of the price to 26c. on July 2. It is no longer any secret that some departments of the Government tried to saddle such contracts upon the producers that the advanced price would not have helped the latter, any way not until after Aug. 15; while to some concerns very serious harm would have resulted. This question had been adjusted, but not very satisfactorily to the producers. Manufacturers, i.e., wire drawers, sheet rollers, etc., who entered into contracts following the original prolongation of the 23½c. price to Aug. 15, have their own grievance. This has not yet been adjusted at all. The whole business is a deplorable muddle, and conversations about it have not been wholly amicable.

On Aug. 6 the "high-cost producers" met the War Industries Board, to plead for special recognition, and received the answer that there would be no discrimination as to price among producers. This decision was, of course, wise. There could scarcely be anything more productive of further chaos than the making of two prices for the same commodity.

On Aug. 7 all of the producers met with the price-fixing committee to consider the agreement subsequent to Aug. 15. The result of this conference was that the 26c. price is to be continued until Nov. 1. This has not yet been approved by the President, and there will be no official announcement until after the approval of the President.

Copper Sheets are not quoted, as there is a wide diversity in prices of different dealers. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—There is nothing worth mentioning done in this market. Singapore quoted £390½, c.i.f., London, for Straits tin on Aug. 1; £394½ on Aug. 2; £406, on Aug. 6; and £404, on Aug. 7.

Mr. Armsby, head of the Tin Division of the War Industries Board; John Hughes, representing the American Iron and Steel Institute, and one other have gone to London as a tin commission, evidently for the purpose of talking over the tin situation. Consumers here think that the price of tin is going to be regulated downward, and therefore are minded to defer their buying There is something humorous in the idea of fixing a price at a reduced level in a market which is in despair owing to short supply of the commodity.

Lead—The situation is unchanged. Supplies continue scarce, with no immediate prospect of becoming easier. Japan inquired for further tonnages of lead, but its inquiries are useless.

Zinc—The market was weaker in the early part of the week on offerings by some of the smaller Western producers, but when it was ascertained that the Government was going to invite tenders for 3000 tons of Prime Western spelter, for delivery between now and the end of the year, the market stiffened. However, it was a dull and uninteresting affair throughout the week. An inquiry for export, presumably to Japan, was an interesting feature. During recent weeks Japan has bought some small tonnages, both of refined spelter and common.

Zinc Sheets—Unchanged at \$15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Sheets are 42c. per lb. for 18 gage and heavier. Price established June 1 and continues to Sept. 1.

Antimony—Spot was quoted at 13@13¼c. The market is steady but not much business was done. We quote futures at 12c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted \$1.50@1.75 per pound.

Nickel—Market quotation is 40@45c. per pound.

Quicksilver—Steady at \$125. San Francisco reports, by telegraph, \$117.50, firm.

Silver and Platinum

Silver—Quotations remain unchanged but owing to the rise in China exchange rates it is profitable to export silver to China and pay over the government price of \$1 per oz. Considerable business is being done for China account at prices over \$1 per oz., with the result that neither the U. S. nor the British government is able to buy silver for its war needs.

Mexican dollars at New York: Aug. 1, 77; Aug. 2, 77; Aug. 3, 77; Aug. 5, 77; Aug. 6, 77; Aug. 7, 77.

Platinum, Palladium and Iridium—Prices fixed at \$105, \$135 and 175, respectively. There may be clandestine business at higher prices.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 3—Blende, per ton, high, \$77.50; basis 60% zinc, premium, \$75; Class B, \$65@60; Prime Western, \$47.50@42.50; calamine, basis 40% zinc, \$37.50@30. Average selling prices: blende, \$57.83; calamine, \$36.08; all ores, \$56.40.

Lead, high, \$103.20; basis 80% lead, \$100; average selling price, all grades of lead, \$98.80 per ton.

Shipments the week: Blende, 9466; calamine, 661, lead, 1693 tons. Value, all ores the week, \$738,530.

The large purchases of Class B grades of ore advanced the average price in the face of a declining market. The lower prices of last and this week will figure more largely in next week's settlement prices.

Producers who have been holding lead expecting it to go higher, seem to have received a tip to the contrary, and some are letting it go on the \$100 basis. The car situation was easier this week, and buyers were able to ship more of their ore.

Platteville, Wis., Aug. 3.—Blende, basis 60% zinc, highest price reported paid for premium grade was \$75 to \$80 per ton; high lead blende, base \$52 per ton; lead ore, basis 80% lead, \$93 per ton base.

Shipments reported for the week were 1849 tons blende, 120 tons galena, and 546 tons sulphur ore. For the year to date the totals are 77,157 tons blende, 4360 tons galena, and 30,350 tons sulphur ore. During the week 2911 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Charles Hardy reports that business was done at \$1.70 per unit for 50% ore in large quantities.

Manganese Ore—Unchanged.

Molybdenum Ore—Quoted nominally at \$1 per lb. of molybdenum sulphide in ore containing 90% or over.

Tungsten—The market continues active, \$24 being paid for high-grade ore free from all impurities; \$20 to \$23.50 for ores containing small amounts of impurity. The scarcity of high-grade ores indicates the continuence of or even an advance upon present prices.

Other Minerals

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight. Tonnage is extremely difficult to obtain. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines, f.o.b. mines.

Iron Trade Review

PITTSBURGH—Aug. 6

The extremely hot weather of the last few days has operated to curtail iron and steel production somewhat, but not as much as in previous seasons. Superintendents, foremen and men are striving to maintain production. Records of July outputs that are available show decreases in some cases and increases in others, as compared with June, and it is certain there has been little total decrease, if any. With the passing of hot weather still larger outputs are in prospect. However, the war requirements are increasing so that the possibility of adding to capacity is being hurriedly but thoroughly canvassed, and it is probable that formal announcement will be made in the near future that capacity is to be increased. The program would involve more additions to blast furnace than to openhearth capacity. Supplies of pig iron now are approximately adequate to the steel-mill requirements, but the heavy demands from abroad can hardly be met in addition.

The War Industries Board adheres to its estimate of 20,000,000 net tons of steel required for the present half year, and has now placed an estimate that at least 20,000,000 tons will be required for the first half of next year. Shipbuilding is to take more than expected, and the shell program is being enlarged, calling for 500,000 net tons or more per month for the remainder of this year.

Some of the mills are able to do fairly well by the jobbers this month, shipping them, according to the recent permission of the War Industries Board, an amount of steel equal to the average shipments in the first half of this year. Other mills, and they constitute the majority, find they cannot supply the material having orders with a priority higher than B-4, which will absorb their output. It is believed that in the majority of cases the jobbers have fair-sized stocks.

Pig Iron—Nothing definite has been given out as to plans being considered for aiding the high-cost merchant furnaces in Tennessee and Virginia, whose costs are much closer the set selling prices than is the case with furnaces in other districts. On an average, merchant furnace profits are entirely satisfactory. In the last two or three weeks there has been some selling by a few interests for the first half of 1919, but only to regular customers, engaged in recognized essential work. Even this business is not altogether approved at Washington. Orders for early deliveries are rarely placed except through the medium of allocations first secured, the prospective consumer placing his case before the pig-iron representative of the War Industries Board, upon whose approval the civilian committee makes an allocation upon the furnace best fitted to furnish the iron. There is no particular shortage of iron for domestic consumption, though somewhat larger supplies could be used at a few points, but there is a serious shortage when the requirements of Britain, France and Italy are considered, and some recent calls from such quarters have scarcely been met, even with the greatest effort so to do. The market remains quotable at the set limits: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight from the Valleys to Pittsburgh being $1.40 and from half a dozen detached furnaces somewhat less. W. P. Snyder & Co. announce the average prices obtaining in sales during July at the set limits $35.20 for bessemer and $32 for basic. Foundry iron during the month also ruled at the set price.

Steel—Several of the steel mills would buy ingots or billets if they could be obtained, but all surplus steel is already marketed. There is scarcely any shell-discard steel to be had, the War Industries Board having found outlets for nearly all that is produced in the filling of direct war orders. The market for soft remains quotable at the set limits: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; wire rods, $57.

Ferroalloys

Ferromanganese—Demand is rather light for both ferromanganese and spiegeleisen and consumers appear to have fair stocks. With the conservation that is in vogue it is now thought necessary requirements will be met indefinitely. Ferromanganese is quoted at $250, delivered, for 70%, with $4 a unit for additional manganese, and spiegeleisen at $75, furnace, for 16 to 18 per cent.

Coke—Output of coke in the Connellsville region continues at a trifle above 350,000 tons per month. Byproduct coke production continues to increase almost weekly. One-half of the new Lorain plant, which totals 208 ovens, is in operation, and the remaining ovens may be completed in about 30 days. At the Clairton plant the first battery, 128 ovens, is in full operation, and the three Clairton furnaces, 450 tons' daily capacity each, are operating exclusively on this coke. The second battery will be completed in about a month.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug	66.083	85.407		31.498	43.418	
Sept	68.515	100.740		32.584	50.920	
Oct	67.855	87.332		32.361	44.324	
Nov	71.604	85.891		34.192	43.584	
Dec	75.765	85.960		36.410	43.052	
Year	65.661	81.417		31.315	40.851	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380		122.391		137.000	
Sept.	25.073		117.500		135.250	
Oct.	23.500		110.000		125.000	
Nov.	23.500		110.000		125.000	
Dec.	23.500		110.000		125.000	
Year	27.180		124.892		138.401	

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681		243.978	
September	61.542		244.038	
October	61.851		247.467	
November	74.740		274.943	
December	87.120		298.556	
Av. year	61.802		237.563	

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594		10.518		30.500	
September	8.680		8.611		30.500	
October	6.710		6.650		30.500	
November	6.249		6.187		30.500	
December	6.375		6.312		30.500	
Year	8.787		8.721		30.500	

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.373	8.473	8.338	54.000	54.000
August	8.360		8.190		54.000	
September	8.136		7.966		54.000	
October	7.983		7.813		54.000	
November	7.847		7.672		54.000	
December	7.685		7.510		54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.11	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	51.17		50.37		53.95	
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Aug. 6
Alaska Gold M.	3½
Alaska Juneau	2⅛
Am.Sm.& Ref.,com.	78¼
Am. Sm. & Ref., pf.	106¼
Am. Sm. Sec., pf., A	89
Am. Zinc	18½
Am. Zinc, pf.	49½
Anaconda	66½
Batopilas Min	1⅛
Bethlehem Steel	84
Bethlehem Steel, pf.	‡88¼
Butte & Superior	27½
Butte Cop. & Zinc	11
Cerro de Pasco	34
Chile Cop.	16½
Chino	39⅝
Colo.Fuel & Iron	46¼
Crucible Steel	66½
Crucible Steel, pf.	91⅛
Dome Mines	8½
Federal M. & S.	10⅛
Federal M. & S., pf.	33
Great Nor., ore ctf.	31¼
Greene Cananea	45
Gulf States Steel	81½
Homestake	71
Inspiration Con.	52¼
InternationalNickel	30⅛
Kennecott	34
Lackawanna Steel	83
Mexican Petrol	101¼
Miami Copper	28
Nat'l Lead, com.	58½
National Lead, pf.	102½
Nev. Consol.	20
Ontario Min	9¾
Ray Con	23¾
RepublicI.&S.,com.	91⅞
Republic I. & S., pf.	100
Sloss-Sheffield	61
Tennessee C. & C.	19⅛
U. S. Steel, com.	109¼
U. S. Steel, pf.	110⅝
Utah Copper	81½
Va. Iron C. & C.	72

BOSTON CURB*	Aug. 6
Alaska Mines Corp.	.12
Boston Ely	.70
Boston & Mont.	.51
Butte & Lon'n Dev.	.13
Calaveras	.50
Calumet-Corbin	‡.01
Chief Con.	2⅝
Cortez	.07
Crown Reserve	.18
Crystal Cop.	.32
Eagle & Blue Bell	2¼
Gila Copper	‡17
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	18½
Mexican Metals	.43
Mines of America	1⅛
Mojave Tungsten	.10
Nat. Zinc & Lead	.15
Nevada-Douglas	.52
New Baltic	.84
New Cornelia	18½
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.07
Yukon Gold	1

SAN FRAN.*	Aug. 6
Alta	.03
Andes	.05
Best & Belcher	.03
Caledonia	‡.03
Challenge Con.	.03
Confidence	.04
Con. Virginia	.22
Gould & Curry	.01
Hale & Norcross	‡.01
Jacket-Cr. Pt.	.07
Mexican	.17
Occidental	‡.51
Ophir	.06
Overman	.02
Savage	.03
Sierra Nevada	.03
Union Con.	.41
Utah Con	.01
Belmont	2.75
Jim Butler	.58
MacNamara	.31
Midway	.04
Mont.-Tonopah	.09
North Star	.08
Rescue Eula	.09
West End Con.	1.05
Atlanta	.03
Booth	.04
Comb. Frac.	‡.02
Florence	.10
Jumbo Extension	.08
Kewanas	.03
Nevada Hills	.01
Nevada Packard	.27
Round Mountain	.18
Silver Pick	.04
White Caps	‡.30
Big Jim	‡.75
United Eastern	3.50

COLO. SPRINGS*	Aug. 6
Cresson Con.	4.75
Doctor Jack Pot	.04½
Elkton Con.	.04¾
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.65
Granite	.19
Isabella	.04½
Mary McKinney	.08
Portland	‡.80
United Gold M.	.14
Vindicator	.43

BOSTON EXCH.*	Aug. 6
Adventure	.60
Ahmeek	76½
Algomah	‡.15
Allouez	50
Ariz. Com., ctfs.	15
Arnold	.20
Bingham Mines	9⅝
Bonanza	.15
Butte-Balaklava	.25
Calumet & Ariz.	67
Calumet & Hecla	458
Centennial	12½
Copper Range	48
Daly West	2⅜
Davis-Daly	5⅞
East Butte	10¼
Franklin	4⅜
Granby	79¼
Hancock	6
Hedley	‡12
Helvetia	.15
Indiana	‡.40
Isle Royale	26
Keweenaw	1
Lake	5¼
La Salle	2¾
Mason Valley	3½
Mass	5
Mayflower	2¾
Michigan	2½
Mohawk	56
New Arcadian	1½
New Idria	14
North Butte	14
North Lake	.60
Ojibway	.50
Old Dominion	42
Osceola	52
Quincy	68½
St. Mary's M. L.	50
Santa Fe	.63
Seneca	11
Shannon	3¾
Shattuck-Ariz	16
So. Lake	1
So. Utah	.13
Superior	5
Superior & Bost.	2⅛
Trinity	3
Tuolumne	1⅛
U. S. Smelting	42⅜
U. S. Smelt'g, pf.	43⅛
Utah Apex	1 13/16
Utah Con.	10
Utah Metal	2
Victoria	2½
Winona	1¼
Wolverine	26½
Wyandot	.50

N. Y. CURB†	Aug. 6
Big Ledge	1 1/16
Butte & N. Y.	‡.75
Butte Detroit	.14
Caledonia	.48
Calumet & Jerome	1 1/16
Can. Cop. Corpn.	‡1 11/16
Carlisle	‡2
Cashboy	.06
Con. Ariz. Sm.	1 13/16
Con. Coppermines	4⅞
Con. Nev.-Utah	‡ 3/16
Emma Con.	‡.10
First Nat. Cop.	2
Goldfield Con.	‡.24
Goldfield Merger	.03
Greenmonster	‡⅜
Hecla Min.	4⅞
Howe Sound	‡4¼
Jerome Verde	‡ 5/16
Kerr Lake	5.65
Louisiana	7/16
Magma	‡32
Majestic	‡.18
Marsh	‡.05
McKinley-Dar-Sa.	.38
Milford	‡.75
Mohican	‡.06
Mother Lode	.36
N. Y. & Hond.	‡12⅜
Nipissing Mines	8½
Nixon Nevada	.43
Ohio Cop.	‡1 1/16
Rawley	‡2¼
Ray Hercules	4⅜
Richmond	‡.56
Rochester Mines	.37
St. Joseph Lead	14½
Standard S. L.	⅝
Stewart	.13
Success	.12
Tonopah	2⅜
Tonopah Ex.	1¾
Tribullion	‡ 3/16
Troy Arizona	.12
United Cop.	‡ 5/16
United Verde Ext.	37½
United Zinc	‡1⅛
Utica Mines	‡.08

TORONTO*	Aug. 6
Adanac	.07
Bailey	.02
Beaver Con.	.23
Chambers Ferland	.12
Coniagas	2.50
Hargraves	.04
La Rose	.35
Peterson Lake	.09
Temiskaming	.30
Wettlaufer-Lor.	.04
Davidson	.22
Dome Exten.	.09
Dome Lake	.12
Hollinger	4.50
McIntyre	1.32
Newray	.13
Porcu. Crown	.11
Teck-Hughes	.10
Vipond	.11
West Dome	.09

* Bid prices. † Closing prices. ‡ Last Quotations.

Engineering and Mining Journal

August 17, 1918

olume 106 Number 7

POT HOLES CLEANED OUT PREPARATORY TO CONCRETING AT SITE OF DAM FOR CLEVELAND-CLIFFS IRON CO.'S NEW HYDRO-ELECTRIC PLANT ON DEAD RIVER, MICHIGAN

New Hydro-Electric Development On Dead River, Michigan

BY MORGAN H WRIGHT*

The new hydro-electric power plant of the Cleveland-Cliffs Iron Co., in northern Michigan, when completed, will generate from 5000 to 10,000 kw.-hr., and is designed to be operated by natural river flowage without storage equalization. The site of the dam is well adapted to economic construction, as sand and boulders for the concrete were easily procurable and a good anchorage for foundations was provided by the many pot holes in the river bottom. The current is to be paid for by the operating company on a meter basis, and will be used at its Marquette range mines.

THE hydro-electric plant of the Cleveland-Cliffs Iron Co., now under construction on Dead River, seven miles west of Marquette, Mich., should be interesting to all companies concerned with the elimination or reduction of coal consumption, for this development will put to work from 15,000,000 to 30,000,000 kw.-hr. annually that for years has run to waste within a few miles of one of the world's most important iron districts.

The development is unique in that the company building the plant neither owns nor leases the power, but will pay for the current generated in the same way as an ordinary current user pays the utility company, according to his meter reading. In the second place, a site was found with ideal dam footings and with the necessary sand, gravel and rock conveniently near. Furthermore, the site offers no opportunity for storage of water.

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*Mining Engineer, Marquette, Michigan

This valuable power was permitted to go to waste because there was no available water storage, because coal was readily obtainable in the region at a reasonable price, and because the power owners and the power users could not agree on the value of the power. For various reasons, in 1917, the ideas of the negotiators converged, and a deal was closed for the use of the power. It is of interest that when purchase and lease negotiations failed, a final agreement was reached on the value of the kilowatt, and the user will pay the land owner by meter, according to the amount of current actually generated.

Pot Holes Offer Good Anchorage for Concrete

In August, 1917, the Foundation Company, of New York, began the construction of the dam under a "cost-plus" contract. The dam site is in the S. E. ¼ of Sec. 14, T. 48, R. 26, and is situated seven miles from the mouth of Dead River, on Lake Superior. At this point the granite country rock cuts across the river, squeezing it into a 30-ft. channel, at the head of brisk rapids. The river bottom presented a rather remarkable anchorage for the dam, being of massive granite, practically without fissures; but the rushing water had seized hard boulders, and, whirling them on the granite, had gouged out a network of pot holes or pockets, which ranged from shallow saucers to holes six feet in diameter and up to eight feet deep. When cleaned out and concreted, these holes gave a singularly good anchorage to the concrete mass of the dam. The accompanying photograph shows holes being cleaned, preparatory to concreting.

Sand, Gravel and Boulders Used in Concrete Were Available at Site of Dam

The dam, already ponding water, is of the gravity type, 400 ft. long and 50 ft. high, and it contains about 16,000 cu.yd. of concrete. A Ransome tower and chutes were used in placing the concrete, the mixture being "sloppy." Masses of granite, quarried at the site, were bedded into the mixture, a high percentage of stone being used in the dam. Sand and gravel of excellent quality were found at the site, removed from the banks of the river by a McMyler excavator, and by means of a chute slid down the bank to the mixer. The equipment as furnished by the contractor consisted of a McMyler Interstate excavator, a Ransome concreting unit (consisting of mixer, elevator, suspended chutes and rock and sand bins) and a quarrying outfit (consisting of compressor and drills and three derricks, one handling rock from the quarry into the dam and two used to relay material, such as steel and forms, from the top of the bank to the dam), as well as the usual small tools and accessories.

By taking advantage of the facilities provided by an old railroad grade to lay track to the site, thereby avoiding road building and teaming of material over rough country, considerable time was saved. Labor was utilized to the utmost in a season of scarcity by working from 13 to 18 hours daily, with good pay and excellent board provided, so that remarkable progress was made, in spite of an extremely unfavorable winter.

The power house is 13,600 ft. from the dam. The water is to be conducted to the generators by means of a seven-foot penstock, the first 10,000 ft. being wood-stave pipe furnished by the Pacific Pipe Co., the lower 3600 ft. being steel pressure pipe furnished by the Walsh Boiler Works. The penstock will lie largely in a rock trench, and the steel pipe will be placed by means of a tramway, the track being laid in the trench and removed as the pipe is laid. The power house, 45 x 90 ft., is to be built of solid brick with limestone trimming, ornamental brick exterior and glazed tile interior. Equipment is to consist of two General Electric 5000-kv.a. units and two 6500-hp. waterwheels built by the S. Morgan Smith Company.

Plant To Utilize All Available Flow of Water

The actual pressure head is 420 ft., but with 20 ft. lost below the turbines, 400 ft. of effective head will be achieved. The plant is designed to take the natural river flowage, without equalization by storage, and is expected to generate about 5000 kw.-hr. during low water and about 10,000 kw.-hr. during high water, but it will be operated to use all the water, regardless of the volume of flow, according to current requirements.

Completion of the McClure plant, which is named for O. D. McClure, master mechanic of the Cleveland-Cliffs Iron Co., will secure a total of about 30,000 hydro-electric hp. for use at the company's mines in Marquette County, as they have already four other plants in operation.

Black Hills Gold Output Drops In 1918

The production of gold in the Black Hills district of South Dakota, for the first six months of 1918, shows a small decrease as compared with that for the same period in 1917. The Homestake mines and mills, which produce most of the output, have been operated steadily, according to Charles W. Henderson, of the U. S. Geological Survey. Of the other important properties, the Golden Reward mines and cyanidation mill are the latest to cease operations, owing to increased costs and low grade of ores. The Wasp No. 2 mill has been dismantled; the New Reliance and Bismarck mills remain idle; the Mogul mill has continued operations on custom ore; and the Trojan mill and mines have been active. Small shipments of lead-silver ore have been made from Galena, and small shipments of coppe ore from the Hill City district.

Rights of Mine Owners

By A. L. H. Street*

In the suit of Copper State Mining Co. *vs.* Kelvi Lumber and Supply Co., 203 *Southwestern Reporter*, 68 the Texas Court of Civil Appeals recently adjudicate several phases of mining law, including a holding tha actual possession of a mining claim under a void location is without legal effect as against another claimin under a valid location, supported by performance of al required assessment work. Incidentally, it is held that since ore becomes personal property immediately upo extraction, it may be followed by the lawful owne wherever found, and that he may there maintain suit t recover possession of the ore or its value in money.

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*Attorney at law, 820 Security Bldg., Minneapolis, Minn

Efficiency Tests of Rock-Drill Accessory Equipment

By CHARLES F. WILLIS*

The inherently low mechanical efficiency of rock drills necessitates every possible economy of power. Each type of drill has a certain air pressure for maximum working efficiency, which may differ, however, from that of maximum economy. Tests show the importance of proper design of gaskets, selection of lubricating oils and the type and size of pipe valves, connections and fittings.

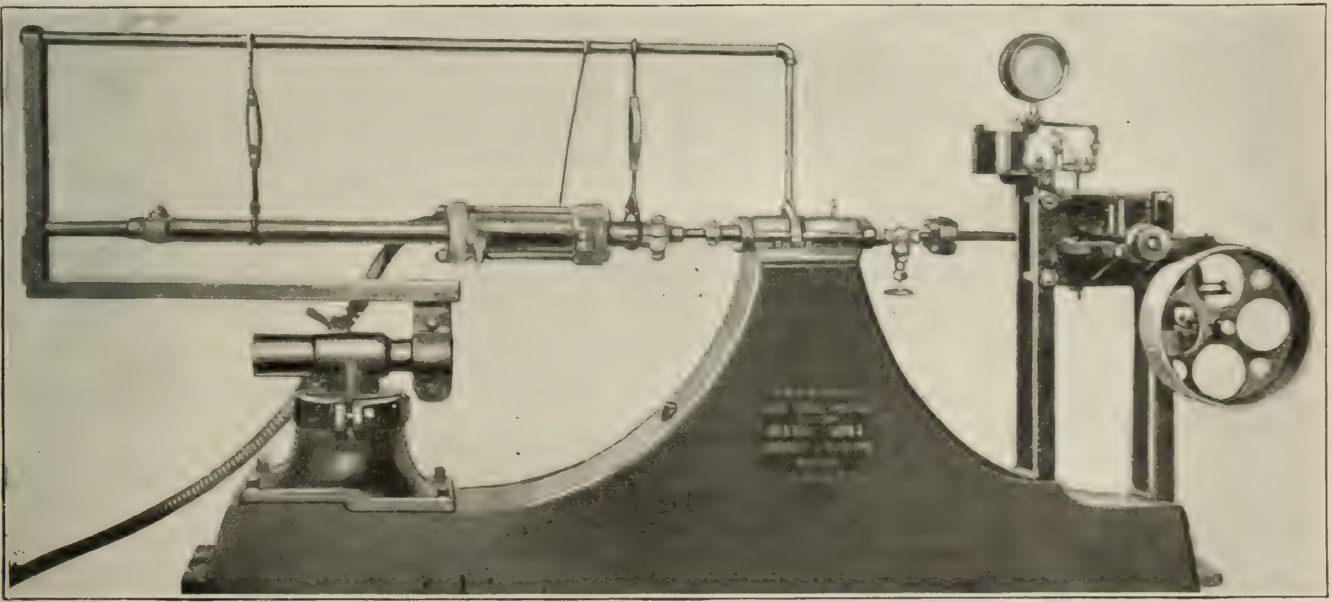
ALTHOUGH there has been considerable technical literature devoted to tests made on the efficiency of rock drills, little or nothing has been written regarding the efficiency of rock-drill accessory equipment with relation to the efficiency of the drill itself. Considering this to be a subject for research with opportunity for enlightening results, I undertook during the last year a series of exhaustive tests on rock-drill accessory equipment, coördinating all tests to the relative efficiency of the drill. While the possibilities are by no means exhausted, it was thought that some conclusions from tests made might at the present time indicate the importance of research in this field and stimulate further experimentation.

The air drill, as is well known, is one of the most inefficient machines, each drill requiring for continuous operation from 15 to 30 hp. at the compressor, whereas only from 10 to 20%, under the best working conditions, is delivered in striking the rock. Losses caused by waste of the heat of compression, by radiation from the air cylinders and air pipes, and by friction of air passing through pipes, are well known, but the greatest loss occurs by exhausting air from the drill cylinder at full pressure and without use of the expansive energy therein stored. Hence, with an already inherently inefficient machine, mechanical losses should be minimized, and in many cases most of the losses caused by poor equipment or care of accessory parts are avoidable.

It is well known and of record that air forced through a hose and pipe or a certain number of standard pipe fittings loses pressure by friction, although the volume of air is increased. I have never found in print any data bearing on this subject taken from direct measurements. In making these tests I also desired to study and demonstrate the real effects of carelessness in operation, the effects of poorly cut gaskets, of leaks, of inefficient or inadequate oil application, and, in fact, to make as complete a study as possible of all of the accessories of the rock drill. It was not expected that all of the tests would show spectacular results, but it seemed to be just as essential to know changing conditions that would give equal efficiency as to know the change of efficiency under different conditions. It was actually proved by the tests that some of the things that might reasonably be expected to influence rock-drill efficiency have really little or no effect.

TESTS MADE WITH PAYNTER APPARATUS

The tests were made on a Paynter rock-drill tester, which is a device for direct measurement of the efficiency of a rock drill, consideration being taken of the number of blows per minute, the number of pounds pressure per square inch per blow, and the foot-pounds of energy expended per blow. The Paynter rock-drill tester shows, briefly, the energy of the blow transmitted through a column of oil against a flexible diaphragm which moves an indicator needle on a rotating drum, the whole device, when calibrated, giving the number



STOPER DRILL SET IN PLACE IN PAYNTER TESTING APPARATUS of blows per minute, the number of pounds pressure per square inch per blow, and, by referring to the curve of calibration, the number of foot-pounds of energy expended per blow. The calibration was performed by allowing a sphere of known weight, suspended as a pendulum, to fall through measured distances against the plunger. The distensions of the diaphragm corresponding to the blows were noted. By forcing oil into the system with an attached pump, the diaphragm was distended to each of these points in turn, and the static pressure corresponding to each was read on the gage. The curve of calibration was then constructed with foot pounds as abscissas and pounds static pressure as ordinates. The air measurements were made on the Clark air meter, which is a positive displacement meter, the machine measuring correctly all compressed air flowing through it.

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*Consulting Supervisor, Phelps Dodge Corporation, Bisbee, Arizona.

The drill used in the tests was a Chicago Pneumatic Tool Co. stoper, and was selected largely because of the fact that it is one of the fastest hitting stopers of the hammer type, and, being fast, is more easily affected by slight changes than many other types. It was essential that all tests be made on one machine, for the results of testing on several machines could not be compared, and it was desired to show the value of testing for accessories on individual types of machines. A stoper was chosen for the tests because of its easy adjustment and the fewer opportunities for error while using with the Paynter tester. This paper will not go into the details of the tests made, but will show in a general way some of the conclusions illustrating the importance of such testing.

Most Efficient Air Pressure for Each Drill Should Be Determined by Test

To get a basis for further work, it was first necessary to have a complete set of throttle tests, made under different air pressures, and a record of the relative effects upon air consumption, pressure per square inch per blow, foot-pounds of energy delivered per blow, and the blows per minute. It was noted in all the tests that the maximum consumption of air in the stoper was only 61 cu.ft. per min. In the throttle tests it was noted that the curves, as to air consumption, blows per minute and pressure per square inch per blow, varied regularly and evenly, while the curve for foot-pounds of energy delivered per blow was almost a straight line. As might be expected, the air consumption varied with the pressure on the throttle valve, although not in direct proportion—the throttle valve three-fourths open was fully efficient as to blows per minute, and about 90% efficient on the other three tests. It was particularly noticeable in all the tests that the blows per minute vary largely in a direct proportion with the amount of friction or the number of obstructions to the passage of the air through the various pipe fittings, hose, etc., in going to the machine, rather than with the pressure.

In the pressure tests it was desired to ascertain for all pressures the point of maximum efficiency under existing conditions. For instance, it was determined that at 50 lb. gage pressure the machine would not use over 50 cu.ft. of air per min., would not deliver over 960 blows per min. with 240 lb. per sq.in. force of blow, and would deliver only 7 foot-pounds of energy per blow. It was ascertained that the most economical pressure for this machine was 90 lb. gage pressure. At 100 lb. no greater efficiency was noted, and the cost of compressing the 61 cu.ft. of air necessary for the additional 10 lb. pressure would serve no useful purpose. The tests illustrated forcibly that the first thing for which a rock drill should be tested is the most economical pressure at which it will operate. There might be a consideration of cost involved, and it is possible to imagine conditions where the most efficient pressure would not be the most economical.

Temperature and Humidity Have Little Effect

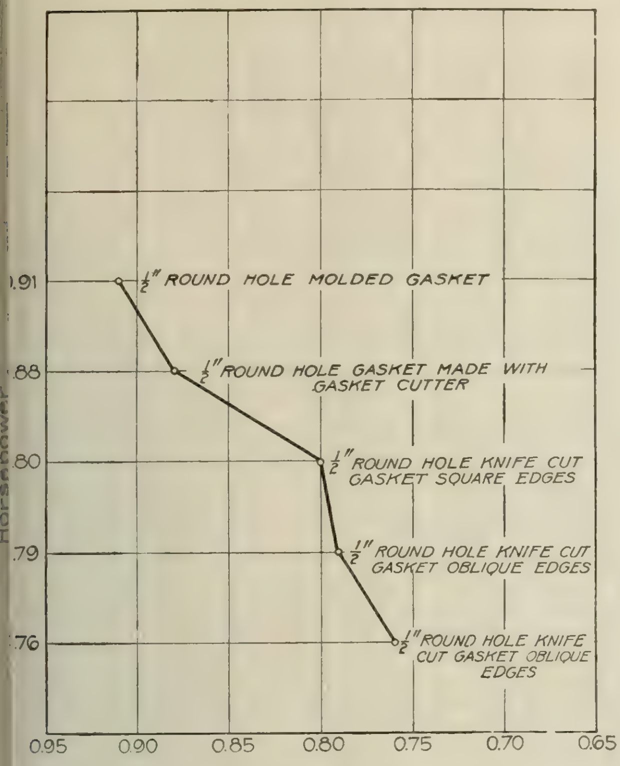
It was considered possible that there might be some relation between rock-drill efficiency and the temperature of the place where the drill was operating, and to ascertain this a series of tests were made with the room at various temperatures from 70° to 100° F. These temperatures were created by means of stoves, and each temperature was maintained for a sufficient time to insure the drill itself becoming of the temperature of record. It was also thought possible that higher temperatures would increase the fluidity of the lubricating oils and possibly give greater efficiency for a shorter time with a lighter oil; and it seemed not improbable that increased temperatures would require different conditions of oiling and different kinds of oil. However, when the tests were made, it was found that the efficiency of the machine was slightly greater at 80° than at 70°, but above that temperature no changes could be observed. The increased efficiency from 70° to 80° was probably due to a loosening of the oil. The probable reason for no improvement with higher temperatures is that during the test, or during any period of operation, the air coming from the outside with more or less uniform temperature cools the drill, and, irrespective of the surrounding temperature, that of the drill is maintained at about the same degree.

Humidity was created by placing open pans of water upon the stoves or by passing live steam into the room, and tests were run at 70°, 80°, 90°, 100° and 110°, with increasing steam moisture. However, no changes in the results were apparent, and it was therefore concluded that neither humidity nor temperature has any appreciable effect on rock-drill efficiency.

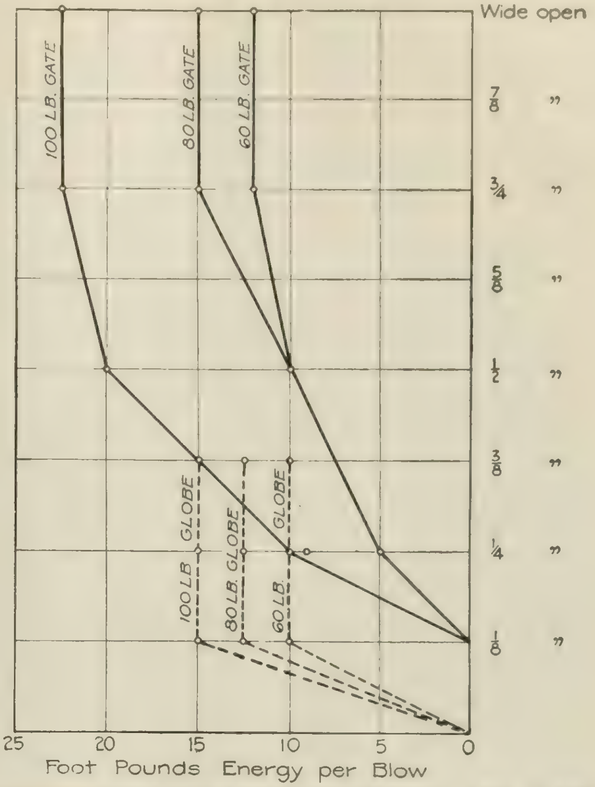
Type and Shape of Gaskets Important Factors

Probably among the least considered accessory parts of a rock drill are the connections between the hose and the air piping; whether a gasket or a ground-joint union should be used; the type of gasket if any; whether a gasket should be machine cut, knife cut or molded. In the first place, the most important thing is the size of the hole. Only definite quantities of air will pass through an orifice of definite size, and as it takes at least 60 cu.ft. of air at 90 lb. pressure to run the drill used in the tests, no orifice of size less than required for that pressure could be used. There is, however, a great difference as to the surface or shape of the orifice. Tables give the flow of air though an orifice, correct only for rounded edges or the ideal opening.

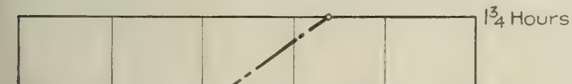
The usual way of cutting a gasket is directly from sheet packing, with a knife, and probably no operation is more carelessly done. The tests under review proved clusively that, even with the same size of opening, most efficient operation of the drill was obtained a molded gasket with rounded edges. The next st efficient type was a gasket made with a gasket er, giving smooth edges, with the cutting perpenular to the face of the gasket. The third in order a gasket cut with a knife, particular care being en to make the walls perpendicular to the face of the gasket. The least efficient was a gasket cut with the walls oblique to the surface of the gasket.



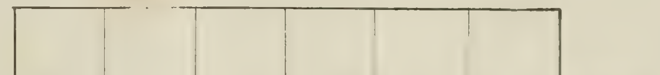
URVE SHOWING RELATION OF DELIVERED HORSEPOWER TO GASKETS



CURVES SHOWING RELATION OF ENERGY PER BLOW TO VALVE OPENING



CURVES SHOWING RELATIVE EFFICIENCY WITH OILS A, B, C, D AND E



CURVES SHOWING RELATIVE EFFICIENCY WITH OILS F, G AND AUTO OIL

In practice it is found that the most common gasket is the last one mentioned—a gasket hurriedly cut with the knife not held perpendicular to the plane of the gasket rubber. Even in this case it made a difference in the operation of the drill whether or not the gasket was placed with the sharp edge toward the incoming air. To be sure, the relative difference in efficiency is small, but, taken over the period of time that a drill is running, and then multiplied by the number of drills in operation, it shows that a poorly cut gasket is an expensive proposition, and that a molded one, although more expensive as to first cost, is in the end the more economical.

The greatest difference observed by the use of the different gaskets was in the blows per minute recorded. This was to be expected, as it was observed in all tests that friction and speed of drill operation are closely allied. The relative distance, however, is great if with one gasket the machine delivers 1320 blows per minute with 20 foot-pounds per blow, and with another it delivers 1380 blows per minute and the same force per blow. As opposed to this, and as an alternative, comes the use of the ground-joint union, thus doing away with gaskets. While new, the ground-joint unions were found to be more economical, provided great care was taken to have no leaks, for inasmuch as the particular drill on which these tests were made was not quite 10% efficient, the loss even of 1 cu.ft. of air per minute would make a perceptible increase in the cost of operation. Ground-joint unions would require as much care as gaskets, for the frequent removal and replacement of the union in changing drill places cannot but batter and scar a brass union, and with this condition leaks will inevitably occur. The conclusions derived from the tests made on gaskets indicate as first choice the use of molded gaskets; as second choice, ground-joint unions, and find nothing in favor of the home-made knife-cut gasket.

Couplings Tests Showed Little Variation

It was considered that there might be some effects on rock-drill efficiency by varying the type of coupling, and tests were made on 22 couplings of five different types, and, in order to accentuate the small results to measurable quantities, in many cases several couplings of the same type were used, great care being taken to maintain uniform conditions. Experiments showed, however, that in the twenty-odd tests made upon couplings no changes in the efficiency of the drill were to be recorded. The tests were negative all the way through, even when the size of the coupling was changed. This was probably due to some extent to the fact that even the smallest coupling had a sufficient aperture to pass the 60 cu.ft. of air necessary to run the drill, and the conclusion was that on rock-drill efficiency the type of coupling has no bearing. Of course, there are many other things to be taken into consideration in coupling tests, such as the ease with which couplings are put on and removed, the readiness with which the joints can be tightened and simplicity of construction and operation.

Oils Rated According to Initial Efficiency, Durability and Consumption

Probably the most important of the tests were those made on lubrication. For purposes of comparison the oils used will be denominated A, B, C, etc. With the exception of E, all were California asphaltum-base neutral lubricating oils, scientifically refined and filtered. The gravity of the California oils ranged from 17° to 22° Baumé; the flash test varied from 300° to 340° F.; the fire test from 330° to 410°, and the viscosity from 70° to 220° at 100° Saybolt; E was a Pennsylvania neutral lubricating oil. The object of these tests was to determine the efficiency of the drill under different oils, the quantity of each oil that should be fed to the drill for maintaining maximum efficiency and the effects due to insufficient lubrication. The method by which the tests were made was as follows:

Preparation for the Tests

The machine was first thoroughly cleaned, by the use of coal oil and gasoline, of all traces of carbon and the oil last used. Then a definite quantity of the fresh oil in this case 25 c.c., was put in and the machine ru two minutes to lubricate thoroughly all parts. An indicator card was then taken which should be the recor of greatest efficiency on that individual oil. The dril was then made to strike against an endurance bloc for a period of 15 minutes without adding more oil and another card taken. This process was repeate until the value of this particular oil as a lubricant wa entirely nil. It was noted that one of the oils ra only 30 minutes under these conditions, while anothe ran one and one-half hours. All of these tests wer carried to a point of low efficiency, but not sufficientl low to damage the mechanism of the drill. It was note that at a point varying from 30 minutes to one hou the drill became more efficient in operation. This wa undoubtedly due to heating and the emulsifying of th oil. Consequent upon the heating was the increase fluidity of the remaining oil, for in all cases the slum after the rise was rapid. It was also recorded on th indicator cards of these tests that the sticking of th valve due to lack of lubrication was the first effect note and probably the cause of the inefficient operation o the drill.

The E oil was in many ways the best of the oil tested, giving a greater number of blows per minut and a greater force of blow than any other of th oils included in the tests. The chief disadvantage o this oil, however, was its lack of endurance, probabl due to the fact that it is rather a thin product. It i evident that, in order to get its maximum efficiency, nc less than 25 c.c. should be fed for every 30 minute of running time. Particularly noticeable on E oil wa the absence of the sticking of the valves that was s noticeable in the other tests. E is an excellent oil fo the careful drillman who will not forget to add o when necessary.

The D oil, during its initial operation, was almos as efficient as E, but fell off rapidly, and even at th end of 15 minutes of continuous operation had lost it real value. D was also a fluid oil, entirely too thin fc rock-drill lubrication, unless such lubrication were auto matic. In this case, however, E would be the better oi

The oil designated C was the most durable of th oils tested, having virtually as great efficiency the end of one and one-half hours of continuous ru ning as in its initial operation. While its efficienc was only 80% of that of E, at the end of 45 minute and from then on up to one and three-quarters hou it was much more efficient. C oil should be used at th rate of not less than 25 c.c. for each one and one-ha hours of running time. It is an excellent oil for car less drillmen.

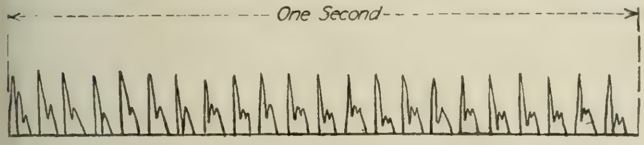
Throughout all of the tests on oils it was conclusively proved that lack of oil does not mean injury to the rock drill, but only to its efficiency, for insufficient lubrication merely allows it to deliver a less number of blows per minute at a less strength per blow. It is particularly noticeable on C oil that the efficiency is increased in the period between 45 minutes and 1½ hours. This, as stated before, is undoubtedly due to the heating of the drill and the increased fluidity of the oil thereby produced. The increased fluidity is therefore responsible for the rapid drop in efficiency after the rise to the point of highest efficiency.

Next of importance from the point of view of initial operation was B oil, although it had little endurance quality. If this oil is used, it should be fed at the rate of not less than 25 c.c. every 15 minutes. It shows its point of heating and increased fluidity at 45 minutes, although the increase was slight.

The A oil was remarkable for its endurance, maintaining almost a steady efficiency for 1¼ hours, its point of rise, so-called, being at the end of one hour. However, from the point of view of an enduring oil, it was most regular. This oil should be fed at the rate of not less than 25 c.c. every 1¼ hours.

Enduring Qualities Desirable in Lubricants

From the standpoint of initial efficiency, E was best, D second best. From the point of view of endurance, C was best, A second best. D had nothing to commend it from either point. Considering the horsepower delivered per cubic centimeter of oil, C excelled the others, largely on account of its endurance, although E, on account of its high initial efficiency, undoubtedly excelled A.



INDICATOR DIAGRAM TAKEN DURING FIRST TWO MINUTES RUN OF THE OIL TEST

In oil selection it is undoubtedly more important to examine enduring qualities rather than initial efficiency, unless oils of enduring qualities are of low efficiency. Drillmen, for the greater part, are careless as to the use of oil, and drills either get large quantities of oil in irregular amounts or none at all. The tests have shown that larger quantities of oil than 25 c.c. added at one time are of no additional value, because of the fact that the excess is, in each case, passed through the machine and out the exhaust without serving any useful purpose.

For purposes of comparison two highly recommended rock-drill oils were tested, one of which may be called F and the other G. F proved to be a highly efficient oil, as to initial operation, maintaining its high efficiency for a period of about 10 minutes; had no point of rise due to heating, but at the end of one hour it had entirely lost its efficient action. It was shown to be necessary to feed the F oil at the rate of not less than 25 c.c. every 15 minutes. G, while an oil of high initial efficiency, was also an enduring oil, having its point of rise at 1¼ hours, which means that it should be fed at the rate of not less than 25 c.c. for a like period.

Tests were also made with high-grade automobile lubricating oil, but it was found to be inefficient both in initial efficiency and durability. This fact only serves to emphasize the need of correct selection of oil.

TABLE I. ROCK-DRILL OIL TESTS

Type of drill, Chicago Pneumatic Tool Co. stoper. Air pressure, 100 lb. gage Temperature, 70 deg. F. Drill-steel rotation, none. Striking pin size, [illegible] in. diameter, 12 in. Hose size, 10 ft. length; ½ in. diameter. Oil used, castor machine. Quantity, 25 c.c. Number of runs made, 8. Time of runs, 15 min., except run No. 1 (two minutes).

Initial and Final Indicator Diagram

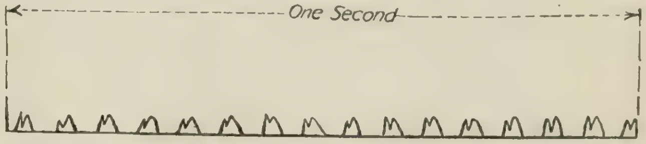
No. of Runs	Time in Min	Blows Per Min	Force of Blow Lb. per Sq In	Foot-Pounds Per Sq in
1	2	1,380	500	27 5
8	15	960	175	4

Table II sums up the oil tests:

TABLE II. COMPARISON OF TESTS IN LUBRICATING OILS

Oil	Rating for Initial Efficiency	Rating for Durability	Point of Rise, Hours.	Minimum c.c. To Be Fed Per Hour
F	1	7	¾	100
G	2	3	1½	20
E	3	6	0	50
D	4	8	0	150
C	5	1	1½	16
B	6	5	¼	100
Auto	7	4	¾	100
A	8	2	1	20

Tables are available that show what may be expected as to drop in pressure of compressed air passing through pipes and pipe fittings. It was desired to determine whether or not there was any direct or indirect relation between these tables and the action of the drill itself, and experimentation demonstrated that through pipes the relation is direct and corresponds closely to the pressure tests shown at the beginning of this paper; that considering loss in pressure, caused by certain definite lengths of pipe of certain sizes, the air delivered would give as high efficiency to the drill as that same pressure would if supplied directly. This applied, however, only to straight pipes; the effects began to deviate radically with the use of elbows, for the efficiency of the drill was indirectly related to the fall in pressure created in changing direction of flow. The elbow curves were especially significant. It was found first of all that the air consumption, that is, the cubic feet of air per minute consumed, did not vary. The relation between the energy delivered in foot-pounds of energy per blow was directly in proportion to the tables showing the added length of pipe for each elbow of different size. The number of blows per minute, however, varied widely from a direct proportion, and consequently the actual horsepower delivered varied correspondingly. These and other tests demonstrate the fact that friction seriously affects the blows per minute on any drill, while it does not affect air consumption, foot-pounds of energy per blow or pounds pressure per square inch per blow.



INDICATOR DIAGRAM TAKEN DURING THE FINAL RUN OF THE OIL TEST

Effect of Elbows On Drill Efficiency

Particularly noticeable is the varying efficiency of the drill on the passage of air through elbows of different sizes; although a 1½-in. hose was used, the drill with six 1½-in. elbows was only 60% efficient. If six elbows were to be used, the size should be 1¼-in. elbows to have the drill maintain its highest efficiency, and, even then, the number of blows per minute delivered through six 1¼-in. elbows was lessened.

The conclusions from the tests on air transmission and its relation to rock-drill efficiency were that straight pipe has no other effect than that given in the many tables published, due to loss in pressure, but the other fittings that require the air in passing through them to change direction one or more times have both a serious and detrimental effect. This is more particularly noticeable in the comparison between globe and gate valves.

Gate Valves Preferable to Globe Valves

Following up the tests on elbows and the more or less direct relationship of friction to the efficiency of the drill operated, irrespective of air consumption or pressure, it was obvious that valves offered an excellent field for further tests. There is much difference between globe and gate valves in the amount of friction created by the passage of air. It was demonstrated, in the first place, that the amount of air passing through a valve was in direct proportion to the size of the orifice, irrespective of the shape of that opening; but a remarkable variation was observed in the operation of the drill, which was in no way related to the size of the opening but entirely to its shape and the change of direction in the passage of air.

In all the tests there was generally an increase in efficiency by use of a gate valve compared with a globe valve of the same size, particularly with regard to the number of blows per minute and less noticeable as to the energy delivered. This bears out the conclusion as to the relation of friction. It will be noted, however, that the differences in efficiency between the globe and gate valves was greater on the ½-in. valve, and the variation decreased with the increase in the size of the valve, until with the 1¼-in. valve practically no difference could be noted. These facts, however, do not apply to the earliest stages of opening the valves, for, on a ⅛ turn, a globe valve is actually wider open than a gate valve, owing to the lap due to the seating of the gate.

These tests demonstrate the importance of selecting the right size and kind of valves for the passage of air used in rock drills. While it has always been thought that, if a ½-in. hose were used, a ½-in. valve should also be used, this was shown by the tests here recorded to be a fallacy.

Believing that there might be some difference in efficiency caused by the direction of passage of air through a globe valve, tests were made to see if there was any difference between passing the air through the valve so that it entered from the bottom of the valve and passed out the top, and causing it to pass out at the bottom. The first condition is noted in the records as placing of the valve forward and the latter as placing the valve backward. It was found that in opening the valve a considerable loss in efficiency occurred in placing it backward, but after the opening became of sufficient size to allow a freer passage of air there was no difference, which results only serve to emphasize the influence of air friction upon the efficiency of the drill.

It is sometimes contended that the only test to which a rock drill can be subjected with any fairness is to put it to work under mining conditions for an extended period. This, however, is but one test, and possibly of importance only as to the relationship of durability and wear.

There are other things that seem to be equally pertinent. The kind of oil used is of great importance, for each oil acts differently under varying valve conditions. It is important, also, to determine the size of hose necessary to give the greatest efficiency, and to ascertain the size valve or throttle that gives the best results. It is of great interest to know the relative speed at which a drill attains its greatest power, or how much time is lost in stopping and starting, and how much of the power is consumed in the rotation of the drill, for under some conditions a greater rotative power is necessary. It is important to know whether or not an increased pressure will compensate for this power. Why use 110 lb. pressure at the drill when 90 lb. is as effective for that individual drill? Air and water consumption should be definitely known, and the relation between the applied horsepower and the actual horsepower delivered is also of material importance.

Marked Improvement in Mining Practice Noted

A great wave of scientific reform in mining is sweeping over the country, and much thought and study have been given to the operation of rock drills. The problem of determining the preferable type and size of rock drill, its steel, mounting, hose and accessories best adapted to existing conditions of ground, is receiving serious attention, supplemented by a study of the best methods for breaking the ground—the size and depth of the drill hole, the number of holes required, their relative position and angle, and the quantity, size and grade of powder required. A serious effort is being made to eliminate or minimize the personal equation. Probably no one is better qualified to advise as to the type and size of drill to be used under different conditions than the specialists representing the rock-drill manufacturing companies. These men have a knowledge of the requirements of different grounds gained by experience and observation, coupled with an intimate familiarity with rock-drill practice. But, after all these questions have been answered, there remain many factors that should be determined in order to get the greatest efficiency possible out of the type of drill selected.

Life Extension of British Patents

The following resolution was among a number passed at a recent meeting of the Association of Chambers of Commerce of the United Kingdom:

> Resolved, That in view of the fact that many owners of patents have been entirely prevented from exercising their patent rights or exploiting their patents owing to the war, a provision should be made for the prolongation or extension of the life of such patents, and that in view of the fact that this necessity arises solely from the conditions of the war and will terminate on its conclusion, this association respectfully urges that any legislative proposals necessary to deal with the question should be embodied in a separate measure and passed into law as speedily as possible.
>
> Further, that it is undesirable that this provision should be included with other amendments of a permanent character to the patent laws of the country, but that it should be treated entirely as a war emergency measure and dealt with on its merits.

The New American Spirlet Roaster

By F. J. Harlow*

The de Spirlet furnace is a roaster of the turret type, but is characterized by movable hearths, the ore on each hearth being stirred by teeth projecting downward from the hearth immediately above. Many alterations were made in the foreign design to adapt the furnace for local conditions, with the result that the improved model is now giving satisfaction.

THE de Spirlet furnace was patented by M. Xavier de Spirlet, director of the chemical plant in Laecken, near Brussels, Belgium. This plant had contracts for roasting ore, and utilized the gases for making acid. Several kinds of roasters were used, such as the Rhenania furnace and the Delplace furnace. Experiments were started to develop a mechanical kiln, the result of this work being the de Spirlet furnace. This particular style of roaster was first introduced into the United States by Beer, Sondheimer & Co., of New York, and the first two kilns were built by Grasselli at Cleveland, Ohio. There are now three kilns of this type at the East St. Louis plant of the American Zinc, Lead and Smelting Co., and a battery of ten de Spirlets at Plant B of the National Zinc Co., Kansas City, Kansas. The purpose of this article is not to criticise the original design of the de Spirlet furnace, but to relate the history of the evolution of the foreign-designed kiln to one adapted to American conditions in construction and operation, consistent with economic practice.

The de Spirlet, or Spirlet, as the kiln is called, is a roaster of the turret type and is so arranged as to permit the removal of the gases of combustion by an independent passage that insures the non-admixture of the carbon dioxide and nitrogen with the sulphur dioxide resulting from the oxidation of the ore. In giving a description of the kiln, I will take the new style or American Spirlet as a basis of discussion, making reference to the foreign design only where necessary. The Spirlet kiln is built on three levels. The upper level is the charging or green-ore hopper runway, which runs the full length of the battery of kilns. The hoppers are charged with green ore from the dryers in small push cars, which are elevated on an electric lift. The second, or chiseling floor, carries the turret roaster. It is on this floor that all operating adjustments are made. The lower floor is known as the fire floor. This floor gives access to the roasted ore hoppers and fire box.

THE FIRE FLOOR

The furnace housing (see Fig. 1) is a rectangular brick compartment 15½ ft. long, 6½ ft. wide, and 7 ft. 2 in. high. This housing contains one fire box, two CO_2 down-takes, and two roasted ore silos. The fire box *J* is of the step-grate type, with grates 30 in. long, and is connected to the muffle by a 22-in. square fire-brick uptake *K*. The center of the fire plate of the fire box coincides with the center line of the combustion muffle, so that the flame has a straight upshoot into the muffle *L*. The combustion air is preheated and delivered to the fire box by passing through tunnels built in the side walls of the fire box.

The two cast-iron down-takes *M* are placed one at each side of the fire box and conduct the products of combustion from the muffle *L* to the flues *N*, which intersect in a common flue on the center line of the fire box. At the outside face of the back wall this common flue then connects with the main CO_2 flue to the stack. The cast-iron down-takes have radial iron fins on the outer surface.

PREHEATING AIR

The air for oxidation enters the preheating chamber *P* through opening *O*, absorbs radiation from down-takes *M* and ore *G*, passes through opening *Q*, is baffled around air muffle *P*, absorbing more heat from radiation through floor of fire muffle *L*. The preheated air then enters the roaster by ore-pass *F*, and is controlled by a slide register at *R*, which is operated from the outside by a rod. Thus the preheating of the air is complete and utilizes only waste heat. The preheating air muffle *P* is 8 in. high and is incased in the same 13-ft. diameter cylinder with the fire muffle *L*. The cylinder is insulated with a 9-in. wall for the air muffle and a 20-in. wall for the fire muffle. The temperature in the air muffle is about 600° C. The combustion or fire muffle is 12 in. high and is baffled so that the flames from the fire box must completely cover the surface of the muffle before being discharged to the down-takes *M*. This insures uniform heating of the lower hearth of the roaster.

THE ROASTER

The roaster sets upon the muffle *L*, the floor of the lower hearth *E* forming the arched roof of the muffle. The arched roof above the lowest hearth, the distance between being only 6¾ in., is composed of special tile, every alternate one being prolonged so as to serve as a rabble arm. The prolong reaches to within an inch of the hearth. The entire arch is built in a steel ring 14 in. in diameter, constructed of standard steel shapes, which in turn is supported by lugs riveted to its periphery. These lugs rest in cast-steel stirrups or hangers, which are hung over the ball of a circular steel rail, which is made of a 90-lb. standard T-rail bent with its base cut. To the outside of this T-1 rail circle is bolted, with fillister head bolts, a segmental cast semi-steel circular rack of 300 teeth. There are 12 segments to this rack, and should a tooth become broken or worn a segment can be replaced in ten minutes.

The T-rail ring, with its rack, is supported on six flanged wheels, one at each column. A pinion to a vertical shaft meshes with this circular rack and revolves the roof of the lower hearth at a speed of one revolution every nine minutes. There are four ore hearths or roasting chambers, two of which are movable, as just described, and two of which are stationary.

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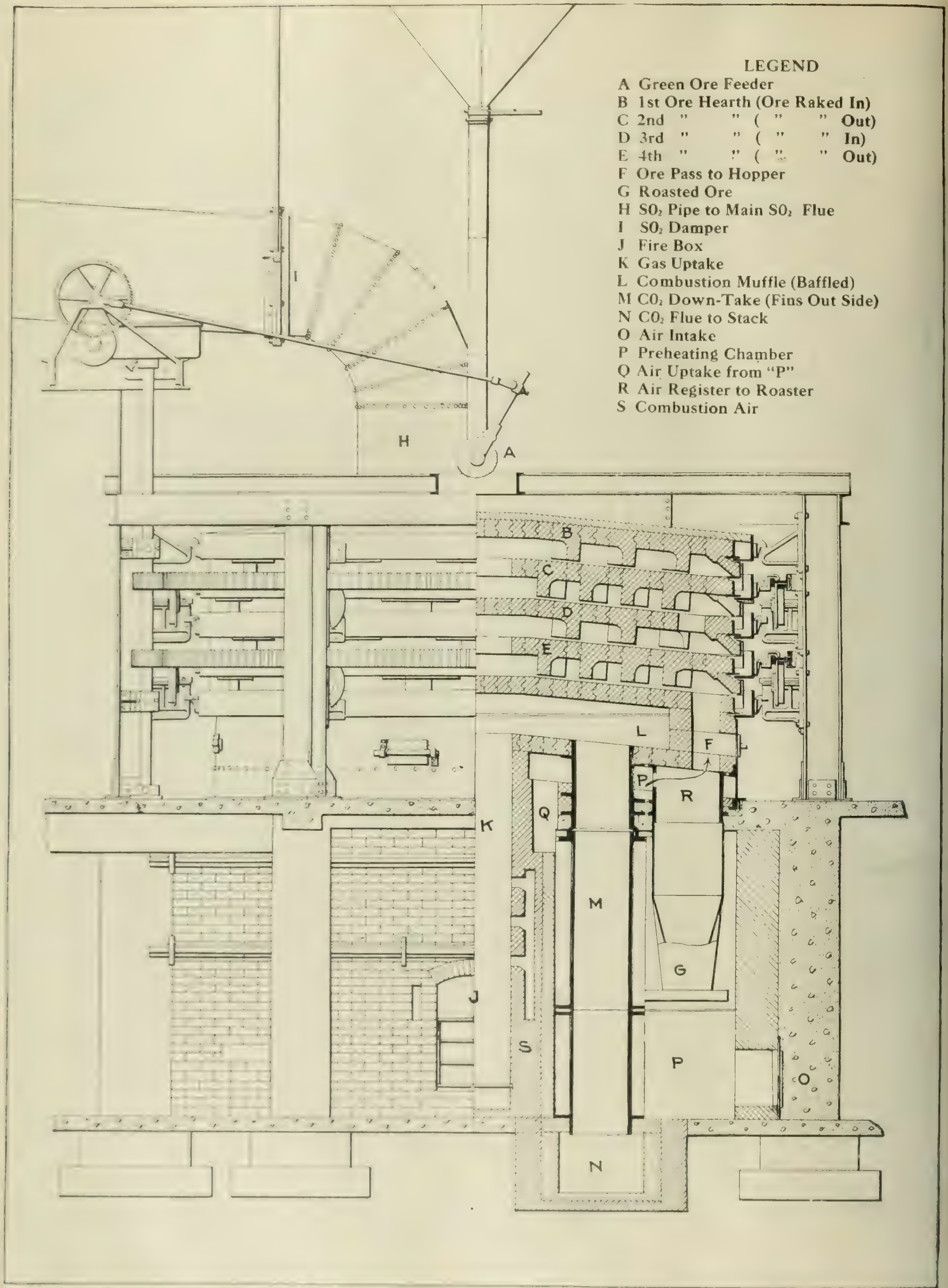
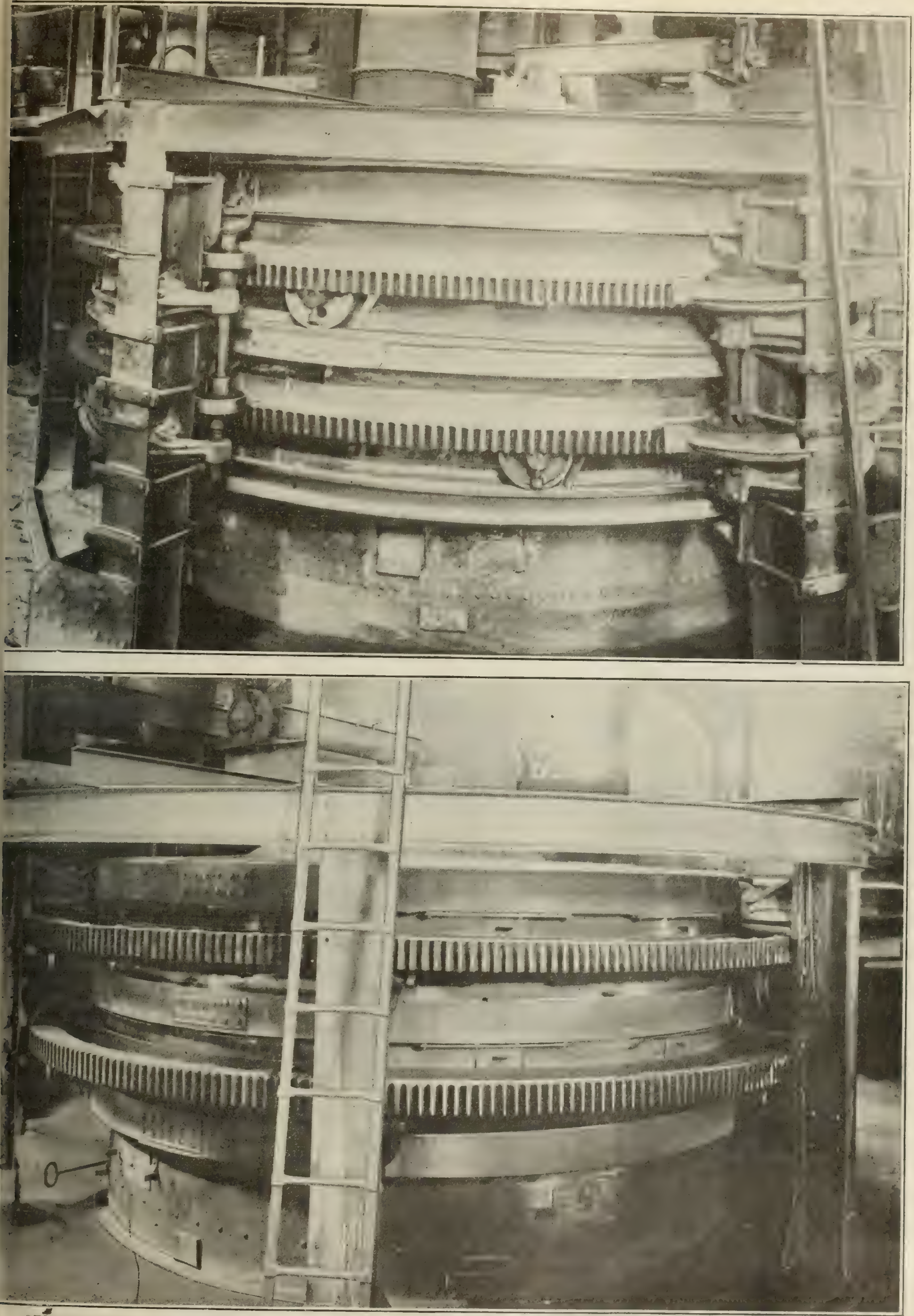


FIG. 1. AMERICAN SPIRLET ROASTING FURNACE



SPIRLET FURNACE UPPER PHOTO IS ORIGINAL FOREIGN TYPE AND LOWER ONE IS AMERICAN DESIGN

The direction of rotation is clockwise; and the roof of the furnace, which is the roof of the upper ore hearth, is stationary.

Every third tile of the roof of hearth *B* is prolonged and acts as a rabble blade. The ore is fed through the roof to hearth *B* about 3 ft. from the center, and is rabbled toward the center. Thus the movement of *B* below the stationary rabbles in the roof causes the ore to be rabbled and transferred to the center discharge opening leading to hearth *C* below. The roof of hearth *C*, which is the under side of the floor of hearth *B*, is movable and is provided with rabbles, or teeth, as they are called. These teeth, due to the movement of the roof, push the ore to twelve 3 x 9-in. discharge openings on the periphery of the hearth and leading to hearth *D*. In hearth *D*, the roof of which is stationary and carries rabbles for *D*, the ore is moved by its action against the teeth by virtue of the moving floor of hearth *D* to discharge at center of hearth *D* into hearth *E*.

The floor of hearth *D* forms the roof of hearth *E* and carries rabbles which move the ore to the outlet holes *F*, of which there are two pair of peripheral openings, 10 x 10 in. each, into the roasted-ore hoppers *G*, one at each side of the furnace. The hoppers *G* have an ore-luted swinging gate, which is air tight, so that no cold air can enter the roaster. The removal of scale is accomplished through twelve 4 x 6-in. doors on the periphery of each hearth. Scale is not dragged out of the kiln, but is merely loosened and carried through the kiln by the rabbles.

METHOD OF SEALING OPENINGS

Both stationary and moving hearths are sealed by an ore lute, which is carried in an annular trough surrounding the periphery of the hearth. A thin steel plate, which is fastened on the lower side of each trough except the lower one, dips into the ore trough of the arch below and makes an air- and gas-tight seal. The ore is fed from the green-ore hopper, through a vertical pipe, into a ratchet-driven worm feed into the uppermost hearth. The SO_2 gas is taken from the kiln at the periphery of the roof of the roaster by a 30-in. brick-lined pipe *H* of 24-in. inside diameter. The draft of the kiln is regulated at the base of uptake *H* by a butterfly damper, which is pivoted in the cast-iron thimble set in the hearth opening. There is also a cut-off damper, which slides down in casting *I*. This damper is slipped in whenever a kiln is under repair and cuts the kiln off from the main SO_2 flue. After the damper *I* is in place, the uptake and attached elbow *H* may be removed with the crane. The thimble at the base is sand luted, insuring a gas-tight joint at the connection of roaster and flue; the joint at *I* is a tight slip joint and is loamed up with yellow clay. The SO_2 flues enter the main flue at an angle of about 30 degrees.

The power for rotating the roaster is obtained from a 5-hp. slow-speed 300-375 motor, by a 6-in. belt to a 42-in. pulley on a $2\frac{7}{16}$-in. worm shaft that carries a bronze worm, which meshes with a 40-tooth worm wheel. The worm wheel and worm are inclosed in a dust-proof cast-iron gear case with inboard thrust bearings. The worm and wheel run in an oil bath and are noiseless. The worm shaft carries a pinion which meshes with a gear on the crankshaft that drives the feeder ratchet by means of a pipe connecting rod, the amount of feed being regulated by means of a slide on ratchet bar which regulates the length of the effective stroke of the pawls. The worm-wheel shaft carries the pinions which mesh with the circular rack that carries the rotating hearths. The average power used to drive a Spirlet furnace is about 2 horsepower.

DUST COLLECTION

The reason for feeding the ore only about three feet from the center of the uppermost hearth, instead of at the edge of the hearth, is to allow the gas a free passage around the ore to the SO_2 outlet. The baffling effect caused by the teeth in this hearth collects a great deal of the dust. This is precipitated upon the hearth, and when the dust beds to a depth of an inch—sufficient height to engage the teeth—it is moved up to the center drop-hole in the same manner as the ore; and, as the dust is continuously being fed back to the roaster in small amounts with the green ore, the amount of sulphate is insufficient materially to affect the quality of the calcined product. The purpose of the kiln, apart from its function as an ore roaster, is to provide a furnace gas as rich in sulphur dioxide and even in tenor as possible, the sulphur dioxide being used for sulphuric-acid manufacture.

The roasters are dismantled by picking up the hearths with a three-legged spider attached to a 5-ton hand-operated differential chain block, which is hung to traveling crane with a hand-chain traction device When a kiln is dismantled, only the circular arches o shelves are removed, the gear circles and drivin mechanism being left undisturbed. One of the grea advantages in this form of construction is that a kil can be taken apart while still hot, whereas a kiln o the cast rabble arm type would not be cool enough fo masons to work inside. At the National Zinc Co. plan spare circles are available, which are interchangeable and as soon as a shelf shows signs of failure an extr one for this particular kiln is built. When the me are ready to make the shift, it can be done before th kiln cools off.

The coal consumption for one Spirlet kiln based o a duty of 191 furnace days showed an average consum tion of 0.7 ton per day of 24 hours. The daily char of ore to the kilns, averaged over a period of ten month showed 7800 lb. of green ore and 1800 lb. of spill. T Spirlet kilns not only work over their own chisel lum and screenings, but a great part of the lumps from t large kilns. The Spirlet can be operated successfu on a sulphur content as low as 25%, but is usua operated at Plant B on about 26%. At present t plant is running on 25½%, because taking over a lar amount of spill from a shut-down on the larger kil Another advantage with the small unit is that shou one lose the output of one kiln, there has been l only one-tenth of the output of one large kiln. I ha roasted Elm Orlu fines as low as 0.3% fault sulphu 0.8 to 0.5% are common results. This may not se low to some users of Joplin ore, but to any one handli a flotation product 80% of which passes throu 200 mesh the results are satisfactory.

The sulphur dioxide gas from the Spirlet furna is of even tenor and will vary only a few tenths of in a day. Plant B Spirlets are operated at about 7.5 but the gas can be run up and held at as high

10%, though this amount is not conducive to a good roast. The SO_2 content of the gas is controlled by readings on an automatic sulphur-dioxide recorder.

The following description brings out the peculiar difficulties that had to be overcome in installing a battery of de Spirlet furnaces at Plant B of the National Zinz Co., in a building already constructed. The improvements required upon the original plan indicate the importance of thorough mechanical design.

The furnaces were erected in a building which had previously contained two lump burners and four Herreshoff pyrites burners, all on heavy concrete foundations, which now had to be removed. The roof trusses of this building were of wood and were entirely too low for the proper installation of a crane-run and other overhead equipment. The building had a central line of concrete columns, which prevented an efficient sulphur-dioxide gas-flue layout. When the first three furnaces were built, not enough consideration was given to the possibility of a future enlargement of the battery.

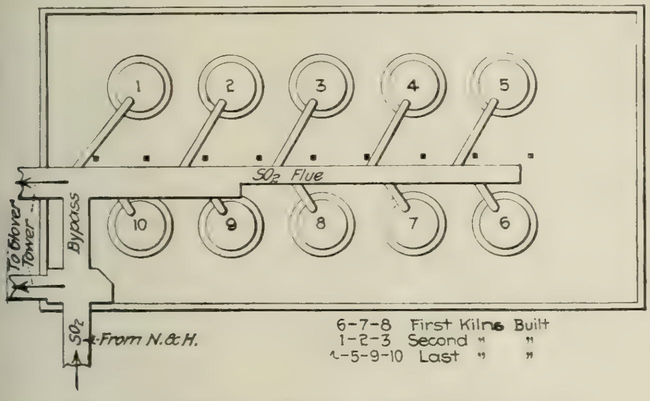


FIG. 2. GENERAL SPIRLET FURNACE LAYOUT

The underground carbon-dioxide flue, built from motives of economy in such a position as to miss the foundations of the old burners as much as possible, was found unsatisfactory and inadequate when the battery was enlarged to ten furnaces. It was difficult to incorporate this first flue in the completed scheme so as to get a compensated draft which would be equal at each unit of the battery. The sulphur-dioxide flue layout was not consistent with good practice for the completed battery of ten kilns, because of the location of the old lump burner flues and their dust chambers, which were incorporated in the new layout. The flue was not compensated uniformly in cross-sectional area for the increased volume of gas carried as it approached the Glover towers.

The conditions enumerated resulted in excessively high velocity in the main flue, which was imperative in order to insure sufficient local draft on the most remote kilns. This condition necessitates a great deal of draft control, as it is necessary to keep the kilns regulated so that the gage shows only about .4 mm. suction on the up-take of the local flue. This regulation is made by a butterfly damper in the thimble of the out-take hole of the top shelf.

The height, being only 27 ft. to the bottom of the wooden trusses, was not sufficient for the best crane-run installation, because the crane could not be placed in the clear above the ore-charging hoppers. This causes extra expense when dismantling a kiln, as it is necessary to take down all feed pipes between the crane, wherever it happens to be, and the kiln upon which we wish to use it. All these conditions were caused by the installation of new kilns in an old building.

In making references to the different units, the numbers will be used as shown in the plan in Fig. 2.

No. 8 was the first kiln built, and the first change was in the supporting lugs and rollers. In the original foreign design, the moving hearth was supported on the gear circle by 16 cast-steel lugs, which rested in cast-steel seats, which in turn rested on a lug, which was merely a widening of the horizontal web section of the cast gear circle. Each one of these cast-steel lugs had a semicircular indenture in the under side, which was supposed to rest on a small roller, which, in turn, was designed to rest in the cast-steel seat, or dogs as they were called. The difficulty of keeping sixteen ¾-in. rollers in place while trying to land a circular hearth 14 ft. in diameter and weighing about five tons can readily be understood. The change was to omit eight of these supporting lugs and to lose sixteen ¾-in. rollers. The stationary shelves had only six lugs, so no reason was apparent for 16 on the moving shelf. If the six lugs would withstand the strain of rotation imposed by the load, or in case of conflict between the two hearths, eight lugs would certainly drive the hearth. The new American design has only six lugs on each hearth.

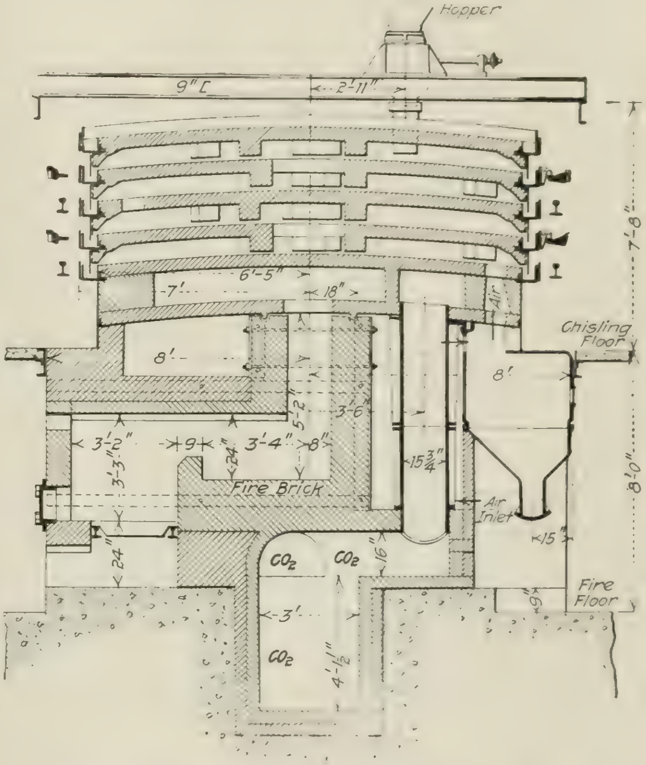


FIG. 3 SECTION OF ONE OF THE FIRST SPIRLET ROASTING FURNACES ERECTED

The second change was in the worm-gear drive of the vertical shaft. The kiln is worm driven, that is, the local driving shaft, which is $3\frac{1}{16}$ in., carries two pinions (of fifteen 1½-in. pitch teeth, with 5-in. face) that engage the above-mentioned gear circle of 316 teeth. This is the old design. The local driving shaft carries a worm wheel, and the shaft from the source of power carries the worm. The worm and wheel were inclosed in a cast-iron gear case with cover. The designing engineer placed this worm and case below the floor and in a recess in the preheating air chamber, thus making it impossible to work on the contents of the worm case without dismantling the whole drive mechanism of the kiln. By putting the worm case at the upper end of the drive shaft the defect was remedied.

The third change was in the motor drive. The specifications called for a rotation period of from eight to twelve minutes, and the designer obtained this speed by a series of reducing gears and a high-speed motor. These gears were noisy and troublesome. A low-speed motor of 300-375 r.p.m. and a 42-in. pulley on the worm shaft was adopted. The fourth change was in the feeder, a cam-action device of the shaker type that was unsuitable for the ore, consisting, as it did, of flotation fines 80% of which would pass through a 200-mesh screen. This cam feeder was noisy and was also always becoming clogged. It was replaced with a rabble feeder that worked on the top moving shelf. This feeder was later discarded for a ratchet-driven worm feed. The fifth change was to put a local damper in the thimble on the top shelf for controlling the fan pull on the kiln.

The changes thus far described were made in the first three furnaces, Nos. 6, 7 and 8, before the kilns had been three weeks in operation. Bar grates were changed to step grates in order to handle the coal better. I had nothing to do with the changes noted, as I was unacquainted with the Spirlet furnaces until the company had decided to construct three more kilns.

ADDITIONAL CHANGES IN FURNACES 1, 2 AND 3

The following changes were made in furnaces Nos. 1, 2 and 3: Not being faimliar with the kilns at the time, I hesitated about materially changing the design, but one thing that struck me forcibly was the expensive brickwork that composed the furnace housing and preheating air chamber. The old-style furnace housing required 384 mason-hours; the new American furnace housing requires 64 mason-hours. Also, I was not satisfied with the construction of the furnace framework, as the six columns which supported the kiln proper started at the fire-room floor level and projected up through the chiseling floor of the kiln. The concrete chiseling floor was carried on steel beams, which were framed into the furnace columns by poor connections. To get around this feature, I poured the concrete chiseling floor and the columns below the chiseling floor in one mass; and also poured the preheating air chamber of concrete, leaving out a space in one side for the fire box, which I built of brick.

The three large cast-iron ore hoppers, which received the roasted ore, were replaced by sheet-steel hoppers, which were only a plate and sheet throat, the sides and outside face being of concrete and brick. The columns carrying the furnace were then placed on the working floor and were made shorter, and therefore did not vibrate like the columns of Nos. 6, 7 and 8. The next change was in the profile of the hearth. The original hearth was the section of a sphere, having a rise from the outer edge to the center of 4 in. This was changed to a conical hearth with a total rise of 7 in. in building up to a circle, which was 17 in. from the center. It was topped out with a spherical section, that brought the actual height to 6 in. This was later discarded, because a 6-in. rise was too great for ore traveling from the edge to the center of the hearth. Now a conical hearth of 4½-in. rise is built, and it works well.

The shape of the rabble, or tooth, as it is called, was changed by cutting out on the back face to insure more clearance for the ridges of ore to pass between the teeth. The bottom of the tooth was also given ¾-in. rake. The next change was to re-design all furnace tile, making the sides of the tooth-block radial, instead of parallel to each other. This eliminated a number of special shapes. All plain-hearth tile was lengthened 8 to 12 in. and tongued and grooved on the ends. In the original design, only the sides were tongued and grooved. This change gave a tighter and stronger hearth, with fewer joints. I also changed the structural shapes which were used in fabricating the hearth ring.

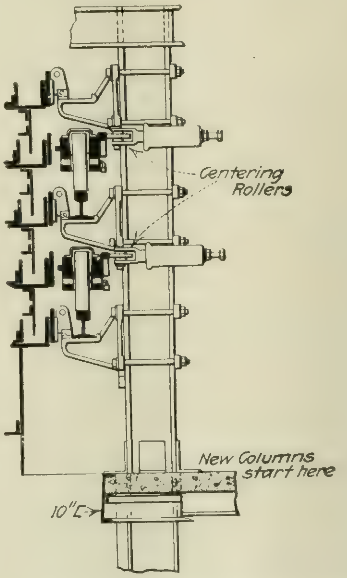


FIG. 4. DETAIL OF HEARTH SUPPORT

Operating troubles at the plant were, however, only partly solved. New mechanical difficulties began to appear, the greatest being inability to keep the moving hearths centered. In the original European-designed furnaces this was accomplished by running an idle roller on the shroud of the large cast-steel gear ring. This roller was about 5 in. in diameter and only about 1½ in. thick and was held in place against the shroud of the gear by being axled in a yoke on the end of a plunger, which was backed up by a helical spring and disc. The plunger and spring were incased in a closed-end cast-iron cylinder, the closed end of which was drilled and tapped for a ⅞-in. bolt, which could be screwed up against the disc, forcing up the spring and thereby increasing the pressure against the shroud of the gear circle. Two of these roller-plunger devices were fastened to each column at the proper levels to meet the gear circles. It was found that when the bolt was screwed in the cylinder enough to keep the hearth centered, the spring was compressed to solidity; and when this was done, the roller could not stand the stress, and it was necessary to replace axles or rollers continually. The wear in the axles was attributable to uneven wear on the roller face, causing it to rotate in a plane out of the horizontal, thus cutting out the axle on one side.

The first attempt to remedy the difficulty was to put two idle pinions with a 5-in. face (the same face as the gear) on one shaft, one pinion being at each gear circle level, at each column; but it was found that the tangential thrust of the gear, due to the drive trying to push the gear off at tangent, caused excessive wear and poor meshing of the teeth of the idle pinions. These were discarded for plain rollers, having a 2-in. face and an 8-in. hub-bearing on the shaft, and working against the shroud of the gear, as the first rollers had done; but all springs were discarded, because it was essential that the gear circle remain accurately centered. The arrangement worked well.

The gear circles next gave trouble. These were cast in four segments and were connected by four ⅞-in. bolts at each joint, but the connection was weak, because the bolts were spaced too close together radially; that is, the joint had a tendency to spring in. This was owing to the tangential driving thrust and because the bolts would stretch, on account of the long lever arm, which in this case was the cord of a quadrant of the gear. The trouble still continues and the only remedy found is to watch the bolts and keep them pulled tight, and replace them all when repairs are made. This trouble has been eliminated by the 90-lb. 5-rail continuous rail circle of the American Spirlet.

After the completion of kilns Nos. 6, 7 and 8, and 1, 2, and 3, orders were received to build four new kilns. The old drawings were discarded, and the new American Spirlet as herewith depicted is the result. The most important item in building a Spirlet kiln is the making of the arch tile. Great care should be taken in moulding and in burning out all shrinkage, because the low crown of the arches will not admit of much shrinkage.

Mr. Chase, in a recent article, gave the average life of a Spirlet kiln at only three months. At Plant B there is one kiln that has run continually 15 months and is still doing good work, and the life of the kilns is placed at one year, and with careful operation it is expected that they will last longer.

Yuba No. 17 All-Steel Dredge

By Lewis H. Eddy*

Yuba No. 17 all-steel California-type bucket-elevator dredge, built by the Yuba Manufacturing Co. at Marysville for the Yuba Consolidated Gold Fields, at Hammonton, Calif., began digging on May 5, 1918. It is the second dredge in the state to be equipped with 100 buckets of 18-cu.ft. capacity. The first was Yuba No. 16, which is the only two-stacker dredge designed for reclaiming a waterway[1]. Yuba No. 17 is, like all other dredges built solely for gold dredging, equipped with one stacker. Details of dimension and equipment were described in illustrations and text on pages 374 and 375 of the *Journal* of Feb. 23, 1918.

The dimensions and equipment of Yuba No. 17 are practically the same as those of Yuba No. 15, which started digging July 3, 1916[2]. The differences are chiefly in the size of the buckets and the length of hull. Yuba No. 15 is equipped with 100 buckets of 17-cu.ft. capacity, and the hull is 10 ft. longer than Yuba No. 17. The digging ladders and the stackers are the same length, and, though Yuba No. 15 was designed to dig 82 ft. below water line and the Yuba No. 17 to dig 85 ft., both boats will exceed the designated depth when the occasion requires. The photographs which appear on the next two pages of this issue were taken after the dredge began digging and are so similar to the photographs of Yuba No. 15 that the differences are not discernible and one might easily be taken for the other dredge. They are practically twin boats. Whether Yuba No. 17 will excavate a greater yardage of gravel in a given time remains to be decided after it has been given a fair trial in similar ground.

The time occupied in construction of Yuba No. 17, from the laying of the first steel, on Aug. 4, 1917, to the date when operations began, May 5, 1918, might require some explanation in any other than present times. From the beginning of construction to the launching, on Nov. 14, 1917, only 76 days were occupied in actual construction work. But from the day of launching to the date of completion there were continual delays in receiving material, which interrupted and retarded construction work in the field as in the shops. Situated, as California is, at such great distance from the steel manufactories, the Yuba Consolidated Gold Fields is most fortunate to have the dredge now completed and in operation.

Malarial Fever in Brazil

Steps to combat malarial fever in Brazil are seen in the recent establishment of a sanitary and prophylactic service, the first official act of which will be to insure a supply of quinine, of guaranteed purity and at a minimum rate, to the public. Vice Consul Richard P. Momsen, in *Commerce Reports*, gives a translation of the decree creating the official quinine service, from which the following articles, of more than local interest, are abstracted:

> The tablets shall be of the exact weight of 10 and 20 cgm., and of 1 gm., packed in glass or similar tubes, hermetically closed with a capsule or seal of guarantee, and labeled with exact directions for use, together with the official cost of the product.
>
> The solutions, sterilized according to the requirements of the medical profession, must be put up in doses of 1 cc., to be injected at one time under the conditions of ordinary medical practice, and with the same guarantees of seal and label of contents.
>
> The official quinine shall be sold in all domestic territory at the same price, fixed by the government and estimated according to the variations of the world's markets, and mentioned on the respective labels.
>
> The price of quinine will be fixed by the average price of sulphate of quinine in the Amsterdam market during the preceding fiscal year, the selling price to be fixed at the next monetary denomination above the cost thus established.

Engineers who visit malarial districts of Brazil will appreciate the steps being taken by the government to reduce the destruction and loss caused by the fever, both by means of the service mentioned above and also by the organization of medical commissions which were authorized at the same time.

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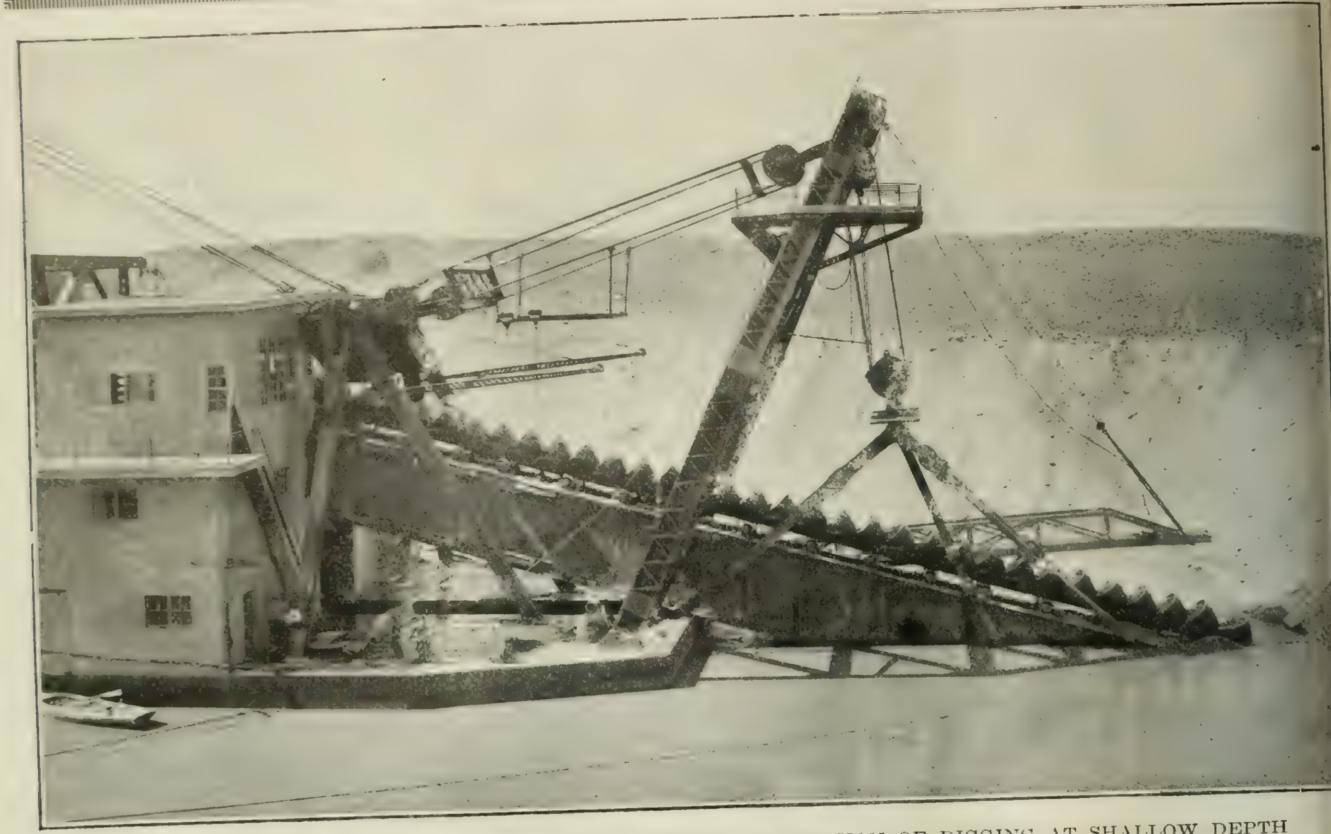
*Associate editor, "Eng. and Min. Journ.," Sran Francisco, California.

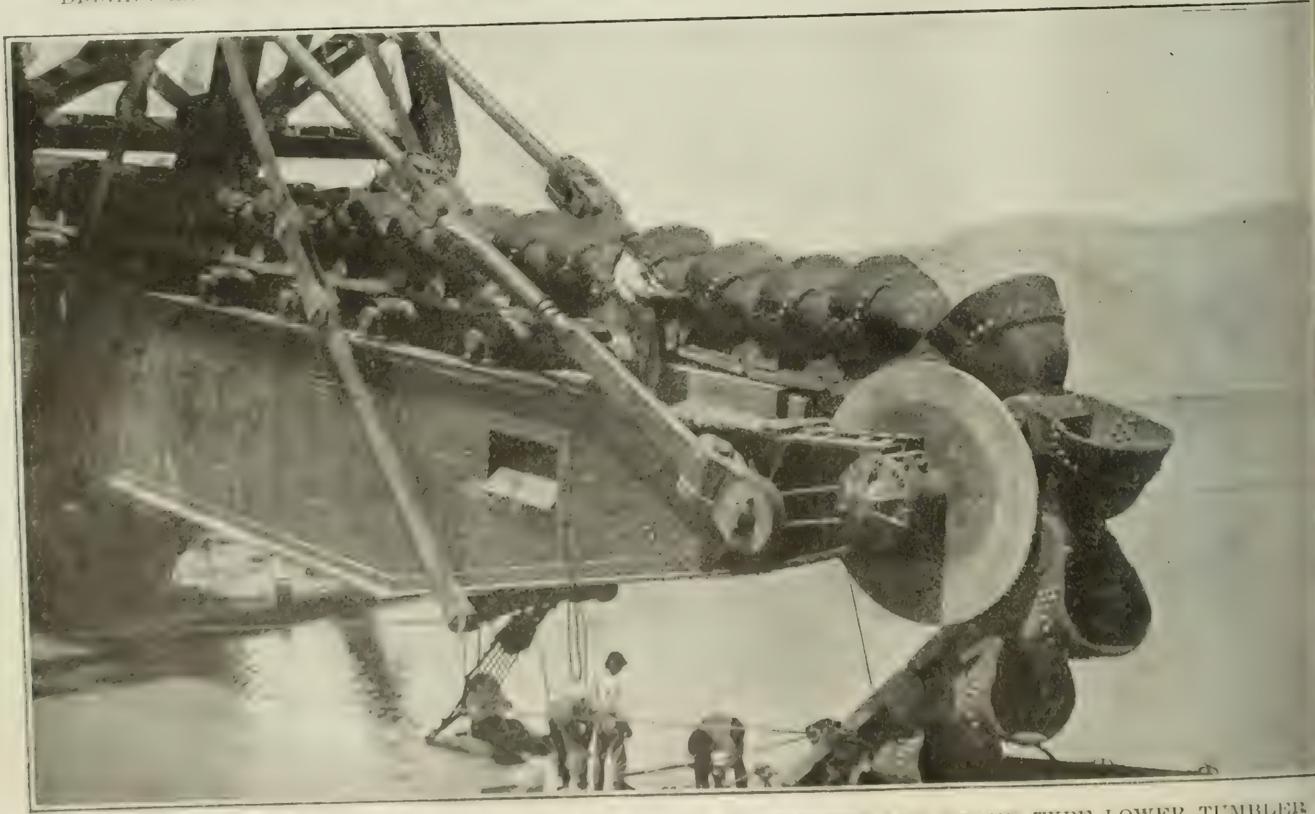
[1] "Eng. and Min. Journ.," Dec. 1, 1917, p. 945.

[2] "Eng. and Min. Journ.," Aug. 19, 1916, p. 329.

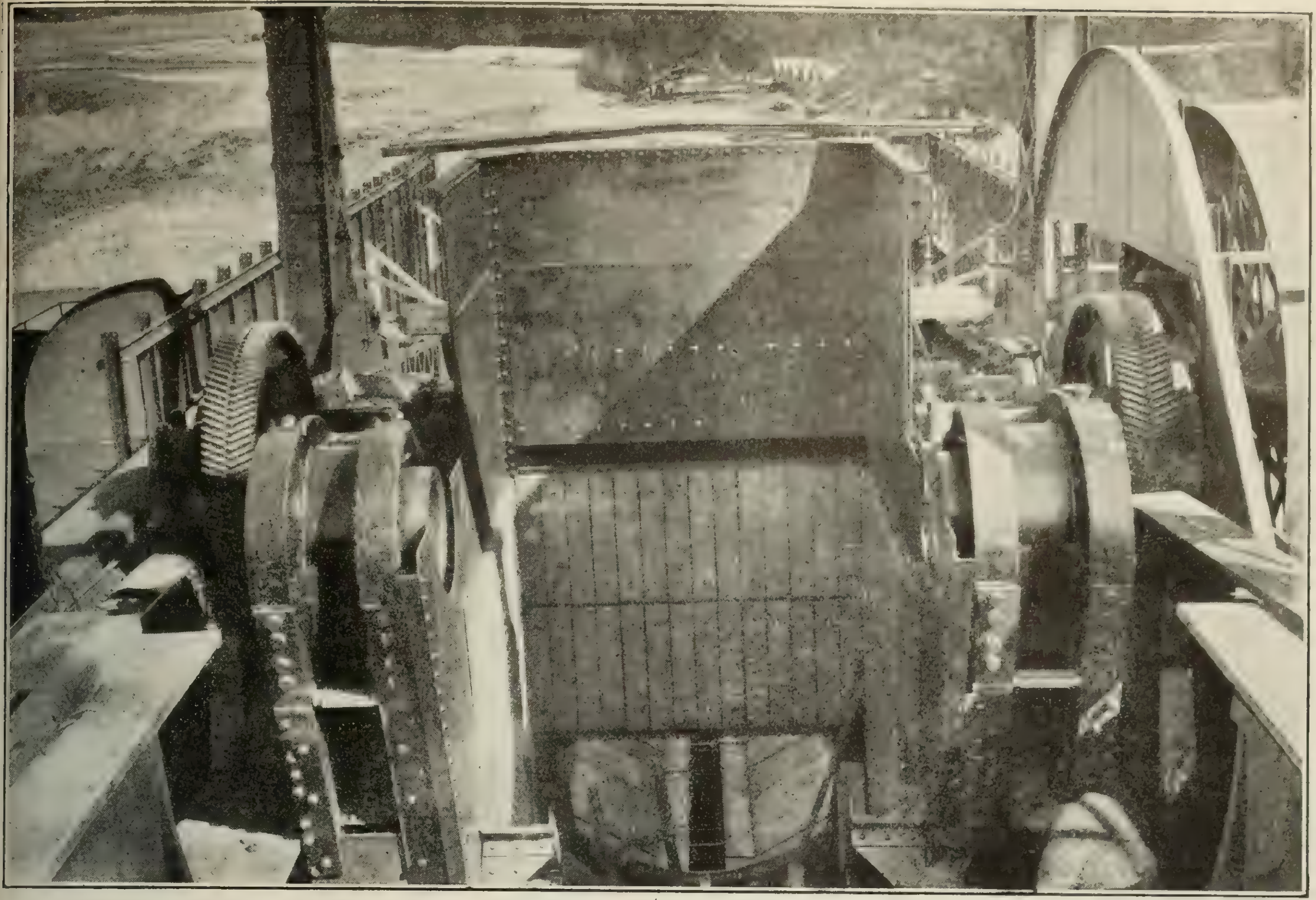
Yuba No. 17 All-Steel Dredge



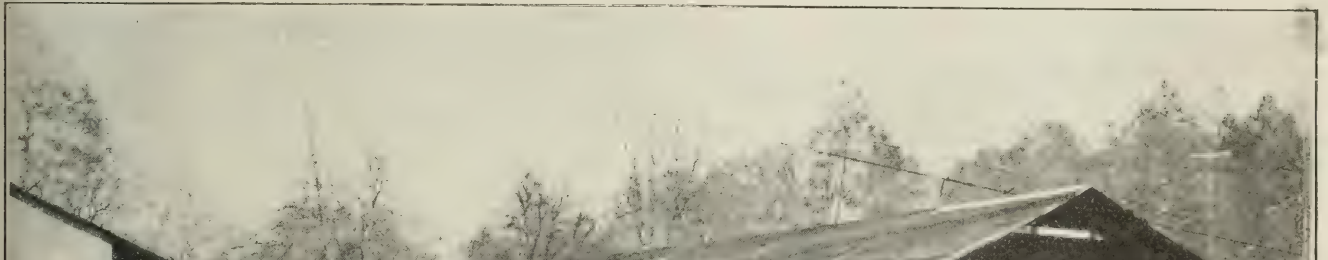
DIGGING LADDER OF YUBA NO. 17 ALL-STEEL DREDGE IN POSITION OF DIGGING AT SHALLOW DEPTH



DIGGING END OF DIGGING LADDER, SHOWING DESIGN OF BUCKETS AND ROUND TYPE LOWER TUMBLER



INTERMEDIATE GEARING OF MAIN BUCKET DRIVE ON YUBA NO. 17 ALL-STEEL DREDGE



SAFETY GUARDS FOR GEARING ON YUBA NO. 17 DREDGE, WHICH BEGAN OPERATIONS ON MAY 5, 1918

Zinc in Missouri, Kansas, Oklahoma And Arkansas[*]

BY OTTO RUHL

A comparison of production figures and a forecast of future operations in four important zinc-producing states. Factors causing uneconomic production are detailed; prices of product and cost of operation tabulated, and the labor question, the problem of the increasing cost of supplies, and the effect on efficiency of the influx of new and sometimes inexperienced workmen are discussed.

DETAILED discussion of the subject of zinc mining and production of Missouri, Kansas, Oklahoma, and Arkansas would have so many ramifications as to make the subject too involved and long for the purpose of this meeting; therefore, only the salient features will be considered and the subject will be handled in a general way.

PRESENT SITUATION IN MISSOURI AND ARKANSAS

Present production throughout Missouri and Arkansas is below normal. Oklahoma and Kansas are supplying the bulk of the output from the four states named, and show the greatest activity now to be recorded in the zinc-mining industry. The situation in the State of Oklahoma, however, is unique in that present production is the fruition of effort begun two years ago. But even in Oklahoma the situation is growing more difficult, and production in many cases is being maintained at a loss—a feature which is bound to result in disaster when this economic law is violated. Bound up inextricably with zinc mining is the byproduct lead, a byproduct which, in the Oklahoma field, is much more important than elsewhere in the district. This, too, has had its effect upon maintaining production in that district as opposed to others.

A decline in the Missouri production is markedly noticeable, and is exemplified by the different shipments from the principal camps of the district. Formerly the Webb City-Carterville sheet ground camps produced, on an average, 3000 tons per week and seldom less than 2000 tons. At present this camp is shipping on an average less than 500 tons. The Joplin camp formerly shipped from 1000 to 1500 tons, whereas 300 tons per week is now seldom exceeded. The same effect may be noted upon the other mining camps of Missouri. It is apparent that the Missouri district has been cutting down its output radically.

Kansas production, so far as the old Galena camp is concerned, has shown a tendency toward curtailment; but to take the place of the old camp there have come into prominence two new sections of the state, which have more than made up for the deficiency. The Waco-Lawton field has increased output to from 100 to 400 tons per week; and in the area north of the Kansas state line, and north of the Picher, Okla., camp, a number of producers have made an output of from 250 to 500 tons per week. There is, therefore, a net gain in the Kansas district, in spite of the bad conditions prevailing in the market.

The Oklahoma district has shown a consistent and steady growth, until today it is, or will be by the end of the year, the leading producer of the four states named. Its shipments are now running from 3000 to 5000 tons per week; and, owing to the number of new producers whose development work is not yet completed, but which is still under way, there is likely to be a continuance of output even in the face of untoward conditions. Shipments of ore for the entire Missouri, Kansas, and Oklahoma district, for the first seven months, have averaged approximately 9125 tons per week, of all grades of zinc ores. Shipments during the months of January and February were the lightest of the year; beginning with March and extending through to the last part of June they have been heavy. The shipments of all grades of zinc ores by months are as follows:

Month	Tons
January	32,995
February	22,250
March	47,955
April	45,810
May	44,315
June	43,900
July	33,510

This makes a total of 270,735 tons for the first seven months of the year, and is 16,785 tons less than the output for the same period last year.

PRODUCTION AND PROSPECTING DECREASED IN ARKANSAS

Conditions in the Arkansas fields are practically the same as in Missouri. There has been a decided slowing down in new prospecting, as well as in actual production. Always a comparatively small factor in the production of zinc ores of the country, it has become still less a producer since the advent of higher mining costs and lower prices. I have no statistics of the production for the seven months just closing.

CALAMINE OUTPUT IN JOPLIN DISTRICT DECLINES

There has been a decided drop in the calamine output of the Joplin district. From a ratio of 10% of the blende ores five years ago, there is now less than 3%. In other words, of the 270,000 tons of ores produced the first seven months of 1918, considerably less than 6000 tons was calamine. Of the blende ores, the ratio of first grades to all other grades has been a question of investigation for the last four months. The High-Grade Ore Producers' Association of the Joplin district undertook a census of the field, based upon assays of the ores produced, and found that approximately 3400 tons of such ores really existed, or were potentially possible, in the field. This grade was established upon the basis of less than two tenths of 1% lead, less than 2% iron and 60% minimum for zinc. It has been shown by the actual working of the agreement between the ore producers and the sheet-zinc producers, that it is possible for many second-grade ore producers to place their product, or a large portion of it, in the first-grade class by the proper method of milling and care in selective mining. Of the production shipped during the first part of 1918, approximately 100,000 tons of the blende ores was of first grade, and the remainder intermediate or second grades and calamine.

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[*] An address to the American Zinc Institute at St. Louis, July 30, 1918

PRICES OF THE PRODUCT

The markets for the year have been exceedingly unsatisfactory, from a profit standpoint. A glance at the average prices paid for the year discloses the trend of the market. The following table shows the average prices of all grades of blende ores by months:

Month	Blende	Calamine
January	$57.02	$32.67
February	55.00	33.00
March	50.14	34.73
April	42.03	32.93
May	47.79	31.00
June	52.07	31.77

As compared with the previous year, the average of blende-ore prices is $16 lower and calamine $11 lower.

COST OF PRODUCTION AND CHANGES TO BE NOTED IN MINING CONDITIONS

At the meeting of the American Institute of Mining Engineers at Joplin in October, 1917, a report was presented, based upon a careful examination of mining costs and the conditions then prevailing, which showed a rapidly rising cost of production, brought about by rising costs for supplies and labor. In a report then made to the War Minerals Committee, the rock cost of mining in the Joplin camp was given at $1.46; in the Webb City camp at $1.27, and in Oklahoma at $1.89, without including royalty, depreciation, and depletion. With these added and on the basis of 2½%, 3%, and 5% recoveries for the various camps, the concentrate cost became $64.40, $65.30, and $54.80 per ton, respectively. Since that time, cost of supplies has advanced, labor has become more scarce and less efficient, and many of the mining organizations are disrupted by reason of so many of the younger men being taken into the Army. It is now believed that a similar census would disclose costs from 10 to 20% higher, and there is no end in sight with regard to advances in materials and supplies.

LABOR CONDITIONS AFFECT EFFICIENCY

The shortage in labor has been growing week by week. Especially has this been true of the shovelers. The shovelers are the younger men, and it is this class that the draft has taken. This makes it inevitable that older men must do the work, which in turn means less efficiency and higher costs. The actual inability to replace men at all is becoming really serious, and it now appears certain that this factor alone will result in curtailment on a fairly consistent scale. It also probably means the beginning of the district's labor problems. Driven to seek other labor, some of the mines have undertaken to hire Mexicans on jobs where white men refuse to work, but the native Americans immediately threatened them with trouble. There is therefore little hope for importation of labor. Some of the mine operators are seeking to solve the labor problems by installing shoveling machines. The experiments seem promising from the point of view that the machines at least do the work, but, so far, at no less cost. That shoveling machines will be utilized in increasing numbers seems certain, and they constitute, so far as any one can now observe, the only avenue for labor relief.

Added to more expensive labor is a marked increase in the cost of supplies. Not only have supplies advanced, but a shortage is developing which may seriously affect roduction. The replacement of machine parts, certain kinds of steel, rope and cable, pipe and many other necessary supplies, is an uncertainty for the future, and already has been extremely difficult in some cases. Then there is the ever-growing difficulty of obtaining fuel; and, added to that, higher freight rates. Verily the zinc-ore producer needs not only the patience of Job, but an ability to perform miracles, in order to keep his plant going in the face of the conditions now prevailing.

It is evident that an automatic cutting off of production will result in those mines whose cost of production goes above the average market price received. This reduction would be in direct proportion to the rise in the cost of mining and the percentage of ore recovery if the Joplin producers were running their operations entirely upon business principles. But they have within their ranks a large proportion of men who "live by faith alone"—who can instill optimism in their stockholders and obtain leniency in the matter of credit with supply men. There is also a considerable number who have no cost system, and they really do not know they are going broke until the Creditors' Association takes charge, and even then they doubt it, so strong is their optimism. Therefore, calculation based upon an elimination table, in which the factor of cost and ore recovery enters, would have to be discounted, on account of the above-mentioned personal factors.

INFLUX OF INEXPERIENCED MEN

One other feature entering into production estimates, especially in Oklahoma, lies in the fact that so many new men have entered the industry. All these new men have not had either the experience or received the competent advice which would make them as efficient as the common standard of the district. Naturally there have been many mistakes in building certain plants which will never be factors in production, but which appear to have potential plant capacity. In reality such monuments create a false impression; they have burdened the industry with additional capitalization, and have absorbed useful material and sorely needed labor. The promoter has done a wonderful work for zinc mining in Oklahoma, but his ever-optimistic prototype is leaving behind him a heritage of difficulty which it will take considerable time to alleviate and a much longer time to correct. From the above-mentioned conditions, it is easily noted that apparent potential production is not always realized; and that from it may come an output based on mistaken economic facts that have injured the industry as a whole.

Some months ago the surplus stock of zinc ores in the bins of the ore producers totaled in excess of 30,000 tons—the highest figure, to my knowledge, in the history of the industry. It has been reduced by the shutting down of plants, curtailment to single-shift operation, and sales, to approximately 18,000 tons, or the equivalent of two weeks' average shipments. But beginning with March, 1918, the serious conditions outlined had so struck home to the operators of the Joplin field that even the greatest optimist realized that production below cost could not go on, and that some remedial measures must be taken.

It was at this juncture that the High-Grade Ore Producers' Association was formed, and took up the work of securing Government help in stabilizing the market of the mining industry. Through Pope Yeatman came the suggestion that there should be coöperation between the smelters and the producers of high-grade ores. After some weeks of effort, such an agreement was made between the sheet zinc manufacturers and the Joplin high-grade ore producers, which resulted in disposing of approximately 1300 tons of high-grade ore weekly on a $75 base, or a little above the cost of production. This materially helped the fortunes of the ore producers of the district; and it is hoped that the result of that beginning in coöperative action will bear fruit in the larger organization planned at this meeting.

SUMMARY

Summed up, the conditions in the production of ores in the four states of Missouri, Kansas, Oklahoma, and Arkansas are as follows:

1. Production is now running behind that of 1917, but shipments have averaged 9125 tons weekly.
2. Production activities are greatest, and will continue to be so, in Oklahoma.
3. Present economic conditions favor curtailment.
4. The peculiar factors of over-optimism and new and inexperienced operators have complicated any intelligent estimate as to future production, have added burdens, and have absorbed needed supplies and labor.
5. Coöperation on a small scale has helped to stabilize production, and lends hope for greater success with more extensive organization.

The American Sheet-Zinc Industry*

BY E. H. WOLFF†

The use of sheet or rolled zinc in the United States has been restricted to well-defined limits, and the commercial growth of the product has been slow as compared with other sheet metals. During a period of 40 years or more, practically the entire requirements of this country had been produced by the two principal companies; and for many years prior to the war there was not sufficient business to keep these mills in operation to more than 60% of their capacity. The war has created a demand for sheet zinc in those foreign countries which Central Europe had supplied during peace times; and this demand, together with the needs of this country for war purposes, has brought other American mills into the producing field. The capacity of one of the Illinois mills is now being increased about 50%. The other Illinois mill can be increased in like proportion.

One of the functions of the Zinc Institute should be to appoint a strong committee on research or metallurgy, to coöperate with the companies directly interested, and to find new and practical uses for rolled zinc, in order that all these mills may be kept in operation after the war. Another function should be the operation of a well-organized export and import department. During the pre-war period our American industry could not export to the present consuming countries outside of Europe, because of competition at lower prices. During the war period Japan has been the principal buyer of sheets in thin gages, but knowing that Japan is at this time endeavoring to market its electrolytic spelter in America, and knowing, too, that it is preparing to roll sheets for home consumption, that country can be disregarded as a possible consumer after the war.

There are, however, other countries now using the American product whose business we might retain for some years. It may not be generally known that our industry was seriously invaded by the German and Belgium sheet producers during the few months prior to Aug. 1, 1914. The base price then prevailing in this country was 7c. per lb., less usual trade discounts, which was about the cost of production. The foreign product was delivered at New England ports, ocean freights and duty paid, at the rate of 15% ad valorem, at ½c. per lb. lower than that realized by the American producers. The tariff law enacted by Congress in the autumn of 1913 reduced the protection afforded prior to that time, giving an advantage to the foreign producers, of which they soon availed themselves. The American industry was thus face to face with a condition that would have meant ruin had it continued for a space of time, but the competition was cut short by the beginning of the war in Europe.

As a national body, the Zinc Institute would be an organization to present properly the claims of the industry for a protective tariff on all zinc products, but more especially on sheet zinc and spelter. The necessity for such a tariff will undoubtedly come, and this organization should be in a position to meet the situation. That benefit may be derived from coöperation was clearly demonstrated several months ago when the high-grade ore producers and the purchasers of these ores adopted a working basis for grades and prices. This arrangement, to the best of my knowledge and belief, has been continued up to this time with satisfaction to all concerned.

I heartily endorse the organization of the American Zinc Institute on a national basis, with all branches of the industry represented, and congratulate the group of men who conceived it. I predict for the industry, through the medium of the organization, the beginning of an era of advancement that could not otherwise be attained. Every one in any manner connected with the production of zinc, from the ore producer to the fabricator, should be urged to subscribe to its membership. A spirit of coöperation for the general good of the industry should prevail. Trade publications should be urged to coöperate by upholding the American zinc industry as an American institution. The war has taught us many things, but none of more significance than that hereafter we shall all be for American products, first, last, and always!

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

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*Slightly condensed from a paper read before the American Zinc Institute at St. Louis, July 30.

†Secretary and general manager Illinois Zinc Co., Peru, Illinois

The Use of Pulverized Coal*

By H. R. Collins†

Methods of preparation of pulverized coal detailed and the advantages in the adoption of the system enumerated. The principal features of modern practice are presented in condensed form, and the economies said to result from the substitution of pulverized coal discussed, with details of savings effected in various types of furnaces.

THE purpose of pulverizing coal before burning it is to make available every heat unit that it contains. Machinery has been developed which will pulverize coal in one operation, delivering it to bins in front of the furnaces at an expenditure of about 17 hp.-hr. per ton, in a medium-sized plant. The cost of the operation depends upon the amount of moisture that must be expelled before pulverizing, the wages of labor, and the price of coal delivered at the plant. At a small plant, requiring a pulverizer with a capacity of only ½ ton per hour, the cost per ton pulverized will naturally be greater than at a plant requiring the largest pulverizer, possessing a capacity of seven tons per hour.

Preliminary Crushing and Drying

The first step is to reduce large lumps to a size suitable for drying uniformly, before passing to the pulverizing mills; this is done in rolls, at a single pass. The second step is the elimination of moisture, in order to facilitate pulverizing to great fineness, while also increasing the heating effect and the temperature attainable when the coal is burned. There are other mechanical advantages in the handling of dried coal. Driers are now manufactured which are able to eliminate moisture without distilling any of the volatile combustible matter in the coal. They are fired by hand or with pulverized fuel. The heat first surrounds the shell of the drier, being confined within a chamber where complete combustion takes place; the heated gases are then led through a duct to the discharge end of the drier and enter the inside of the shell at a temperature not exceeding 300° F. This temperature is maintained by the operator and is indicated by a pyrometer. Volatile combustible matter is not likely to be distilled until the temperature rises above 400° Fahrenheit.

Elimination of Iron and Pulverizing

On discharging from the drier, the coal is usually passed over a magnetic separator in order to prevent pieces of iron from going to the pulverizer. Two types are used: a magnetic pulley which automatically discharges its collection of iron, and a lifting type, from which the iron is removed by hand when convenient. In the operation of pulverizing, the coal should preferably be reduced until 95% will pass through a 100-mesh and 70% through a 300-mesh sieve. Such a product is obviously an almost impalpable powder. After pulverizing, the fuel is conveyed by one of several methods to the point where it is to be used. In several installations the pulverized coal is conveyed a distance of over 900 ft. Where possible, a bin should always be installed at the furnace, in order to guard against interruption of supply.

Feeders are practically indispensable for regulating the passage of the fuel from the bin to the burner. They are now made of simple design and are highly efficient. They deliver the pulverized coal in definite quantities into an air current of fixed volume, where the air disseminates the pulverized fuel, surrounding every particle and putting it into condition to develop all its energy. The first to ignite are the volatile gases; these raise the temperature to the ignition point of the solid carbon, and before leaving the zone of heated air every particle has released its last heat unit. It is entirely possible to obtain temperatures ranging between 1900° and 3500° F.; the highest temperature (3500°) I have observed was in an openhearth, when the average temperature of the furnace itself at some time ranged from 3100° to 3200° Fahrenheit.

Advantages in Pulverizing Coal

To justify the expense of erecting a special building and installing special machinery to pulverize coal, the following advantages in its use may be enumerated:

1. Conservation of the country's fuel, by utilizing every heat unit in the coal, made possible by this method of consumption.

2. Reduction of labor for handling coal to the point of consumption, handling by the fireman, and the removal of ash and unconsumed fuel from the ashpits; practically all this expense is avoided when fuel is burned in pulverized form. All the coal is received at one point, and thereafter it is handled entirely by automatic machinery, the human element being thereby eliminated, except for supervision, adjustment, and necessary repairs.

3. From actual experience with many grades of coal, I believe that every carbonaceous fuel in solid form, from lignites to the graphitic anthracites of Rhode Island, will yield its maximum measure of heat if burned in a truly pulverized condition.

4. Coal in pulverized form can be injected into a furnace on a column of air at very low velocity, thus allowing the expanding gases to liberate their heat without erosion of the refractories.

5. Pulverized fuel permits the maintenance of a constant temperature in a furnace when the relative amounts of fuel and air have once been set and the body of the furnace has been brought up to the desired temperature. It will continue thereafter under what is known as a test condition. Furnaces can be operated in this manner hour after hour, as shown by charts of recording pyrometers. The correct relationship between the amount of pulverized fuel and the volume of air, for any desired temperature, can be controlled automatically, after adjustment to the particular grade of

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*From a paper to be discussed at the Colorado meeting of the A. I. M. E., September, 1918.

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coal in use, thus using a minimum of excess air. Gas analyses have been obtained showing as high as 17% of CO_2.

Pointers in Pulverized Coal Practice

Many questions are asked on the subject of pulverized coal, and I have arranged the answers to them in the following order:

1. *Grades of Coal Used Successfully*—For kilns, boilers, or metallurgical furnaces, coals of about 35% volatile, 50% fixed carbon, 8% or less ash, and 2% or less sulphur, are preferable.

2. *Experience with High-Ash and High-Sulphur Coal*—Coals analyzing 25% ash and 5% sulphur have caused no trouble in kilns, boilers or metallurgical furnaces. Experience shows that sulphur is entirely consumed by burning in suspension, none of it being absorbed by the metal or other liquid bath, as occurs in the usual copper reverberatory furnaces used for melting electrolytic copper.

3. *Provisions for Storage*—Storage bins for pulverized coal should be dust-tight and have steep hoppers, enabling old coal to leave the bin completely; accumulations of old coal are liable to fire, smolder, and coke, causing more or less annoyance.

4. *Why Coal Should Be Dried Before Pulverizing*—(*a*) To facilitate the pulverizing operation, giving the finest product with the least power consumption. (*b*) To permit high temperatures with the least consumption of fuel. Drying of the coal also promotes uniformity of temperature. (*c*) Dried coal will flow more easily from bins and through the feeders and burners. Coal should be dried to 1% of moisture, or less when possible, except that lignites can be readily handled with 5 to 8% combined moisture.

5. *Fineness of Grinding*—The finer the coal the more rapid its combustion, with relatively higher efficiency. It is commercially and economically possible to grind coal so that at least 95% will pass a 100-mesh sieve and 70% will pass a 300-mesh sieve.

6. *Cost of Handling, Grinding, and Upkeep*—The cost of preparing pulverized coal depends largely on the price and on the moisture content of the coal to be used. On the basis of 200 tons per day of coal containing 7.5% moisture, at present rates of wages and supplies and with coal ranging in price from $1 to $8 per ton, the cost of pulverizing will be between 30 and 40c. per ton, not including overhead charges, interest, depletion or depreciation.

7. *Danger From Dust Particles Floating in the Air*—A mixture of coal-dust particles in air will not ignite until it reaches a certain density; on the other hand, a mixture that it too rich in coal dust has a tendency to smother flame. Dust clouds should naturally be avoided outside the furnace chambers, and all sparks or flames should be kept away. Pulverized coal should be conveyed from mills to bins in as compact condition as possible; air currents should not be used to convey pulverized coal if any other method can be devised. Leakages should be stopped, to prevent uncleanness and accumulations in inaccessible places. Carelessness in the handling of pulverized coal and poorly designed plants are the only causes of so-called explosions.

8. *Essentials of a Good Feeder*—It must absolutely control the flow of pulverized coal to the burner, and prevent any rush or flooding of the fuel. This i essential for the positive control of predetermine temperatures.

9. *Essentials of a Burner*—A good mixing projecto or burner, should be so designed that it will receive th pulverized coal in regulated quantities, break up th stream of fuel, and so distribute it that each particle i surrounded by the correct proportion of air. It mus also project the fuel into the furnace at the velocity re quired by the operation, and must be so proportioned a to deliver the necessary volume of air at the prope velocity. Four types of burners are employed: (*a* Induction type, in which a high-velocity jet induces an entrains the necessary additional air, and projects i into the furnace at low velocity; this type has the high velocity air under control as well as the induced ai (*b*) Positive type, in which the high-velocity air induce and entrains the fuel and projects it into a positiv larger column of low-velocity air, thereby breaking u the fuel stream evenly, and disseminating it throug the larger column of low-velocity air before it enter the furnace. The larger column of low-velocity air i usually preheated, in stoves located in a chambe through which the waste gases from the furnace pass temperatures of preheating range from 100° to 600 F. in the better-designed system of stoves. Both co umns of air are positive, being generated by fans o pressure blowers, and gates regulate the quantity. (*c* Single type, in which the high-velocity air first induce and entrains the fuel stream, after which a high-pre sure jet of air, applied usually in the center of th stream, gives a sharp projection of flame and quick di tribution of the fuel through a larger volume of pr heated air at low velocity. This type of burner is us ally adjustable in direction. The heated air ranges temperature from 2200° to 1300° F., as in openhear practice; usually 10 to 15% of the air enters with th fuel, and 85 to 90% from regenerators. The sta draft through the regenerative chambers is regulat by a valve. (*d*) Single type, in which the high-veloci air induces and entrains the fuel and projects it into t furnace, as in rotary-kiln practice, under usually 5 to oz. pressure from a fan. The additional air required f combustion is induced by stack draft, and enters arou the hood and through the kiln discharge opening.

10. *Air Pressure and Effect of Stack Draft*— pressures of $\frac{3}{8}$ oz. entering the combustion chamb of some types of furnaces, from air and fuel mixi burners, up to 2 lb. in pressure jets of other types, ha been in successful and constant use for years. Sta draft should be of only sufficient intensity to create partial vacuum in the furnace, thereby helping the f and air into and not out of the chamber; its stren must be enough, however, to extract all the products combustion.

11. *Design of Furnace*—Fuels low in volatiles high in fixed carbon, as anthracite and coke breeze, quire a special furnace in which the incoming fuel air pass through the flame and the products of c bustion, in a water-cooled, arched firebrick chamber, their way to the furnace or boiler. When the vola constituents of the fuel range from 1 to 3.5%, it difficult to support combustion unless a temperat above 900° to 1000° F., the flash-point of carbon

maintained. The water-cooled arch, rear wall, and side walls are made of a special form of firebrick, which slips in place over the water tubes. After circulating through the tubes, the water passes to the hotwell or heater at approximately 190° F., entailing no appreciable loss of heat. Lignites and bituminous coal require no special furnace. As the volatiles ignite between 600° and 700° F., from the radiant heat of the walls, the flame is self-supporting, and every heat unit in the fuel is liberated before coming into contact with any cold surface.

12. *Ash or Furnace Slag*—Anthracite, coke breeze and lignite ash do not slag. Bituminous coal ash will slag on the bottom of the furnace chamber if not blanketed with cooler air, properly admitted, and if allowed to remain too long in the furnace. Most of the ash from pulverized coal passes away through the breeching to the cyclone, where the ash is separated from the gases. That portion which settles to the floor of the furnace should be removed from time to time; the quantity is small and light.

13. *Furnace Temperatures and Slag Formation*—Temperatures between 1800° and 3500° F. can be maintained in the flame. Slag forms more readily at high temperatures, necessitating proper blanketing with cooler air, always remembering the advisability of obtaining the maximum percentage of CO_2. From 16.5 to 17% of CO_2 is frequently obtained under operating conditions.

14. *Checkerwork in Metallurgical Furnaces*—Experience seems to point to the necessity for vertical baffle walls where the waste gases enter the regenerative chambers. Turning the direction of the gases up and down several times tends to discharge the dust tangentially, allowing the major part to settle in the bottom of the passages, whence it is easily removed through proper cleaning doors at the sides, not interfering with the operation of the furnace. The gases then filter through checkerwork, properly spaced and installed. The narrow side of the brick tile should be laid vertically and on rider walls, to permit the use of longitudinal scrapers to remove the ash which may have passed by the vertical baffle walls. This arrangement will undoubtedly give the regenerating chambers a life equal to the best record ever attained, as the narrow edge of a vertical tile presents little surface for the flocculent ash to rest on and thus close the gas passages.

15. *Furnace Life*—The life of furnaces in which pulverized fuel is used is equal to that of hand-fired, stoker, oil, or gas-fired furnaces. By absolute control of the quantity of coal and air, the velocity of the expanded gases can be reduced until erosion of refractories becomes hardly discernible.

16. *Economy of Pulverized Coal*—In this connection, all the benefits of pulverized coal should be taken into account: labor saving, increased fuel efficiency, ability for closer adjustment, and absence of smoke.

COMPARATIVE COSTS AND ECONOMIES

The efficiency of hand firing depends upon the skill and reliability of the fireman. With the best of attention, a loss of 20% heating value is frequent, and it often reaches as high as 40%, taking into consideration the analysis of the ash and of the flue gas. Stoker firing is relatively more efficient and more regular than hand firing, but the feeding of moist coal wastes part of the heat in the most undesirable place. Losses also occur in breaking and removing the clinker, in the discharge of unburned fuel, and in the flue gas.

Producer-Gas Firing: Referring to W. H. Blauvelt's results[1] and as quoted in Kent, page 819, it will be noted that 131,280 cu.ft. of gas was produced from one ton of coal, and contained 20,311,162 B.t.u., or 155 B.t.u. per cubic foot, or 2270 B.t.u. per pound of gas. The composition of the coal from which this gas was made was as follows: water, 1.26%; volatile matter, 36.22%; fixed carbon, 57.98%; sulphur, 0.70%; ash, 3.78%. One ton contains 1159.6 lb. carbon and 724.4 lb. volatile combustible, the energy of which is 31,302,200 B.t.u. Hence, in the process of gasification and purification, there was a loss of 35.2% of the energy of the coal. Producers are built today which will do slightly better than this.

Oil and Natural-Gas Firing: Coal, properly pulverized and burned, is on exactly the same basis as far as thermal capacity is concerned; and the price of the coal prepared and delivered into the furnace is directly comparable, on the heat-unit basis, with the cost of fuel or gas delivered into the furnace, plus the slight additional cost for ash removal.

Savings by the adoption of pulverized fuel in the operation of various types of furnaces have been attained as follows: heating and busheling furnaces, 20 to 25%; puddling furnaces, 30 to 50%; openhearth furnaces, compared with gas producers, 30 to 40%; copper reverberatory, smelting ore, 30 to 45%. In other furnaces, the consumption has been reduced to the following figures: continuous billet heating, 160 lb. of coal per ton of billets; desulphurizing iron ore in rotary kilns, 296 lb. of coal per ton of ore; drying and nodulizing iron ore in rotary kilns, on basis of 30% free moisture and 11% combined moisture, 477 lb. of coal per gross ton of ore. The figures given are from actual operations over extended periods, and confirm the contention that coal burned in true pulverized form is the only method by which every unit in the fuel can be made to develop its full value.

The Metallurgy of Antimony in France*

In considering the metallurgy of antimony, it is to be remembered that all conditions are subject to the constant fluctuations of the world market for the metal. Before the war the metallurgy of antimony had received little attention. It was the rule to treat, by a simple process of liquation, only the richest ores, and at points best situated for economical reduction, notably in England. Later, in France, where the deposits were relatively lean, a simple method of volatilizing roasting was adopted which converted the antimony contents into the oxide Sb_2O_3, which was then either sold direct or converted to regulus by reduction in small reverberatory furnaces. Despite the discovery of an important deposit of rich gold-bearing stibnite in Mayenne, the French orebodies gradually became exhausted, and the producers of Auvergne were forced to import increasing quantities of rich Chinese stibnite ores, brought in under heavy freight charges, in order to keep their industry alive. Thus France was almost entirely dependent for antimony upon foreign ores when the war demands for the metal arose in 1915. A new company was then formed, which opened up in Algiers large deposits of oxidized antimonial ores, which were shipped to Haute-Loire, where they were smelted directly with the proper fluxes in a reconstructed lead blast-furnace plant. The development of this new source of antimony was extremely rapid, and, during the first months of the year 1917 the French antimony industry produced from Algerian ore more than 300 tons monthly—a quantity sufficient to cover the greater part of the military needs of France, and equivalent to approximately half of her total production. It is estimated that about 35% of this total production still came from the treatment of native stibnite ores by the old method.

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[1] Trans. A. I. M. E. (1889), 18, 614.

*Abstract of report by M. Biver, "L'Echo des Mines et de la Metallurgie," Mar. 10, 1918.

Manganese Deposits in White Pine County, Nevada

An examination of deposits of manganese ore in White Pine County, Nevada, in the Ely (or Robinson) district and the Siegel (or Schellbourne or Aurum) district, was made by J. T. Pardee, a geologist of the U. S. Geological Survey, early in June of this year. His reconnaissance covered an area about 50 miles long from north to south and 20 miles wide, comprising part of Steptoe Valley and the mountains that border it on the east and west.

The manganese ore extends from the surface to a depth of 50 ft. or more. Practically all the deposits occur in limestone and are associated with bodies of jaspery quartz. The manganese minerals have replaced both the wall rock and the quartz. The orebodies are irregular pipes, pockets, and lenses that range from a few feet to 70 ft. or more in length and from a few inches to 10 or 20 ft. in width. Several of the larger bodies contain from 500 to 1000 tons or more. Water level has been reached only in the Siegel mine, where it stands 200 ft. below the surface.

The bulk of the ore is composed of the softer manganese oxides, pyrolusite being predominant in some mines and wad in others. The wad is generally rather compact and tough and can be whittled like wax. Psilomelane and manganite, though widespread, occur in subordinate amount. Fairly large masses of a hard, compact black manganese oxide, tentatively regarded as braunite, are found in the Bowen and Holmquist mine. The ore below water level in the Siegel mine is composed of rhodonite, rhodochrosite, and alabandite. Jaspery quartz, calcite, and iron oxides are generally associated with the manganese minerals. In the Siegel mine cerusite and massicot were observed above water level and galena and pyrite below. Most of the ores contain more or less silver.

The ore mined contains from 36 to 45% of manganese, 3 to 16% of silica, 3 to 5% of iron, a moderate amount of lime, and a little phosphorus. Parts of the orebodies not now mined or rejected in sorting ore for shipment contain more than 16% of silica. Ore containing 25 to 30% of manganese and 15% or more of iron occurs in several places. A total output of 2108 short tons of 40% manganese ore was produced by seven operators up to June 1, 1918, the first shipments having been made late in 1917. In addition 1200 tons was produced by the Siegel mine from 1902 to 1908, but this ore, though high in manganese, was smelted for silver and lead, the manganese content being lost in the slag.

About 550 tons a month are now being shipped from the Ely and Nevada districts. Additional equipment now being installed by one of the operators is expected to increase the production by 100 tons a month, and if the Siegel mine becomes active it will produce an additional 250 tons a month, so that the total monthly output will be 900 tons. Most of the orebodies are near the surface and can be mined by open pits or shallow shafts and tunnels. Water usually has to be hauled, and mine timbers, machinery, and general supplies are said to be rather expensive and difficult to obtain. Wages are $5 a day, and miners are reported to be fairly numerous and to prefer employment with the manganese or other small mines rather than with larger corporations. Board is $1.25 a day.

The cost of hauling the ore from the Ely district to the railway, a distance of two or three miles, is about $2 a ton. The cost of hauling by motor truck from the Nevada district to East Ely, a distance of 10 miles, is about $4 a ton. The distance from the Siegel district to the railroad is 30 miles by one and 40 miles by the other of the two most available roads. Estimates as to the probable cost of transportation from this district to the railroads range from $6 to $10 a ton.

The high-grade manganese ore (40% manganese and low silica) now in sight is estimated at 5450 tons; the ore containing 15 to 40% manganese and high silica, at 5000 to 12,000 tons; the ore having 15 to 40% manganese and high iron, at 1650 to 4000 tons; and the sulphide and silicate ore carrying 20 to 35% manganese and 20 to 37% silica, at 1000 to 3000 tons.

Copper in the Belgian Congo

The mineral industry of the Katanga is practically confined to the operations of L'Union Minière du Haut Katanga, states the acting British vice-consul at Elisabethville in the *Board of Trade Journal.* The company holds the mineral rights over a large area of country, which is known to contain copper, tin, and gold, but only the first named is at present being worked on a large scale, and practically the whole of it has been obtained from the richer ores of two mines, the Star of the Congo and the Kambove. The blast-furnace process of extraction has been employed since 1911. The central smelting plant is at Lubumbashi, near Elisabethville, and at present consists of five blast furnaces, of which four are in continuous operation. Two additional furnaces are in course of construction, and will be ready for use soon. The completed plant will have a daily capacity of 100 tons of copper. The output of the furnaces during the first nine months of 1917 was 19,766 metric tons, as compared with 21,273 tons in the calendar year 1916, and 13,483 tons in 1915. It is estimated that the output for the year 1918 will be 40,000 tons.

Enormous quantities of ore have been proved of a lower grade than is possible to treat economically by smelting; and, after exhaustive experiments, a plant is in course of preparation for the treatment of these ores by leaching and the electrical deposition of the copper. This plant is to have a yearly capacity of 50,000 tons of copper. The program of expansion and development up to the year 1921 provides for an expenditure of £3,000,000.

From 1911 until the outbreak of war, the whole of the company's output was sold to Germany. Since the beginning of hostilities it has been sent to the United Kingdom. The company employs 450 Europeans and 7000 natives. The scarcity of labor during 1917 was serious.

Furnace Plants Using Pulverized Fuel

The following names of companies are given by F. P. Coffin in the May, 1918, issue of the *General Electric Review*, and are found among an extensive list of users of pulverized coal in various industries:

ORE ROASTING AND NODULIZING

Algoma Steel Corporation, Sault Ste. Marie, Ont.
Bethlehem Steel Co., Lebanon, Penn.
Carolina Ore Co., Winston-Salem, N. C.
Central Iron and Coal Co., Hold, Ala.
Charleston Ore Co., Charleston, S. C.
Eastern Nodulizing Works, Newark, N. J
General Chemical Co.
International Nickel Co., Copper Cliff, O .
Lackawanna Steel Co., Buffalo, N. Y.
Mississippi Valley Iron Co., Waukon, Iowa.
Northern Iron Works, Standish, N. Y.
Pennsylvania Salt Manufacturing Co., Natrona, Penn.
Pennsylvania Salt Manufacturing Co., Philadelphia, Penn.
Princess Furnace Co., Glen Wilton, Va.
Spanish-American Iron Co., Cuba.
Virginia Coal and Coke Co., Middleboro, Ky.

COPPER ORE ROASTING AND SMELTING

American Smelting and Refining Co., Garfield, Utah.
American Smelting and Refining Co., Hayden, Ariz. (a)
American Smelting and Refining Co., Maurer, N. J.
American Smelting and Refining Co., Tacoma, Wash. (a)
American Smelting and Refining Co., Mexico.
Anaconda Copper Mining Co., Anaconda, Mont.
Anaconda Copper Mining Co., Great Falls, Mont.
Braden Copper Co., Valparaiso, Chile.
Canadian Copper Co., Copper Cliff, Ont.
Furukawa Mining Co., Tokio, Japan. (a)
Lake Superior Smelting Co., Dollar Bay, Mich.
Nevada Cons. Copper Co., McGill, Nev.
River Smelting and Refining Co., Florence, Colo.
United Verde Copper Co., Clarkdale, Ariz. (a)
United Verde Extension Mining Co., Jerome, Aliz.

ZINC INDUSTRY

Bartlesville Zinc Co., Collinsville, Okla.
Edgar Zinc Co., Cherryvale, Kan.
River Smelting and Refining Co., Florence, Colo.
Société des Mines du Djebel, Ressas, Tunis, North Africa.

(a) Under construction.

Antimony in Oklahoma County, Washington

By Olaf P. Jenkins*

Antimony has actually been mined at two places in Okanogan County, in north central Washington. One of these is seven miles north and a little west of Tonasket, and is known as the Lucky Knock mine. The other is situated on Gold Creek, not far from Methow, in the southwest part of the county. Here several deposits are situated in the same neighborhood. Chief among the claims on these deposits are the Dixie Queen and the Minnie, which have previously been mined and the product converted, in part, into white oxide before shipment.

At the Lucky Knock mine, stibnite occurs in irregular pockety masses in limestones and calcareous shales. Some of the limestone beds are entirely white, others are bluish gray, and still others are black, more shaley, and with coal-like material between the layers. The deposit is a whole appears to lie along a locally disturbed, crushed and possibly faulted area. The stibnite evidently is a replacement in the limestone. Near the surface the sulphide is oxidized to a heavy, earthy rock. Several hundred feet of tunneling has been done, and the ore shipped, amounting to a carload or so, is said to have been used mostly for experimental purposes in connection with the manufacture of enamel in the bathtub industry, the work having been carried on by the Standard Sanitary Manufacturing Co., of Pittsburgh.

On Gold Creek, 25 miles by road from Pateros, the nearest railroad station, is a group of claims controlled largely by the Gold Creek Antimony Mines and Smelting Co. It is said that a thousand tons of ore was shipped during 1915 and 1916, and also several hundred tons of the oxide, which was made near the mine. The ore is mostly stibnite, occurring in metamorphic sedimentary formations, largely slaty shales, sandy shales and calcareous rocks. The orebodies are irregular, pockety or lenticular in form. In places, oxides of antimony occur near the surface. These are obviously of several varieties, and are yellow, red and white. They occur only as surface oxidized portions of the sulphide bodies.

On the whole, there are indications, in connection with work on the Washington State Geological Survey, that if a better knowledge of the nature of ore deposits in general had been applied, as well as better methods and management of mining, both properties might have been put on a commercial basis. This is especially probable now that the Government desires to encourage the domestic production of antimony ores.

Plan To Conserve Sulphur

In recent years several processes to treat phosphate rock by calcining to make it suitable for fertilizer have been under development and test. The first of these, the Newberry-Fishburne process, was tried out on a commercial scale some years ago, and later tests have been made of a similar process developed by W. F. Downs, an industrial chemist, of New York. By the calcining process, the use of sulphuric acid is entirely avoided and a product of greater phosphoric-acid content per ton is secured. It is claimed that this product, though not so "available," to use the trade term, as the acid-phosphate product, will, however, yield its phosphoric content to the plant in a suitable form and with sufficient promptness to conform to good agricultural practice.

In the present stress for sulphur for sulphuric-acid purposes, the use of these processes is being considered by the authorities, to save the large amount of acid now regularly used in the fertilizer business in the treatment of phosphate rock.

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Correspondence and Discussion

Taxing the Mining Industry

An article appeared in your issue of Apr. 6, 1918, reviewing that feature of the Federal Income Tax Law which is applicable to the mining industry by a committee appointed for the purpose by the American Institute of Mining Engineers, and I think it can safely be said that the report of this committee was an unqualified endorsement of the measure as it now stands.

How this conclusion was reached, in view of the fact that the provisions of the act are confiscatory in the highest degree, it is difficult to comprehend. Perhaps it was thought that any attempt to remodel it might lead to more serious consequences, but if such were the case, the committee surely overlooked the fact that unless it is remodeled, and remodeled promptly, a further decline in the output of gold and silver is inevitable.

The following interpretation of this freak measure is by a consulting engineer of the Bureau of Mines, at Washington, and appeared in a later issue of the *Journal:*

> When the net revenue obtained is between 7 and 9%, there is no tax to be paid. If above 10%, it progressively mounts until a rate of 60% of all net returns can be imposed.
>
> To illustrate: Let us assume an investment of $1,000,000 and a net income of $1,000,000 in sight in the mine. If taken out in one year, the company would have to pay the Government $479,400; if taken out in five years the rate would be 20% per annum, or a total tax of $119,500; if taken out in 10 years the rate is 10% per annum, or a total tax of $14,000.

It seems almost unbelievable that a committee representing an organization composed exclusively of mining engineers could have lent its endorsement to such an unjust measure, had any logical process of reasoning been pursued. The same also may be said of the gentlemen who framed this measure and who seem to have had but one thought in mind—the raising of revenue—which they went at with a vengeance, taking a shot at everything in sight, assets as well as profits.

Under the Constitution and laws, the method of acquiring a Government title to mineral land is similar in all respects to the law governing the patenting of a homestead. Both patents convey title to real property, and the same rules and regulations governing matters of taxation must be strictly adhered to. An orebody is an asset that when worked out cannot be replaced, and any form of taxation that demands a division of the assets, instead of a percentage of the profits such assets yield, is unsound in theory as well as practice. Nevertheless, Congress seems to think it is justified in classing dividends paid by mining corporations on a par with those paid by commercial and manufacturing enterprises, and does not seem to grasp the fact that orebodies represent real instead of personal property, and that so-called dividends paid by mining corporations are in reality a distribution of corporate assets to the stockholders, though dividends paid by commercial and manufacturing corporations represent profits.

For Congress to assume, as an illustration, that the owner of a mine, with ore valued at $100,000 in sight and favorable prospects of further discoveries, will hasten to remove this ore and recover the values under a system of taxation that would allow him at the most but 40% of the value of his net assets, is to misjudge human nature. Neither will any democratic form of government think of asking him to do so, any more than it would think of asking the farmer to convert his farm into cash and apply the proceeds in a like manner. Such a procedure means confiscation. Nevertheless, Congress, in its infinite wisdom, has passed such a law, and the American Institute of Mining Engineers has virtually approved it. That its enforcement will not provide the revenue anticipated is a certainty. That it will greatly hamper the industry and retard output is also a certainty.

With the world's total gold reserve only 10½ billions of dollars and a war debt climbing up toward the two-hundred-billion mark, it would seem that the paramount question confronting the belligerent nations and threatening the financial structure of the whole world is how to increase materially the output of the money metals—gold and silver—which has shown a steady decline for the last four years.

No one familiar with the mining situation and the maximum annual output of gold for the last decade will undertake to prove that the output can be materially increased under the most favorable circumstances. Neither will an attempt be made to prove that the available gold reserve of the belligerents (except that of the United States, which is approximately one-third of the grand total) is adequate to meet the present and constantly increasing credit demands made upon it.

What, then, is to be done to meet this extraordinary situation? Gold has long ago disappeared from circulation and silver never shows itself in denominations larger than a fifty-cent piece.

"Bryanize" silver and you solve the problem. It is presumed, however, that this suggestion is just as distasteful to the "Gold Bugs" of Threadneedle Street now as it was 20 years ago, but with all due deference to the gold monopoly that these benevolent old gentlemen have enjoyed for so many years, one should not lose sight of the fact that your Uncle Samuel is now the man behind the pie counter. Your Uncle Samuel can also produce the silver, and produce it in sufficient quantities to meet the existing unprecedented demand, if Congress will just forget about taking the lion's share of the output for war purposes.

When silver went to $1.08½ a few months ago, the "Gold Bugs" of Wall Street found ways and means, through Congress, of forcing the price down to $1, and they have so far succeeded in keeping it from rising above that figure. If Uncle Sam wants more silver—

and we think he does—he would better make up his mind to pay a price at least equivalent to its coinage value ($1.29), to make sure of getting it.

It would seem that the "Gold Bugs" have had their day, but it has taken a world war to bring that fact home to them. F. H. ALLEN.

New York, July 23, 1918.

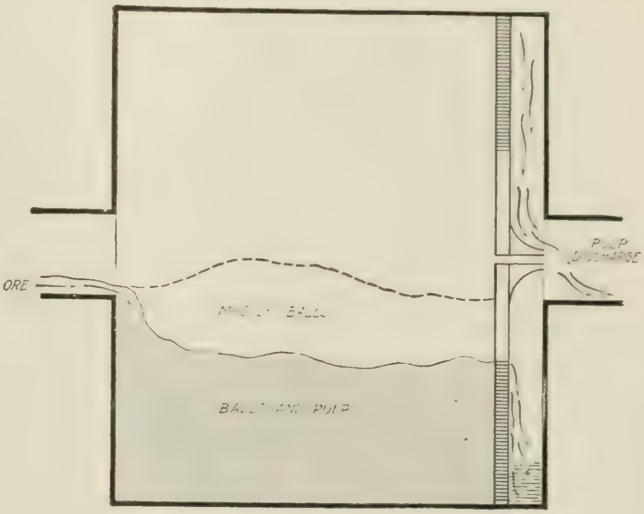
Grinding of Ore in Ball Mills

The continued discussion of the principles of the grate type, or quick discharge, ball mill, as compared to the central discharge, or, preferably termed, trunnion over-low ball mill, has progressed to some extent without apparently arriving anywhere. In all fairness to each ype of mill, let it be said that there is a field for both. The particular case is up to the judgment of the engineer or engineers in charge. However, owing to the plainly biased opinion of the writer of the article appearing in he *Journal* for July 6,[1] I am of the opinion that a few general remarks would be of considerable assistance to hose interested.

In judging reports that come by hearsay from various mining camps it must be remembered that in many nstances the operators of the grate-discharge type of mill do not learn to operate such a mill at once. This s not always true, of course; nevertheless so many nstances have come to my attention that it is suggested hat a careful consideration of bad reports coming from such an installation should be made before they are aken as fact. Within the last week the general manager of a Colorado company operating a Marcy ball mill remarked to me that for about four months hey had been disappointed with the operation of their mill, but that in an exceedingly abrupt manner the operation changed and they obtained almost double the onnage through their ball mill that they were formerly getting. It was simply a case of the operators learning how to handle the mill.

One correction must be made regarding the diagram of the grate-discharge mill submitted with the article above mentioned. The cut accompanying this article shows the correct position of the pulp level in the mill. The level indicated is, of course, approximate, because the depth of the pulp depends upon how heavily the ore is fed into the mill. The point to be emphasized is that the pulp level is approximately horizontal in position and does not taper down to a thin edge at the grates, as one might be led to believe. If such were the case the fundamental principle of this grate-discharge mill would be inactive. By "fundamental principle" I mean to say that the operation of the mill, especially when reducing ores to a fine mesh, depends largely upon there being a difference between the level of the pulp within the mill and the level in space on the opposite side of the grates. This difference in level causes the pulp within the mill to flow by gravity and to be squeezed by its own weight, and the weight and action of the balls, through the grates and into the space between the grates and the head of the mill. From this position it is lifted and allowed to slide down the lifting blades, as they become perpendicular, and so passes out through the trunnion.

To judge from the screen analyses submitted in the article referred to, the operator of the grate-discharge type of mill was not operating it in an efficient manner. There is no reason that the discharge should have such a percentage of oversize in it if the operator were familiar with the principle and operation of the mill. Proper regulation of pulp density and other simple adjustments would improve results greatly, I believe. It would be interesting to know what the ratio of ore to water was in each test. A screen analysis of the discharge of a ball mill means nothing for comparative purposes unless the necessary data, such as the ratio of water to ore, are given.



GRATE-TYPE BALL MILL

Examination of grate-discharge mills stopped in operation has shown without exception (as far as my knowledge goes) that the pulp level is practically horizontal in position. Furthermore, these examinations also have shown that the liners are not worn in an uneven manner. I have seen a number of sets of liners that have been removed from such mills, and have also viewed photographic evidence that, without exception, showed the wear to be in an even manner from feed to discharge end of each liner section. The only exception to this even wearing is found in the natural tendency for the liners to wear more rapidly around the bolt holes.

Though it is possible that one may deduce that my preference lies in the grate-discharge type of ball mill, in all fairness to the other types it must be said now and will become generally admitted before long that there is no one "cure-all" for the crushing and grinding of ores. DONALD H. FAIRCHILD.

Denver, Colo., June 10, 1918.

[It is difficult to understand the designation of "quick discharge" when given to a mill where a grating permits the passage of pulp only when it is "squeezed" through the apertures "by its own weight and by the weight and action of the balls," as compared with the free displacement discharge in an ordinary mill.

The "exceedingly abrupt manner" in which improved results were obtained after four months of disappointing operation would suggest an opportunity for a fuller explanation of the cause of the trouble than that given by our correspondent in rebuttal of Mr. Del Mar's conclusions.—EDITOR.]

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[1] "Grinding of Ore in Ball Mills," by Algernon Del Mar.

Events and Economics of the War

Allied troops have forced a passage of the Vesle, between Braisne and Fismes, and, later, made extensive advances on the Somme front, taking many prisoners and gaining much booty. The new positions have been consolidated and counter-offensives repulsed.

American and other Allied forces have landed at Archangel. Ostracism of the Soviet government, if it persists in supporting Germany, is threatened by the Entente. The Bolsheviki have caused arrest of British and French diplomats. Britain has retaliated.

Another hospital ship was torpedoed. Lloyd George's threat of economic fight irritates Germans, whereas Lansdowne's sentimentalism is welcomed.

The first ship was launched from the Hog Island shipyard, statistics showing the month's output from all yards to exceed that of any previous year.

Copper Producers and Price-Fixing Committee Agree

The text of the War Industries Board's statement in regard to the new agreement concerning the price of copper is as follows:

> The President has approved an agreement, made between the producers of copper and the price-fixing committee of the War Industries Board (after investigation by this committee in conjunction with the Federal Trade Commission as to cost of production), that the maximum price of copper shall be 26c. per lb., taking effect Aug. 15, 1918, for shipments after that date, but subject to revision after Nov. 1, 1918, f.o.b. cars or lighters at Eastern refineries, f.o.b. cars or lighters at Pacific Coast refineries for Pacific Coast destinations, and f.o.b. cars or lighters New York, if shipped to Eastern or interior destinations from Pacific Coast refineries and from refineries in the interior of the United States. All shipments made after Nov. 1, 1918, are subject to any change in price made by the price-fixing committee, to take effect after that date. This maximum price is subject to the additional charges on copper shapes approved by the price-fixing committee on June 5, 1918.
>
> The conditions are, (1), that the producers of copper will not reduce the wages now being paid; (2), that they will sell to the U. S. Government, to the public in the United States, and to the Allied governments at not above the maximum price; (3), that they will take the necessary measures, under the direction of the War Industries Board, in the distribution of copper to prevent it from falling into the hands of speculators who might increase the price to the public; and, (4), that they will pledge themselves to exert every effort necessary to keep up the production of copper so as to insure an adequate supply so long as the war lasts.

Control of Sulphur-Bearing Materials

The committee on production, distribution, and control of sulphur-bearing materials has been holding meetings each week in Washington, completing plans for taking over the distribution of all pyrites and brimstone shipments on Aug. 1. A questionnaire has been sent to all consumers of sulphur materials, asking for figures for the month of July, which, if not already forwarded, should be sent immediately, addressed to the committee, No. 15 William St., New York City.

The committee is working under the instructions of the War Industries Board, which requires figures covering all plants using brimstone and pyrites, and all uses, whether for acid or other products. Data have been submitted to the Railroad Administration and Shipping Board with regard to the tonnage required to be moved by rail and water, and the committee has been assured that everything will be done not only to make the necessary monthly deliveries, but that during the last five months of this year an attempt will be made to move sufficient additional tonnage to assure every consumer enough material to continue full operations should there be an interference with railroad transportation similar to that experienced last winter. The War Industries Board has also requested the committee to procure figures on pyrites cinders and the sintered and nodulized product, in the interest of iron and steel manufacture, for which purpose pyrites cinder is a valuable raw material. Questionnaires have been forwarded to sulphuric-acid manufacturers recently, and the committee requests that prompt replies should be sent, so that full and final report can be made to the War Industries Board at the earliest possible date.

Cinder should be carefully conserved and guarded against mixture or contamination with other material especially phosphate rock, which would be unfitted for use as a low-phosphorus iron material if mixed with or contaminated by other substances. It is the hope of the committee that through the organization it is now developing it will be possible to provide sufficient sulphur materials to keep every sulphuric-acid plant in full operation.

New Bureau Handles Material From Canceled Orders

A new bureau has been established in the purchas and supply branch of the General Staff. It will hav charge of what is to be known as the surplus inactiv supply service, and its work will be carried on, throug General Hugh S. Johnson, as a branch of the office o Major-General George W. Goethals, assistant chief o staff and director of purchases, storage, and traffic by direction of the Secretary of War.

Much war department material and equipment becomes available for needs other than those originall intended, owing to changing conditions at the front i France or elsewhere.

The new bureau will have a current list of all surplu material which may be regarded as inactive. A copy o this will be kept in the current desk files of all th purchasing divisions of the War Department, wher the new bureau will have representatives. The lists wi be consulted to see what the War Department has o hand, before purchasing or the letting of new contract If a contractor turning out Government work is ru ning short on his supply of certain material, he will be able to get in touch with the new bureau to find out whether it is on the list of so-called inactive supplies; or it will be ascertained for him if there is a likelihood of the material becoming available.

When material or equipment is found which is not wanted by any branch of the War Department, the case is taken up with the War Industries Board, and advice is sought as to where it can be used to the best advantage in war or other essential industry. Steps are then taken so that the particular branch of industry most affected may have the opportunity of purchasing under the system of competitive bids.

Questionnaires for the purpose of taking a census are now being sent out. Aside from the saving of hundreds of millions of dollars to the taxpayers and the Government, it is expected that the work of the new bureau will save a tremendous amount of time, labor, and material, more essential to the winning of the war than the mere money involved.

The Development of Domestic Potash Resources

In the manufacture of cement there is a loss of potash from the kilns, which is carried away in the form of flue dust. Plants are now being designed and erected to recover this as a byproduct. The Cottrell process is used for precipitating the dust with high-tension electrict current, and rotary vacuum filters are being found suitable for the separation of potash solution from valueless residue after the dust is pulped with water. With regard to the potentialities of potash production from this source, the Bureau of Soils has recently completed an investigation of the subject, and finds that from 0.35 to 5.34 lb. of potash per barrel of cement manufactured escapes from plants in the manner mentioned, or an average of 1.9 lb. Assuming an annual production of 90,000,000 bbl. of cement, it may be estimated that the amount of potash being lost (other than in the few instances where byproduct plants have been erected) amounts to about 86,000 tons annually. Experimental work and data from actual byproduct plant operation show that about 80% of this is recoverable by existing methods of treatment, so that an output of nearly 70,000 tons of potash would be possible in the United States from the cement industry alone. An additional advantage in the installation of a byproduct plant in this case would be the elimination of flue dust from the atmosphere in the neighborhood of the works.

Expansion of War Industries Increases Fuel Demands

The demand for fuel is growing by leaps and bounds. Estimates of the coal consumption for the year which were judged high in April are now proving inadequate. Despite the increase in the rate of production at the mines, the strictest fuel economy must be enforced if the country is to escape a serious coal shortage next winter. Every means of coal conservation must be observed; waste must be eliminated.

The increased demand for coal for the Navy reached almost 100% in July. By the end of the calendar year 1919 it is estimated that approximately 8,000,000 tons will be required to cover these demands.

With the launching of new ships, the requirements of the Shipping Board have grown beyond all expectation, and, as demonstrated by experience, the figure is now placed at 13,000,000 tons. Coal for bunkering purposes has grown in demand until present calculations call for 21,000,000 tons. Aside from the requirements from new or enlarged plants, many old plants are now demanding still more coal.

The source of supply for the new requirements is within a limited coal area. The extra demands call for coal from New River and Pocahontas low volatile fields of West Virginia; the low volatile fields of Pennsylvania and Maryland; and the high volatile fields of West Virginia, Pennsylvania and Kentucky. These fields produce the grades of coal especially needed for the war work. And it is from these same fields—with the exception of Kentucky—that the enormous calls of New England and the Atlantic States for coal for war use must be answered.

The U. S. Fuel Administration faces the difficulty of meeting greatly increased demands for coal, not from the nation's big coal pile, but from a much smaller pile, representing the output within a small area. The war necessities must be cared for by coal from these fields, and non-war industries will be given coal from them only after the war plants designated by the War Industries Board for Preferences are supplied.

Sulphuric Acid in Great Britain

The British Minister of Munitions orders that from June 1 the maximum prices for sulphuric acid specified below will be substituted for those specified in the schedule to the order dated May 29, 1917:

1. Weak acid; that is, acid of all strengths up to and including 90% H_2SO_4:

Class A.—Arsenical acid, maximum price per ton, 83s. ($19.70), for acid of 140° Twaddell at 60° F., with an increase or reduction of 6d. (12c.) in respect of each complete degree Twaddell by which the specific gravity is more or less than 140° Twaddell at 60° Fahrenheit.

Class B.—Non-arsenical or de-arsenicated acid, maximum price per ton, 98s. ($23.27), for acid of 140° Twaddell at 60° F., with an increase or reduction of 7d. (14c.) in respect of each complete degree Twaddell by which the specific gravity is more or less than 140° Twaddell at 60° Fahrenheit.

2. Concentrated acid; that is, acid of all strengths over 90% H_2SO_4:

Monohydrate (H-SO-) Content of Acid, Per Cent.	Maximum Price Per Ton			
	Class C. Arsenical Acid	U. S. Currency	Class D. De-arsenicated or Non-arsenical Acid	U. S. Currency
	£ s. d.		£ s. d.	
90 to 91	5 9 0	$25.90	5 19 0	$28.25
91 to 92	5 15 0	27.30	6 5 0	29.70
92 to 93	6 1 0	28 75	6 11 0	31 10
92 to 93½	6 7 0	30.15	6 17 0	32.55
93½ to 94	6 10 0	30.90	7 0 0	33.25
94 to 94½	6 13 0	31.60	7 3 0	33.95
94½ to 95	6 16 0	32.30	7 6 0	34.70
95 to 95½	7 1 0	33.50	7 11 0	35.85
95½ to 96	7 6 0	34.70	7 16 0	37 05

Over 95% in both classes, an addition of 1s. (24c.) per ton, for each complete one-tenth of 1% of additional monohydrate.

Gasoline Conservation Chief Appointed

W. Champlin Robinson, director of the Bureau of Oil Conservation of the U. S. Fuel Administration, announces the appointment of C. C. Winningham, of Detroit, as chief of the gasoline section and director of publicity of the oil division. Under the Mr. Winningham's direction will fall the work of eliminating the waste of gasoline by distributors and users, the use and conservation of lubricating oils, and the inauguration of methods for the reclamation of used oils.

The oil division, by education and publicity, is seeking to avoid the necessity for enacting drastic rules which would result in the regulation of sale of these essential products.

The demands of the war call for a tremendous increase in the supply of gasoline, kerosene, and lubricating oils, which can be met, it is believed, if the public will only eliminate the waste now existing. If this is done, it is hoped there will be sufficient gasoline and lubricating oil to meet war needs without interfering with the operation of passenger cars at home. But failure on the part of those who have anything to do with the production, handling, and use of oil products will necessitate drastic regulation, that would probably mean gasolineless days and insure other methods of conservation.

President Issues Warning and Appeal To Coal Miners

The seriousness of the coal situation has been gaged by President Wilson, who states, in a proclamation recently issued, that the threatened shortage of coal would constitute the greatest obstacle to the winning of the war. Operators are called upon to insure high efficiency by every means in their power; miners are urged to work steadily and faithfully, unless prevented by unavoidable causes. Essential laborers in the industry will be given deferred classification in the draft; and the community must hold them patriotic in accepting this decision. Complete and harmonious coöperation between all engaged in the industry, and unflagging effort, will alone secure the desired results and achieve the gratitude of the nation.

Furnace Slag Used Largely as Fertilizer

The economic uses of blast-furnace slag have been greatly developed the last few years, states the *New York Times* in outlining the recent researches of William H. Ross, of the Department of Agriculture. Formerly this was an incumbrance, and its disposal was often a matter of considerable expense. Of much more value as fertilizer is the slag obtained in the preparation of steel from high-phosphorus pig iron. To remove the excess of phosphorus, the iron is melted in converters lined with limestone, and quicklime is added. At a certain stage air is driven through the molten material, which leads to an accumulation in the slag of the phosphorus originally present in the metal. This slag is drawn off and cooled, and when finely ground is placed on the market under the trade name of basic slag. The phosphoric acid in the slag prepared in this way varies from 11 to 23 per cent.

For a time the fertilizing value of the slag was not recognized, but it has now become one of the most popular of commercial fertilizers. In fact, on account of its freedom from acidity, many prefer it to any other phosphatic material. The slag produced for the fertilizer trade amounts to about 2,000,000 tons annually.

Portuguese Fix Price of Wolfram

The following prices have been fixed, according to the *Iron and Coal Trades Review*, by the Portuguese government for the sale of various grades of wolfram ore under the terms of the decree of Mar. 14, which reserves to the government the sole right of purchase and export of all minerals employed in war industries: 50% tungstic-acid content, 95 fr. per unit of tungstic acid; 51%, 98 fr.; 52%, 101 fr.; 53%, 104 fr.; 54%, 107 fr.; 55%, 110 fr.; 56%, 112 fr.; 57%, 114 fr.; 58%, 116 fr.; 59%, 118 fr.; 60%, 120 fr.; 61%, 122 fr.; 62%, 124 fr.; 63%, 126 fr.; 64%, 128 fr.; 65%, 130 fr.; 66%, 132 fr.; 67%, 134 fr.; 68%, 136 fr.; 69%, 138 fr.; 70%, 140 fr.; 71%, 143 + 10 fr.; 72%, 146 + 10 francs.

Britain To Ration Coal Supply

The German advance in France this year has cut off or otherwise disorganized the French coal supply to the extent of 8,000,000 tons per annum. Nearly half a million British miners have been drafted into military service. These two facts are causing concern, and Great Britain must make up France's deficit of coal while hampered by a severe shortage of miners. Economy in coal consumption will be imperatively necessary in England, and a system of rationing to householders and other consumers is predicted.

Conditions Governing Entry of Mexican Labor Into the United States

With regard to the revocation of parts of the immigration act, for the duration of the war, to permit Mexican laborers to enter the United States and relieve the labor shortage in the south, the following sections are to be inoperative; illiteracy, contract labor, and head-tax clauses.

Mexicans admitted are compelled to open a postal savings account at the place or port of entry. Twenty-five cents is to be withheld weekly from each Mexican's wages by the employer, and this sum is to be deposited in a savings bank, from which it may withdrawn, with accumulated interest, when he leaves the country.

The need for ships in Australia has stimulated the demand for locally manufactured materials. Steel plates are now being produced at the Broken Hill Proprietary Co.'s plant at Newcastle, N. S. W., and an initial output of 200 tons in the first month of operation is reported. Although minor modifications may be found necessary before maximum output is attained, the results so far show that the construction of ships in Australia, entirely from Australian materials and products, is now possible. The iron ore used is shipped from Spencers Gulf, South Australia.

Industrial News from Washington

By **Paul Wooton, Special Correspondent**

National War Labor Board Makes Important Decisions

Awards by the National War Labor Board in the controversies which had arisen at the Herculaneum smeltery of the St. Joseph Lead Co., and at the mines and furnaces of the Sloss-Sheffield Steel and Iron Co. at Russellville, Ala., are of more than usual significance, as they indicate a policy which doubtless will be followed in other decisions. In the case of the St. Joseph Lead Co., the award grants the workers a general increase in wages, establishes a minimum wage, and provides a system of collective bargaining between employer and employees. The award is made retroactive to Apr. 21, the date on which, at the suggestion of the striking employees, the two parties jointly submitted their dispute to the jurisdiction of the board. The board's synopsis of its decision reads as follows:

> The arbitrators found the increase in wages to be necessary in order to maintain, in full health and efficiency, the workers in this primary war industry, which produces one-ninth of all the lead mined in this country. The product goes chiefly into bullets and shrapnel. It was found that the workers, who are peculiarly subjected to the danger of lead poisoning, had suffered an alarming number of workless days through sickness, and were often supported during such periods from the funds of their labor union, since their wages were frequently too low to make possible any savings. For the same reason, many workers were obliged to default in their Liberty Loan payments. The efficiency of the plant had likewise suffered from an enormous labor turnover, sometimes as high as 200% per annum, due partly to the low rate of wages.
>
> The arbitrators granted the wage increase on a sliding scale, in harmony with the principle recently applied by the Railroad Wage Commission, giving to the $3-a-day men a flat raise of $1, or 33⅓%, and graduating the rate of increase down to 10%, or 50c. a day, for those earning $5. For those earning more than $5 a day the increase was merely nominal. In thus favoring the least skilled workers, and in establishing a minimum wage of $4 a day, the arbitrators were guided by the board's principle that "minimum rates of pay shall be established which will insure the subsistence of the worker and his family in health and reasonable comfort." As in all other awards made by the board, it is here provided that these rates of pay may be readjusted at intervals of six months, in conformity with the change in the cost of living.

The arbitrators also granted 50% additional pay for the first two hours worked in excess of eight hours a day, and double pay for additional hours, as well as for Sundays and holidays. The plant during the war has been working on a seven-day basis. The arbitrators refused the request of the employees that their union be recognized and dealt with as such during the war, but provided for the election of committees of the men to facilitate collective bargaining. The board thereby maintains the pre-war status of the plant in relation to unionism, while protecting the workers in their efforts to adjust complaints without undue friction, through chosen representatives. The right of the men to membership in their union is affirmed. The administration of this award will be placed in the hands of a representative of the board, whose decision will in every case be binding, pending appeal.

In the case of the Sloss-Sheffield dispute, the award grants wage increases to all classes of workers; upholds the right of the workers to organize and bargain collectively; condemns the so-called "permit system" by which, it was alleged, companies in the district agreed with each other not to hire a man until he could produce a permit from the company which last employed him; directs the discontinuance of the company's practice of exacting 20% discount for cashing advance pay checks for employees; provides for payment for overtime work; establishes a system of wage readjustments at six-month periods on basis of changing living conditions in the community, and directs the appointment of an examiner to supervise the fulfilling of the award.

A statement issued by the board setting forth the principal features of the award is as follows:

> A hearing in St. Louis developed the following to be the demands of the workers: That the prevailing scale of wages, varying from $1.85 to $4.25 a day, with the bulk of the employees receiving from $2 to $3 for a 10-hour day, be increased by $2 a day for all employees in the mines; that the 8-hour day be applied, with time and a half for all overtime; that the company consent to the establishment of a system of collective bargaining; that the payment of insurance, for which, it was charged, deductions were made from the worker's pay, be made optional with the workers; that the permit system be abolished; that orders for money due be paid at face value, with no discount; that the company be prohibited from discriminating against union employees. The testimony also developed that the company operates a store from which the workers purchase virtually all of the necessities of life, and that many of the workers receive less than a dollar in their pay envelopes every two weeks by reason of the deductions for these necessities and other charges made upon them. These other charges include $1 per month for the service of a physician employed by the company; 50c. per month for the maintenance of a school; and $1.25 a month for insurance. A collection of bi-weekly pay checks, some calling for as little as 15c., was presented as evidence. Charges were made that the services of the physician were not obtainable when he was needed and that the workers frequently had to contribute to send a stricken fellow to Birmingham to a hospital.
>
> The award established a wage schedule by which no worker shall receive less than $3.99 for a 10-hour day. The highest wage provided for in the award is $6.30 a day for lathe men in the machine shop. It places upon the company the responsibility to select a physician with care and to see to the proper administration of the school fund, and suggests that the establishment of a small hospital would not be unreasonable.
>
> The Sheffield Iron Corporation and the Suwanee Iron Co., operating in the same district, after difficulties with their employees, asked that the award in the Sloss-Sheffield controversy be made applicable to the entire district, comprising the three companies, which has been done. The arbitrators in this case acted by agreement of the company and the employees, following a serious strike in May. The award as to wages is made retroactive to Apr. 17, 1918.

The next Liberty Loan, possibly for $6,000,000,000, will be open for subscription on Sept. 28, and the campaign will be continued for three weeks. Arrangements are under way to achieve even better results than in previous instances, and unprecedented efforts will be made to educate and convince a large proportion of the people. Interest payable to investors in the new loan will probably be 4¼%, but the actual rate is not considered likely to affect the success of the issue.

Imports and Exports of Metals and Ores

Imports of the more important minerals and metals during June, 1918, as reported to the Department of Commerce, with the figures for the corresponding month of 1917, as finally revised, are as follows:

METAL AND ORE IMPORTS, JUNE, 1917, AND JUNE, 1918

Metal and Ore:	June, 1917	June, 1918
Antimony ore, contents, lb	1,855,584	360,814
Antimony matte, regulus or metal, lb	2,815,235	1,951,044
Copper:		
Ore, contents, lb	10,799,784	5,079,450
Concentrates, content, lb	3,666,734	4,195,525
Matte, regulus, etc., contents, lb	1,141,067	2,349,300
Imported from (in part):		
Canada, lb	3,315,921	2,650,674
Mexico, lb	3,320,166	5,415,753
Cuba, lb	6,656,676	1,613,116
Chile, lb	961,974	1,629,185
Peru, lb	782,230	....
Unrefined black, blister, etc., lb	44,779,479	13,801,332
Refined, in bars, plates, etc., lb	320,935	282,432
Old, etc., for remanufacture, lb	3,454,978	100,696
Composition metal, copper chief value, lb.	15,548	19,640
Lead:		
Ore, contents, lb	4,019,973	2,302,941
Bullion, contents, lb	7,610,683	16,479,770
Imported from (in part):		
Canada, lb	214,630	1,252,460
Mexico, lb	8,738,159	17,050,868
Chile, lb	....	479,383
Pigs, bars and old, lb	275,187	....
Manganese ore, long tons	62,778	38,427
Imported from (in part):		
Cuba	5,842	1,817
Brazil	47,000	31,481
British India	7,450	4,550
Pyrites, long tons	63,133	31,172
Imported from:		
Spain	41,027	13,881
Canada	22,106	17,291
Zinc:		
Ore, contents, lb	15,135,827	4,053,254
Imported from:		
Canada, lb	520,000	1,142,422
Mexico, lb	8,387,181	2,910,832
Australia, lb	6,228,646	....
Blocks or pigs, and old, lb	29,567	1,425
Zinc dust	145,600	....

Exports of copper, lead and zinc for June, 1918, as reported to the Department of Commerce, with the figures for the corresponding month of 1917, as finally revised, are as follows:

EXPORTS OF COPPER, LEAD AND ZINC, JUNE, 1917, AND JUNE, 1918

Metal and Ore	June, 1917	June, 1918
Copper:		
Ore, contents, lb	573,357	109,335
Contentrates, contents, lb	14,000	129,428
Unrefined, black, blister, etc., lb	..	1,069,737
Refined in ingots, bars, etc., lb	89,677,585	70,902,177
Exported to (in part):		
France, lb	28,558,059	31,929,488
Italy, lb	23,480,238	9,829,605
Russia in Europe, lb	4,892,127	....
United Kingdom, lb	24,109,099	26,921,159
Canada, lb	6,636,859	1,550,962
Composition metal, copper chief value, lb	....	24,299
Old and scrap, lb	36,054	73,805
Pipes and tubes, lb	....	447,842
Plates and sheets, lb	700,920	303,592
Wire, except insulated, lb	1,957,903	1,758,328
Lead:		
Pigs, bars, etc., produced from domestic ore, lb.	6,666,210	12,557,348
Produced from foreign ore, lb	8,035,416	5,473,282
Exported to (in part):		
Denmark, lb	234,475	.....
France, lb	227,970	1,299,200
Canada, lb	13,850,906	7,033,706
Argentina, lb	.....	307,199
Brazil, lb	....	131,189
Zinc:		
Dross, lb	928,516	3,761,844
Spelter:		
Produced from domestic ore, lb	19,645,431	12,828,218
Produced from foreign ore, lb	4,486,104	833,925
Exported to (in part):		
France, lb	5,905,252	8,320,822
Italy, lb	4,150,885	1,706,189
United Kingdom, lb	12,178,566	2,267,296
Canada, lb	1,821,514	1,217,219
Zinc [illegible], lb	4,971,352	1,919,789

Canada has been producing refined spelter and copper for some time, and recently there has been an increase in the output of refined lead. The manufacture of brass in the Dominion quickly followed the production of refined copper and spelter and opened up extensive avenues of new industry.

Mining Taxes in Mexico

Mexican export duties on metals were slightly modified by a decree of Apr. 26, 1918, which contains, according to *Commerce Reports*, a consolidation and reënactment, with certain changes, of other laws relating to mines. A stamp tax of 8% ad valorem is specified for exported gold or silver in the form of ore or mixed with substances other than metals, though gold and silver in bullion or mixed only with other metals are subject to a tax of 7% on the official values. The duties on copper are fixed at from 2½ to 5% of the value, depending on the form and copper content, but for lead, tungsten, molybdenum, manganese, graphite, and mercury the rate is 3%, as heretofore. Zinc, tin, antimony, and other metals or minerals not specifically provided for are subject to a duty of 1% ad valorem upon exportation. The monthly schedules of export duties on metals issued since the decree of Feb. 26 show slight decreases in the actual rates on lead, zinc, and antimony. In the case of silver, however, the new rates are approximately 66⅔% higher than those formerly in force.

The mint is directed to receive gold for coinage at a fixed price without limit; but as regards silver special permission must be secured from the Mexican Treasury Department, and the price to be paid will depend on the New York quotation for silver. A reduction is made in the "pertenencia" tax on the ownership of mining properties. Another provision of the same decree admits free of duty the following materials when imported for use in the treatment of ores: zinc and aluminum in ingots, filings, grains, or wire; sulphur, alkaline cyanides; hyposulphite of sodium; saltpeter, or nitrate of potassium or sodium; acetate of lead; and perforated sheets of zinc.

Errata—July 20 Issue

We have been asked to make the following corrections: "Notes on Recent Metallurgical Progress," page 143, line 2 of paragraph 3, instead of 70%, read 60%; page 143, line 9 of paragraph 3, read 8 lb. instead of 6 lb. "Practical Notes From the Anaconda Reduction Works," page 134, Fig. 3, the truck shown does not enter the furnace, but is used to transport the arms from the furnace. A special two-wheeled carriage receives them inside the furnace and delivers them to the truck illustrated, which stands outside.

In the article on "Blast Furnace Plant for Smelting Copper Ore," in line 6, page 122, the word "capacity" should be substituted for "production," and in line 8 from the bottom of the column the word "hardly" should be placed between "would" and "be." The last sentence of this paragraph would thus read: "A site for a reverberatory furnace is shown on the plan, as a 3000-ton blast-furnace plant without a furnace of this type attached would hardly be complete under present conditions."

July Mining Dividends Erratum

In the table of mining dividends published in the *Journal* of Aug. 3, the amount of the payment by the Butte Copper and Zinc Co. should have been entered as $300,000, instead of $205,850.

July Pig-Iron Production

Pig-iron production in July was 3,420,988 gross tons, as compared with 3,323,791 tons in June, according to *Iron Age*. The daily rate for July was 110,354 tons for a 31-day month, as against 110,793 tons daily in June, a 30-day month, or a decrease of 439 tons a day. Although the pig iron produced in the seven months of this year, amounting to 21,423,660 gross tons, is less than the 22,412,330 tons and 22,634,966 tons for the corresponding periods of 1917 and 1916, the daily rate of 110,354 tons exceeds the rates for July, 1917 and 1916, by 2534 tons and 6337 tons, respectively. A total of 51,762 gross tons of ferroalloys was produced, of which 29,996 tons was ferromanganese. Nineteen stacks were blown in and 11 blown out, a net gain of eight furnaces.

Examinations for Commissions in Engineers' Reserve Corps

Examinations of candidates for commissions in the Engineer Reserve Corps are being conducted by a board of officers now touring the country. Applicants must be engaged in the active practice of some branch of engineering, and be in good physical condition. Those accepted by the board will be given a course in military training at Camp Humphreys, near Washington, previous to their assignment to duty with engineer troops. The board has already held examinations in Buffalo, Detroit, Cincinnati, Louisville, Indianapolis, St. Louis and Kansas City. Other points to be visited are: St. Paul, Aug. 19 and 20; Denver, Aug. 22; Salt Lake City, Aug. 24; Butte, Mont., Aug. 27; Seattle, Wash., Aug. 29 and 30; Portland, Ore., Aug. 31; San Francisco, Sept. 2, 3 and 4; Los Angeles, Sept. 5, 6 and 7; Deming, N. M., Sept. 10 and Dallas, Tex., Sept. 13. The board will return to Washington on Sept. 16.

Lake Superior Iron-Ore Shipments Show Increase

Record ore shipments continue to be made from upper Lake ports. According to *Iron Trade Review*, July shipments totaled 10,659,203 tons, compared with 10,241,633 tons in July, 1917. This is breaking the record of July, 1917, by 417,570 tons. As last year's figures established a record never before attained on the Lakes, it is a record worth beating. Up to that time the fleet had never carried more than 10,000,000 tons in any one month. By Aug. 1, last year, 26,376,768 tons of ore had been brought down. This was a decrease of 2,988,956 tons as compared with the 1916 tonnage of 29,365,724. This year's figure shows an increase of 3,232,165 tons over the 1917 shipments and of 243,209 tons over the 1916 shipments.

The Relative Value of Terms

Maybe some of our readers are shy in contributing to the 27th Engineers' Comfort Fund because they have a mistaken idea as to what the fund does. "Comforts, forsooth! There are mighty few comforts about these days." This gives us a chance to explain.

Do you understand that what the boys over there consider comforts and luxuries are looked upon as bare necessities over here? Few of us realize how well we are off, because we don't have to go without. In France it is different, and the little that can be done through the agency of the Comfort Fund is small enough service to those brave fellows whose pluck and skill are making history—such history as makes you tingle all over to read about.

If we all do our best, the material result must be pitifully small in any case—in comparison—but the spirit of the thing is what counts. Send along what you can spare. You needn't wait until you are in a position to emulate the other fellow who sent us such a big check. We want your personal interest in the fund.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
Wm. H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
Total	$16,024.61

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Owing to the large volume of work involved in administering the fund, contributions are acknowledged only by publication in the *Journal*.

Editorials

The Price for Copper

THE copper producers met the price-fixing committee of the War Industries Board last Wednesday and had a session that was entirely amicable. On the previous day there had been a conference with the "high-cost producers," at which the latter were informed that no discrimination in their favor would be made. At the general meeting on the following day, Mr. Brookings, the chairman, informed the producers that the Government had enough copper in sight, and therefore there was no reason why the price of 26c. should be advanced. If the opinion be correct, the reasoning is surely sound. With enough copper available at 26c., it would be absurd for the Government to offer any more.

The price-fixing committee is pretty cocky in its attitude, not only with regard to copper but also in the matter of lead, which, for the moment, is in an even more ominous situation. It recognizes that higher prices would bring out more copper and more lead, but its present logic appears to be that any additional production would come from high-cost producers, who would better not produce at all, for the reason that the men they would require ought rather to be occupied in some more profitable work. More copper and more lead may indeed be needed, but the answer is to discontinue non-essential work, so that not so much of the metals will be required. Indeed, with this view, a further curtailment of production may be regarded with complacency, and, in fact, the high-cost producers are told in substance that they would best give up the fight and shut down.

In our opinion, such an attitude is preposterous and dangerous. The fact that no producer of copper is willing to sell a pound of it for less than 26c. is in itself conclusive evidence that there is not copper enough. If there were copper enough, somebody would find that he had a little that he could not sell for 26c., he would offer it for less, and immediately the market price would be something below the restrictive maximum. The country has no reserve stock of copper, and yet we are told with smug complacence that there is copper enough. Mr. Brookings seems to us rather to be playing checkers with a gambler's spirit than to be considering that he is performing a part in fighting a life or death war.

The New Industrial Dispensation Must Be Made Labor Insurance

PASSAGE by Congress of the legislation demanded by the railroad brotherhoods, and embodied in the agreement of Mar. 19, 1917, marked the inauguration of a new and significant era in American industrial evolution. The recognition then tacitly accorded organized labor by the legislative branch of the Government has since been enlarged and extended by executive order, and the acute situation attributable to conditions created by the war has operated further to confirm the unionist movement in its insistence on full partnership in every field where it has won recognition.

Indeed, many leaders in the labor world, frankly subscribing to the obvious truth that labor, by no possible legerdemain, can take more out of an industry or business than the workers put into it, are nevertheless convinced that the large corporation or other business association or combination, no matter how erected or with what skill or acumen made to show return and render public or other service, is in essence merely a distributing agency for the product of labor, and this point of view is naturally most insistent in those industries wherein the work of men's hands and brawn and brain takes the tangible form necessarily assumed by those exceedingly tangible commodities through the instrumentality of which our country must expend such prodigious and sustained effort to "make the world safe for democracy."

It is patent that if development progress along the courses now indicated, and if further extensions of duality of control over industry are to continue and to be confirmed by general acceptation, the arrangement must be on a basis radically correcting past uncertainties, vexations and abuses. Since the United States took up the sword, there has been an epidemic of strikes and disturbances, and of threats of strikes, in essential industries—labor profiteering in no degree extenuated or rendered less patriotic by the sporadic individual or corporation grafting recorded daily in the press and apparently to be expected in every period of national peril by every nation in every age. And before the American people will accept organized labor at its own valuation, there must appear a reformation of the policy too often dominating its leaders.

The strike is a worn-out weapon, born of bitterness and a sense of outraged class distinction foreign to our genesis, and often, in truth, of the subconscious desire for leisure inherent in all animate creation. It is as antiquated, unjust and inequitable a method of adjudicating differences over wages or hours as is the fist fight or club fight in determining ownership of property —or wives. Executive decrees, counselling arbitration —ordering it when exigency indicates the need—in which, theoretically, the voice of the people speaks through their chief executive, point a course that must be followed if industrial peace, founded on justice, is to be a concomitant of that political and national peace for which the noblest blood of the race is now drenching the soil of France.

To some workers the words compulsory arbitration have an ugly sound. Why? Civilization is itself built on that foundation. The law of every civilized land compels the arbitration of every crime that discolors the human record. Were the existing labor status not a serious and present menace, the very suggestion that industrial disputes are in their nature not susceptible of settlement by reasonable methods would be matter for derision and contempt.

It follows that if labor is to bargain and covenant collectively, its agreements must be something more than a German treaty—scraps of paper. Contracts must be honestly drawn, understood, confirmed and observed, in upright good faith, in spirit and in letter, if organized labor is to be accepted as competent to manage its affairs and disposed to do business as business ought to be done. Its agreements must constitute to society protection against strikes, an insurance against industrial disorders and a guaranty, likewise, of a fair day's work for the wage paid, assuring stability of industrial processes and freedom from mutual and community loss arising through childish pique over such trivial episodes as a change in shift boss, foreman or superintendent.

When those directing the destinies of organized labor in mine, shop and field can persuade the vast body of American workers that to live and work and prosper under the law, moral as well as statute, is more to be desired than to attempt to wax fat and prosperous outside and above the law, the people of America—and especially "Big Business"—may be expected, no doubt, willingly to adjust their industrial practice to the new industrial order.

The Comparative Efficiency Of Ball Mills

A CORRESPONDENT in this issue avers that the frequent expressions of opinion and the publication of much data as to the merits and weakness of different types of ball mills have led nowhere. From this view we respectfully beg to differ. Keen competition has led to the carrying out of exhaustive tests and the publication of useful and illuminating information. What our correspondent probably means is that the controversy, if such it may be called, remains at the *status quo ante bellum,* as far as any decisive general verdict is concerned. This reflects to the credit and ingenuity of those who have attacked the question from so many angles.

In such matters the personal equation is often overlooked, and this factor enters largely into the question of efficient operation of the equipment under discussion. The majority of operators who really believe in the mechanical or metallurgical efficiency of a machine will take abnormal pains to make it work satisfactorily. The inventor will make almost superhuman efforts to insure success; and, convinced of its infallibility from the beginning, will use every possible argument to see that the good features of design and construction are duly appreciated. Such arguments are made to appeal to the millman, especially if the machine is of a type that takes a feed and delivers a discharge without need for constant attention, causes little trouble, and, to use a popular phrase, "delivers the goods."

The ball mill has proved a welcome relief to operators whose experience has included the care of a stamp mill, or other even less popular crushing machine. To be in a condition to wager, with fair chances of success, that a mill will run for 24 hours without attention, is welcomed by the millman; it means a conservation of labor—a freedom to attend to minor details which, in the aggregate, help to maintain or improve the general efficiency of the plant. Many millmen make their preference for a type of ball mill at the outset, and remain loyal to the first machine of this class that they had any experience with, provided, of course, that it was not of defective design or construction. They remember the smooth-running operation, and the time that was left to adjust it to varying conditions, or to perfect normal results. When confronted with some modification in design in an alternative type of mill, they are loath to expend the same enthusiasm on its operation; they cannot see eye to eye with the inventor and similar enthusiasts; they already know, from actual experience, that the other mill did excellent work; and no student of human nature could expect them to transfer their allegiance from type to type, without strong reasons, and to modify their convictions accordingly.

A bias toward a particular class of mechanism is not to be deprecated—it is only natural. It breeds opposition or encouragement; it leads to criticism which often exhibits an unconscious bias of its own, but which, nevertheless, serves to encourage further research; and it engenders accuracy of statement. An engineer whose ideas are consistently neutral is inclined to present a flavorless view of any problem. Thanks to a healthy bias of opinion among millmen and metallurgists, there is an opportunity for frequent discussion of important points which often leads to the elucidation of problems and improvements in design and operation.

Conservation of Power Resources

ELIMINATION of waste must needs be the slogan of the day, and mine operators, in conjunction with other directors of industry, are placing their shoulders to the wheel in the supreme effort to convince the nation that conservation of every resource is a necessity. The present war situation has undoubtedly produced a speedier realization of this fact, but the trend of modern industrialism has for some time been in that direction. The two basic things necessary for the continuation of industry—power and labor—have been undergoing a period of education and experimentation, and the results of both have been to form a stronger working unit and one which has operated to the benefit of the nation.

In this issue we present two papers, one complementary to the other and each descriptive of a distinctly different operation, but both splendid examples of power conservation. In his article on "Hydro-Electric Development on Dead River," Mr. Wright describes the proposed utilization of water power which "for years has run to waste within a few miles of one of the world's most important iron districts." This is conservation of the right order—an efficient operation, carefully planned and one in which every opportunity was taken of the natural resources offered. In the generation of this power, which is used in mine operation, the complete elimination of the use of coal is effected.

In contrast to the hydro-electric development described, Mr. Collins, in his "Use of Pulverized Coal," suggests and expounds the complete and efficient utilization of coal in the metallurgical field. The many advantages, i. e. fuel conservation, labor reduction, utilization of lower grades of coal, maintenance of constant temperature and ease of combustion acquired by fine-grinding, strongly commended this process wherever it may be applicable.

Both processes aim at and achieve fuel conservation, and both are laudable in their saving of power and labor.

The California All-Steel Dredge

THERE is a wide gulf between the D-handled shovel and the all-steel dredge illustrated in this issue. It represents a similar process of evolution to that of the American blast furnace, the steam shovel or the Hulett unloader, and it exemplifies how dependent the mechanical engineer is upon the peculiar requirements developed by operating conditions.

The first successful gold dredges were constructed in New Zealand and were used for dredging river beds. They were necessarily small, but were of good mechanical design.

The dredging of alluvial auriferous terraces on the sierran rivers of California was first done with small dredges, and the richer alluvial material was successfully worked. Operating engineers speedily discovered that large capacity, high operating efficiency, freedom from excessive wear and tear, greater range of work, both in depth and width of cut, were essential if low-grade deposits were to be worked. Larger and larger dredges were successively developed. Gravel from 12 to 15c. per cubic yard was profitably handled. The culmination of this development is seen in the massive dredge illustrated. It is an achievement in which mining and mechanical engineers should take special pride.

BY THE WAY

During the spring of '60 two mining companies were at war about their locations, and one company threatened the other with an injunction, wrote Dan De Quille in "The History of the Big Bonanza." There had been considerable talk among members of the threatened company about the impending injunction being put on their claim. Two green Irishmen, who heard of the matter, concluded that they would keep a bright lookout for the injunction, although they had no idea what it was like. This they did for several days, but saw nothing stuck up anywhere about their claim.

About this time, it happened that a party of surveyors, engaged in running out a road in that neighborhood, arrived at the disputed claim; and, leaving their theodolite standing on the line they were running, went into town to get dinner. Pat and Mike returned from their dinner before the surveyors got back; and, catching sight of the costly instrument, Mike cried:

"By the powers o' war, Pat, what divlish thing is that, standing there on its three legs?"

"It looks like some quare kind of patent invintion," said Pat, "wid all of its brass muzzles and stop-cocks. What would it be, anyhow?"

"Well, now," said Mike, "I wonder if it isn't the thaving injunction thim rascally divils over beyant have been swearin' they'd put upon the claim?"

"By the sivin churches, ye've said it!" yelled Pat. "Let's afther it!"

With this, one seized a pick, the other a crowbar; and, rushing upon the theodolite, they smashed it into a hundred pieces. Pat flung one leg of the instrument as far as he could send it, yelling: "To the divil wid all injunctions!" Mike sent another down the hill, shouting: "Bring out yer injunctions, we're the lads that can knock the stuffin' out of the best and biggest of thim!"

Just as the pair had succeeded in "busting up the injunction," the party of surveyors returned. The interview between them and the two Irishmen was short; but, as Pat afterward acknowledged; it was "mighty improvin'."

Government Needs Draftsmen

The United States Civil Service Commission announces vacancies in large numbers of drafting positions. The filling of these situations is urgently necessary, as they have a direct connection with the war organization. Applicants will not be required to report at any place for examination, the ratings being based upon the applicant's education, training, experience and general qualifications, as shown by the application and corroborative evidence.

Following is a list of the drafting positions now open in the civil service, and the entrance salaries paid:

WAR DEPARTMENT

Title	Sex	Usual Yearly or Daily Entrance Salary
Construction Division:		
Architect	M	$2500–$3500
Structural designer	M	2400– 2700
Architectural designer	M	2100– 2700
Senior architectural draftsman	M	1800– 2100
Junior architectural draftsman	M	1200– 1800
Architectural tracer	M	1000– 1200
Quartermaster Corps and Ordnance Department:		
Automobile engineer	M	2400– 7200
Automobile engineer	M	1800– 3000
Automobile draftsman	M	1400– 2000
Automobile tracer	M	1000– 1400
Signal Service:		
Aëronautical mechanical draftsman	M	1200– 1400
Ordnance Department:		
Mechanical draftsman	M&F	800– 1800
Gage designer	M	2000– 3000
Automobile draftsman	M	800– 1800
Apprentice draftsman	M	480
NAVY DEPARTMENT		
Ship draftsman	M&F	4.00– 6.88
Architectural, mechanical and structural-steel draftsman (for shipwork)	M&F	4.00– 6.88
Topographic and subsurface draftsman	M	4.48– 5.04
Radio draftsman	M&F	3.52– 6.00
Copyist draftsman	M&F	2.00– 3.44
Bureau of Yards and Docks:		
Mechanical draftsman, armor and steel plant	M	4.00– 8.00
Engineering draftsman	M&F	3.04– 7.04
Bureau of Ordnance:		
Mechanical draftsman	M&F	4.00– 7.84
Bureau of Construction and Repair:		
Metal furniture draftsman	M	4.00– 6.00
Aëronautic draftsman	M	4.00– 5.04
Bureau of Steam Engineering:		
Electrical draftsman	M&F	4.00– 6.40
Marine engine and boiler draftsman	M&F	3.28– 7.04
INTERIOR DEPARTMENT		
Geological Survey:		
Copyist topographic draftsman	M&F	1100– 2000
DEPARTMENT OF COMMERCE		
Coast and Geodetic Survey:		
Hydrographic and topographic draftsman	M	1000– 1200
Apprentice draftsman	M	(a) $60

(a) Per month.

Full information and application blanks may be obtained by communicating with the U. S. Civil Service Commission, Washington, D. C., or with the secretary of the board of civil service examiners at Boston, New York, Philadelphia, Atlanta, Cincinnati, Chicago, St. Paul, St. Louis, New Orleans, Seattle or San Francisco.

NEW PUBLICATIONS

Hydraulic and Placer Mining. By Eugene B. Wilson, pp. 425; 5 x 7¼; illus.; third edition, $3. John Wiley & Sons, New York.

A well-known book that has served the practical miner by bringing the more important practical details of placer mining to his attention.

Analyses of Mine and Car Samples of Coal Collected in the Fiscal Years 1913 to 1916. By Arno C. Fieldner, Howard I. Smith, J. W. Paul and Samuel Sanford. Pp. 478; Bull. 123, U. S. Bureau of Mines, Washington, D. C.

Mineral Enterprise in China. By William F. Collins. Pp. 308; 5¼ x 8½; maps; 21s. William Heinemann, London, England.

The author of this interesting contribution to the literature of the art deals at length with the vicissitudes which have attended all attempts to extend or improve mining in China. The chronology of the industry carries the reader back to 2852 B. C., when metals were probably first used for currency, through mediæval times when non-metallic media of exchange were adopted at intervals, to the Eighteenth Century, when mining was allowed "only when found not to interfere with the farms and graveyards of the people." The opposition to the systematic development of mineral wealth, inexplicable to the more practical ideas of other nationalities, is attributed by the author largely to the amazing hold on the Chinese mind of superstitious "sciences," the tenets of which seem capable of being twisted to suit every eccentric point of view.

A detailed history of the efforts made by the United States, Great Britain and France in recent times to promote trade and, incidentally, to foster and develop the mining industry, provides interesting sidelights on the efforts of Li Hung-chang, and the official Chinese attitude toward the "barbarians." Sandwiched in among other historical facts we read of H. C. Hoover's connection with Chinese mining from 1899 to 1901.

The author deals at length with Chinese mining legislation, and avers that it is diametrically opposed to the policies of progressive nations. Titles are said to be uncertain and liable to forfeiture for flimsy reasons. Taxation is dependent on quibbling interpretations of Chinese terms and the precise meaning of statutes, all of which are apparently liable to periodic modification. Government control of mines, as suggested in official Chinese quarters, is viewed as an economic impossibility.

Equivalent weights and measures of Chinese and other systems are given in the appendix. The volume is one which will prove invaluable as a reference book on Chinese mining history, from the earliest time to the present day; and it will provide interesting reading on the subject of the psychological viewpoint of the Chinese mind toward modern ideas and progress.

Mining Operations for Gold, Coal, etc., in the Province of British Columbia for the Year Ended Dec. 31, 1917. Pp. 485; illus. Minister of Mines, British Columbia, Canada.

An excellent review in detail of the mining industry of an important mining area. British Columbia is a metal- and coal-producing province. The gross value of its mineral production in 1917 was $37,010,392, and the gross value of the metallic minerals recovered in 1917 was $27,284,474. Statistical tables and charts, together with descriptions of mines and mining districts, are given in sufficient number thoroughly to cover the field. The descriptions of the Granby Smelting Works, at Anyox are interesting. A report by George S. Rice, chief engineer of the U. S. Bureau of Mines, on the "Bumps and Outbursts of Gas in the Mines of the Crowsnest Pass Coalfield," furnishes an insight into the problems of mining coal in certain districts of British Columbia.

Matachewan Gold Area. By A. G. Burrows, Ontario Bureau of Mines; Bull. No. 34. Pp. 30, with Geological Map. A. T. Wilgress, King's Printer, Toronto, Canada.

This publication, which will form a part of the 27th annual report of the Ontario Bureau of Mines, has been issued in separate form as an advance edition, so as to make the information contained available to prospectors and others interested as early as possible. The Matachewan gold area is so called from its proximity to the Hudson's Bay Company post of that name on the Montreal River. Gold was found in Powell Township in the autumn of 1916, and it has also been found in the adjoining townships of Cairo and Alma. Mr. Burrows' report is the result of a general examination embracing Powell, Cairo, Baden and Alma townships and the Matachewan Indian reserve, with some adjacent territory. The newest railway station is Elk Lake, the terminus of a branch line of the Temiskaming & Northern Ontario Ry., from which point where is a canoe route up the Montreal River, a distance of about 30 miles, to the Davidson landing. A gasoline boat has been utilized for a part of the route in high water. The trip by canoe is arduous, owing to the swift current. Three portages are necessary. A route via Long Point Lake, requiring wagon transportation for part of the way by the Gowganda wagon road, has also been used, and supplies for this season's operations went forward from Elk Lake by a winter road that roughly follows the Montreal River.

The country covered by the report is near the height of land separating the waters tributary to Hudson Bay from those flowing southward. The area is of the rocky lake type, but much of the rock is concealed by a thin covering of soil. Where not recently burned over, there is a heavy growth of medium-sized timber. The topography is rugged in parts, some hills reaching 200 ft. above the plain, and changes of elevation of 50 to 100 ft. are frequent. The oldest rocks are of the Keewatin age, and consist mostly of basic to intermediate volcanics, accompanied by chert (iron formation) and schistose sedimentary rocks like quartzite and conglomerate. These have been intruded by numerous diabase and porphyrytic dikes.

The gold deposits in Cairo and Alma townships consist of quartz veins in the syenite. Narrow quartz veins on the Brookbank and Cluef claims in Alma give low assays in gold and silver, and on the Brookbank the quartz carries some fluorite, barite, copper pyrites and galena. On the Craig claims there is a long north-and-south vein consisting mainly of quartz and brecciated syenite, in one place showing a width of over 150 ft. A shaft has been sunk, and visible gold was reported in material from the workings.

The gold deposits in Powell Township occur in rusty weathering gray schist, reddish orthoclase porphyry, and a wide quartz-schist vein on the Davidson. The orthoclase porphyry occurs as small stocks intersected by numerous veinlets of quartz, some of which carry gold associated with iron pyrites. The porphyry itself is impregnated with iron pyrites, which at the surface has been partly oxidized with the formation of iron oxide and a breaking down of the porphyry into irregular fragments at different points. The porphyry outcrops are in places from 300 to 600 ft. in width. Gold has been found on several claims of the Davidson and Otisse groups in the porphyry. A sample from the surface of the porphyry in a trench on one of the Davidson claims gave an assay of $10 per ton over a length of 15 ft. Another surface sample from a long trench gave on assay a value of $12.50 over a length of 10 ft. These figures are not given as representative of the actual value of the whole mass of the porphyry, but indicate its gold-bearing character. Gold also occurs in a quartz and schist vein that has been traced 225 ft. by trenching.

Veins containing barite in syenite occur in several parts of the area. They are generally small, but there are two deposits which would be of commercial value if nearer railway transportation. They are the Beiderman deposit, in Cairo Township, and one near Yarrow Lake, in Yarrow Township. Fluorite has been found in small quantities in Cairo and Alma townships, and hemalite occurs in lenses in quartz veins on the La Brosse claims in Yarrow Township, west of the east branch of the Montreal River.

Personals

Have you Contributed to the Association of the 27th Engineers?

Edson S. Pettis, of San Francisco, is in New York.

Algernon Del Mar is now manager of the Techatticup mines, El Dorado Canyon, Nevada.

P. W. Clark, manager of the Galena Farm Mine, Silverton, B. C., has returned to Spokane.

D. B. Thomas has accepted a position with the American Cyanamid Co., and will act in an advisory capacity.

Herbert C. Hoover has paid a visit to the American battlefront. Among the places he visited was Belleau Wood.

John C. Anderson, general manager of the Santa Cruz Silver-Lead Co., Tucson, Ariz. was recently in New York.

Bruce C. Yates, superintendent of the Homestake Mining Co. is spending his vacation at the Yellowstone National Park.

Milnor Roberts, dean of the college of mines, University of Washington, is making a trip to the mining districts of Idaho.

John W. Beard, formerly with the Philadelphia Exploration Co., is now with the Cia. Minera de Penoles, Mapimi, Dgo., Mexico.

W. A. Deichen, formerly chief engineer for the state mines at Hibbing, Minn., has accepted a position with the Dean Iron Co., Mr. Deichen is succeeded by Ray Moore.

H. C. George, who has been engaged in consulting work in the Wisconsin zinc district during the last year, has accepted the position of geologist to the Wisconsin Zinc Co.

A. C. Allen will be in charge of the Bureau of Mines Rescue Car, No. 5, which will be at Lead, S. D., from Aug. 4 to 17. Instruction will be given in First-Aid and mine-rescue work.

W. C. Thomas has severed his connection with the Wolf Arizona Copper Co. and is now engaged in consultation work. His present address is 167 Seymour Ave., Newark, New Jersey.

J. N. Mahoney, for 12 years a member of the engineering department, has tendered his resignation to the Westinghouse Electric and Manufacturing Co., and intends to open consulting offices in New York City.

Bruce A. Middlemiss, general manager for the Todd Stambaugh interests on the Mesabi range for several years, has accepted the post of superintendent of the Chile Copper Co.'s mines in South America.

Charles Lehmann has left Naltagua, Chile, and has returned to England. His address for the present will be care of the Institution of Mining and Metallurgy, 1 Finsbury Circus, London, E. C., England.

S. K. Dahl, mill superintendent for the Messina (Transvaal) Development Co., Ltd., Zoutpansberg, South Africa, until the closing down of the property, has severed his connection with the company and will return to the United States.

L. B. Pringle, formerly chief chemist and experimental engineer for the Bonne Terre division of the St. Joseph Lead Co., Bonne Terre, Mo., is now office manager of the varnish division of the Certain-Teed Products Corporation, St. Louis, Missouri.

J. O. Elton, superintendent of the Anaconda Copper Mining Co.'s electrolytic zinc plant at Great Falls, Mont., is now in charge of special work for the Bureau of Mines. During his absence **B. B. Caples** will have charge of the plant.

S. G. Blaylock, of Trail, B. C., assistant general manager of the Consolidated Mining and Smelting Co. of Canada, Ltd., is in the East and intends to return at an early date. Mr. Blaylock attended the mining convention held last month at Revelstoke, British Columbia.

R. W. Brock, who has been in England for the last two years on military duty, has been chosen by the Imperial authorities as geologist with the British army in Palestine and has been instructed to proceed to the Holy Land to take up his new duties there. Mr. Brock was until recently dean of the faculty of applied science at the University of British Columbia.

C. E. Addams has resigned from the position of general manager of the Arizona Hercules Copper Co., which he held for several years and was succeeded on Aug. 1, by **A. A. Wrenn**, formerly with the Ray Consolidated Copper Co. and the Nevada Consolidated Mining Company.

F. H. Brownell, president of the Federal Mining and Smelting Co. and the Tacoma Smelting Co., and one of the directors of the American Smelting and Refining Co., is now general counsel for the last-named corporation, vice John K. Steele. Mr. Brownell recently left New York for Seattle.

Industrial News

L. R. Boyer, formerly with the Bureau of Standards, has joined the organization of E. & T. Fairbanks & Co., scale manufacturers, St. Johnsbury, Vermont.

J. H. Fenton, of the Los Angeles office of the Westinghouse Electric and Manufacturing Co., has recently been appointed manager of the industrial division of that office, which includes jurisdiction over the Tucson and El Paso offices.

Allis-Chalmers Manufacturing Co. reports earnings for the first six months of the year of $3,279,993, as compared with $2,107,361 for the latter half of 1917. Unfulfilled orders on June 30 represented $28,962,095. Sufficient has been earned during the first six months to pay regular 7% dividends for the whole year on preferred stock to liquidate the 7% dividend at present unpaid, and leave nearly 4% for dividends on common stock.

W. R. Grace & Co., of New York City, have formed a corporation to be known as the International Mining Co., which will operate tin and wolfram mines in Bolivia, and will develop an extensive mineral area there. The control of operations in Bolivia will be vested in a board consisting of D. S. Ingelhart, J. Louis Schafer and J. E. Zalles, with J. M. Connal as managing director. The Bolivian office will be at La Paz.

Societies

The British Iron and Steel Institute will hold the Autumn meeting in London on September 12 and 13.

American Museum of Safety and Sanitation will hold an exposition at St. Louis, Mo., during the week of September 7 to 12.

American Gear Manufacturers' Association will hold its semi-annual meeting at the Onondaga Hotel, Syracuse, N. Y., Sept. 19, 20 and 21. Announcement of the program will be given in a later issue.

American Chemical Society will hold its annual meeting at Cleveland, Ohio, from Sept. 10 to 13, inclusive, with headquarters at the Hotel Statler. The following local committees have been appointed: Executive—A. W. Smith, chairman, Case School of Applied Science, Cleveland, Ohio; Hippolyte Gruener, vice chairman, Adelbert College, Cleveland, Ohio. Finance—W. A. Harshaw, 720 Electric Bldg., Cleveland, Ohio. Entertainment—Hippolyte Gruener, Adelbert College, Cleveland, Ohio. Hotels—H. H. Gronemeyer, 1887 East 93rd St., Cleveland, Ohio. Entertainment of Ladies—Miss Josephine Grasselli. A tentative general program has been arranged as follows: Monday, Sept. 9, 4 p. m., council meeting at the University Club, Euclid Avenue and East 38th St. Dinner there for the council as guests of the Cleveland section. Tuesday, Sept. 10, 10 a. m., general meeting, reading of a paper on "The American Chemist's Place in Warfare," by Charles L. Parsons, chairman of the committee on war service for chemists. Other general papers to be announced. At 2 p. m. a general symposium on the chemistry of dyestuffs. R. Norris Shreve will act as chairman. Numerous interesting papers and addresses are being prepared. These will take up the whole of the afternoon of Tuesday and may continue on Wednesday morning in the industrial division. In the evening there will be a banquet at the Hotel Statler, followed by a smoker at the same place. Wednesday, Sept. 11, in the morning there will be divisional meetings at the Hotel Statler, and in the afternoon a choice of excursions. (a) Sanitary trip, including sewage-disposal experiments, water filtration, garbage disposal. (b) Steel industries, blast furnaces, byproduct coke, steel—bessemer and open-hearth. (c) Industrial tour of Cleveland, including manufacturing centers. (d) Trip to Oberlin. In the evening the president will deliver an address, followed by informal reception. Thursday, Sept. 12, divisional meetings all day. In the late afternoon there will be an outing to one of the country clubs, followed by reception at the Cleveland Museum of Art. Friday, Sept. 13, choice of excursions. (a) By special cars to Akron—Goodrich Rubber Co. (limited to 200), Knight Chemical Stoneware plant, and possibly pottery works. (b) Auto trip to Wadsworth, near Akron—Ohio Match Co., Ohio Salt Works, and Ohio Brass Co. (limited to 50). The usual meetings, including the annual election of officers, will be held by all the divisions, and by the rubber chemistry section, with the following special program: The division of biological chemistry is planning a symposium on plant chemistry. The division of industrial chemists and chemical engineers, besides continuing the symposium on the chemistry of dyestuffs, is planning a symposium on potash and a continuation of the very successful symposium on metallurgical subjects started at the Boston meeting.

Exposition of Chemical Industries. The program for the fourth national exposition, to be held in New York from Sept. 23 to 28, is in active preparation. Opening addresses are to be made by Dr. G. H. Herty and Dr. G. W. Thompson. Other addresses will be made by F. J. Tone, president of the American Electrochemical Society; Dr. W. H. Nichols, president of the American Chemical Society; and others. Joseph W. Richards, of the Naval Consulting Board, will speak on "Ferroalloys of Silicon, Tungsten; Uranium, Vanadium, Molybdenum and Titanium." Theodore Swann, president of the Southern Manganese Corporation, will speak on "Ferromanganese." The program will include a series of symposiums on the "Development of Chemical Industries in the United States, Notably Since July, 1914," one of which will be devoted to a consideration of potash development. C. A. Higgins, of the Hercules Powder Co., will speak of the operations of that company in recovering potash from kelp. Linn Bradley, of the Research Corporation, will discuss the recovery of potash from cement dust and other sources by electrical precipitation. Among the speakers at other symposiums are: A. Hough, "Chemical Engineering in Explosives, T N T, T N A, Picric Acid and Nitrobenzol"; E. J. Pranke, "Development of Nitric Acid Manufacture"; S. P. Sadtler, "Development of Industrial Organic Chemistry"; George H. Tomlinson, "Wood as a Source of Ethyl Alcohol"; C. A. Higgins, "Kelp as a Source of Organic Solvents"; and Alcan Hirsch, "Pyrophoric Alloys." The American Ceramic Society, which will hold its meeting at the exposition on the afternoon of Sept. 26, already has the following on its program: A. V. Bleininger, "Recent Developments in the Ceramic Industries;" L. E. Barringer, "Manufacture of Electrical Porcelain;" H. Ries, "American Clays;" and F. A. Whitaker, "Manufacture of Stoneware." Motion pictures will be shown depicting various phases of the many fields in which chemistry plays a part.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal at 25c. each. British patents are supplied at 40c. each.

Zinc Vapor, Apparatus and Method for Condensing—Charles H. Fulton, St. Louis, Mo., assignor, by mesne assignments, to Metallurgical Laboratories, Incorporated, Chicago, Ill., (U. S. No. 1,271,560; July 9, 1918.)

Electric Furnace—Carl A. Pfanstiehl, Highland Park, Ill., assignor to Pfanstiehl Company, Inc., North Chicago, Ill. (U. S. No. 1,271,760; July 9, 1918.)

Filter—William Henry Duryea, Tiffin, Ohio. (U. S. No. 1,271,681; July 9, 1918.)

Frog—Joseph P. Fleckenstein, Bethlehem, Penn., assignor, by mesne assignments, to Bethlehem Steel Co. (U. S. No. 1,271,556; July 9, 1918.)

Gold-Saving Apparatus—Adolph J. Jarmuth, Seattle, Wash., assignor to Erastus S. Bennett, New York, N. Y. (U. S. No. 1,271,714; July 9, 1918.)

Joint for Fixing Elastic Tubes Upon Metal Pipes—Maurice Alexandre Mazade, Paris, France. (U. S. No. 1,271,597; July 9, 1918.)

Melting-Furnace—Thaddeus F. Baily and Frank T. Cope, Alliance, Ohio, assignors to Electric Furnace Company, Alliance, Ohio. (U. S. No. 1,272,186; July 9, 1918.)

Sulphur Dioxide, Method of Recovering from Furnace Gases—Henry Howard, Brookline, and Frank G. Stantial, Melrose, Mass. (U. S. No. 1,271,899; July 9, 1918.)

Motor-Actuated Shovel—Michael J. Zabawa, Grand Rapids, Wis. (U. S. No 1,271,648; July 9, 1918.)

Editorial Correspondence

SAN FRANCISCO—Aug. 7

The Confidence That Oil Producers of the Pacific Coast and Rocky Mountain regions will avoid unnecessary and harmful competition, as expressed by Mark L. Requa, will no doubt be respected without the slightest hesitancy in California, where Mr. Requa is well known for intelligent and fair conduct of important matters. And there is no occasion for doubt that in other regions of petroleum production respect for the wisdom of Mr. Requa's recent remarks on the subject also obtains. The recommendations of the National Petroleum War Service Committee on distribution and price control do not apply to the Western regions. These recommendations include regulation of sales and time of selling, fixing of posted prices and of maximum premiums and elimination of competition. The committee stated that similar regulation may be applied to the Rocky Mountain and Pacific Coast regions later. But Mr. Requa, who is at the head of the Oil Administration, speaking on behalf of the petroleum producers, says he believes the oil industry of these regions can govern itself wisely and well; that it can better formulate its own rules and regulations voluntarily than through Government mandate. But the Government will be obliged to act in the matter if the oil industry does not do so voluntarily. And he adds: "I should be unwilling to be obliged to admit that the industry has failed in finding some solution to this question, some method of determining what is just and right, which will prevent unnecessary and harmful competition. I can conceive of nothing less to be desired than the necessity for the oil division of the Fuel Administration being compelled to initiate such procedure." That is straight talk and of the sort to be expected from the source, and, moreover, the kind of speech that will be respected and heeded.

The Survey of the Gold Situation in California undertaken by the State Mining Bureau has been completed in the Mother Lode region and is being extended into Nevada, Placer and Sierra counties. The survey has disclosed what is well known to all metal-mining men, that costs of mining gold in 1918 are approximately double the costs in normal times. In other words, the purchasing power of gold has been reduced about 40%, and production in the first half of 1918 is estimated at $8,500,000, as compared with about $11,000,000 in the same period of 1917. Also, the facts indicate that the decline in production is due largely to shortage of water for placer mining and quartz milling and power uses. Statistical data compiled in tabular form or narrated in the text of the report to be issued by the bureau will be of no direct, or even indirect, benefit to the gold-mining industry of California. It will not influence a reduction in the costs of labor, materials or supplies; nor increase the amount of available labor; nor cause the rains to fall on the just and leave the unjust to go dry. As a mere matter of history—that in 1918 the gold miners in California were hard hit by a combination of conditions over which they had not the slightest control, due primarily to the wickedness of the Kaiser and in a small degree, at least, to the neglect of Jupiter to shake his shield and send down the much-needed rain and snow—it may make easy reading for the idle curious after the war. But for the purpose announced by the state mineralogist—the relief of gold miners from the increased costs of mining—it will be as a missed hole in an extremely hard formation. Missed holes break no rock, but are a dangerous menace to be carefully guarded. Unwarranted expenditure of state money is a menace to the progressiveness of the department of the state which allows it, and should be more carefully scrutinized, even in the beginning of a political campaign.

La Grange Hydraulic Gravel Mine, in Trinity County, is being permanently closed down, owing to high costs and lack of material for continued operation. War conditions are demanding steel to the extent that steel rails for riffles cannot be supplied for hydraulic mining, and as the La Grange used 500 tons of steel rails annually, it was impossible to operate the property on a paying basis under existing conditions. It is the largest hydraulic mine in the world and has been in operation for about 40 years. Its operation has never been affected by the anti-debris laws, owing to the fact that the tailings in no way interrupted agriculture nor interfered with navigation or the purity of domestic water. Whether the owners, chiefly English stockholders, made any effort to induce the Government to aid them in the interests of gold mining as an essential industry to the success of the war has not been made public. It is probable that the life of the property might not have extended much longer and possible that the increased cost of steel would have rendered the complete working out of the mine unprofitable. But that there is still a large amount of gold in the holdings that cannot be profitably mined by other than expensive hydraulic process is not disputed. The production of the past has totalled several million dollars, and operating methods were being constantly improved during the working life of the property. The company has 23 miles of flume, ditches and pipe and large "giants" and other essentials were employed in the operation. Forty men, most of them having families, were employed, and an important camp was established, being supplied with electric lights and water system. The property is situated four miles from Weaverville, the county seat and chief town of the county. The final gold clean-up is about finished, and the company is said to be contracting with junking firms for dismantling the plant and disposing of the material.

The High Cost of Gold Mining has in the last year been more disastrous to the gold-mining industry in California than will ever be made public by the mine owners and operators. The survey of conditions undertaken by the State Mining Bureau will probably disclose that the cost has increased approximately 43% since 1914. The real condition is not being made known to the field assistants of the Bureau by any of the larger mines. There are many inside facts regarding the gold-mining situation that mine owners keep to themselves. It is safe to place the increase in costs, not since 1914, but within the last two years, at near 50% in every important gold-mining region in the state. And unless there is to be an appreciable reduction in costs, many of the mines will close down completely, instead of keeping the properties alive merely by development and preserving the physical conditions and maintaining the equipment in proper repair for future resumption of production. It can serve no good purpose to make public to the world of mining investors and disinterested people generally the details of the true condition of the gold-mining industry in the state. Such publication will not make the future any better but, rather, might drive away from the state many possible future investors in gold mines. The fact is that it is bad enough as it stands. But not so bad that a remedy may not be found if action is taken immediately. It does not require expensive and extensive travel over the state to learn the facts. A review of the information provided and opinion expressed by mine owners and operators of prominence and repute as gold miners will provide all the essential facts. As to the remedy, the same number of responsible owners and operators may be as reliably quoted, if they would permit. And there is not one of the entire fraternity of gold miners in the state that demands anything unreasonable or that has the disposition to be unpatriotic. The consensus of views as to the remedy for excessive costs is that the gold miner should be relieved of certain taxation and be given the advantage of priority, along with other mine owners and operators, in the obtaining of the necessary supplies and materials. The gold miners are ready and willing to forego even the ordinary or usual profits if they are allowed to keep their properties alive and in condition for future continuous operation without loss and damage to mines and equipment. They are all patriotic enough to trail along behind the copper and silver and lead and zinc miners and the miners of chrome, manganese, tungsten and other special minerals, who are making money or getting rich. And their patriotism, like the patriotism of all good Americans, is backed by the belief that the future will bring its reward and happiness not to themselves merely but to their fellow Americans and to the rest of the world who are opposed to Kaiserism. All the fuss and feathers and playing politics and making a great stir about the situation of the poor gold miner does not get anywhere. Let the proper representatives of the Government and the real representatives of the gold miners of the country get together, and eschew politics and eloquence and oratory, and they can settle the situation in a day. It will not require a great convention of delegates and a brass band and a waving of flags and shouts of patriotism. If the President would relieve Hoover from the job of Food Administrator and induce him to assume control of the gold-mining administration—with power to act—the whole question would be settled before the small fry had done talking about it, and the gold mines would be going along in the usual way and contributing their profits to the winning of the war. What Hennen Jennings is doing in his field and Mark Requa is doing in his field, Hoover or some other man of like cailber would speedily do in the gold-mining field.

SALT LAKE CITY—Aug. 9

An Increase in Coal Production by Utah and Wyoming of 7000 tons during the week ended July 20, over the week preceding, is evidence of the speeding up of the coal industry to meet war needs and is a hopeful augury for the coming winter, for which fears of a coal shortage have been entertained.

A New Process which will secure 100% copper concentrates, according to Prof. Elbert D. Thomas, secretary-registrar of the University of Utah, has been obtained through the work of the United States Bureau of Mines at the University of Utah. In accordance with the spirit of the times, this process will be secretly communicated to the Government for use in carrying on the war. The new process, if put into use, would add greatly to the amount of available copper.

Output of Park City Mines during July was 7710 tons of ore and concentrates, the largest shippers being Ontario Silver, Silver King Coalition and Judge Mining and Smelting. A further wage increase of 50c. a day has been granted by the above-mentioned mines, and by other companies operating in the camp. Mine rescue work is being done at various properties under direction of the United States Bureau of Mines, rescue car No. 1 having arrived in Park City on Aug. 5.

Possible Curtailment of Labor in nonproductive mines until producing properties have been served has been talked of in connection with operations in American Fork Canyon. There is labor shortage at many properties, and the high cost of labor and material is automatically cutting off much prospecting. More or less of this work is necessary for the health of the industry, which cannot confine itself to the exploitation of known orebodies in proved ground.

An Immediate Increase in Sulphuric-Acid Output in this section is not to be expected. The plant of the Garfield Chemical Co., operating at Garfield and producing acid from smelter fumes, is maintaining an output of 150 tons daily, but further expansions is temporarily suspended, owing to the heavy cost of material and labor. The demand for the material, owing to transportation costs, is a local one. At present Utah Copper is taking the greater part of the output of the plant for use in leaching operations.

Increase in Coal Production in the state is shown for the first half of 1918 to be 500,000 tons over that of a corresponding period in 1917. It is expected that the increase for the year will be double this amount. There will, of course, be some shortage of cars in the autumn, when the heavy movement of crops begins. However, so great a shortage as that of the year preceding is not looked for, and it is hoped that it will be possible to keep the coal moving. On the whole, it is not expected that the coal shortage of last winter will be repeated. The effort to speed up production during the period when coal mining is usually slack has met with success.

The Recent Increase in Freight Rates, as affecting Utah mine operators, is under consideration by those interested and a committee has been formed consisting of A. G. Mackenzie, Imer Pett, J. C. Dick, G. W. Lambourne, and F. G Westcott, of the Utah Chapter of the American Mining Congress. The increased rates will be felt in two ways. The advance will rest directly on the producer, as changes in future smeltery contracts and increased charges are announced; and curtailment in the output of low-grade ores is sure to follow, which may make it difficult for the smelters to operate at full capacity, resulting in an increase in overhead expense. As has been pointed out, it seems logical to conclude that an increase in the price of metals would afford a solution of the problem of preventing a curtailment of production. In regard to the fixing of a basic wage scale by Government action, definite assurance has been extended to operators by the Department of Labor that no action will be taken without giving all concerned a full opportunity to be heard, and to present suggestions and criticism.

JEROME, ARIZ.—Aug. 6

Jerome Labor Trouble has been settled by acceptance of the award by mediator Hywell Davies of a 25c. wage raise, in addition to the 50c. that came after the increased copper price to 26c. In this connection, Mr. Davies explained that the copper companies would derive no benefit whatever from the raise of price from 23½c., the difference being wholly consumed in additional labor, transportation and refining charges. A demand for the $100 a year service bonus for old employees, lately made effective in Bisbee, was waived, in consideration of the 25c. addition. It was agreed, also, that local companies attend to the better housing of their employees at lower cost, the United Verde assenting to rental reductions of $8000 a year and to a program of building new quarters for its men. Lighting costs will be reduced from 15c. to 11c. per kw-hr. and the water rates go down 10 per cent. These changes all are effective July 1. Word has been received that on recommendation of mediator J. S. Myers, an additional 25c. has also been granted in the Globe-Miami section, effective Aug. 1. Here the demand of the workmen for a flat raise of $1.10 a day lost strength after receipt by the unions of a telegram from Secretary Wilson of the Department of Labor, asking coöperation with the mediator, that there be no cessation of the production of copper.

JOPLIN, MO.—Aug. 7

A Shortage of Electric Current for the district is threatened once more this summer as a result of comparatively dry weather. White River is low, and the generators of the Ozark Water and Power Co. there are unable to operate sufficiently to supply the Empire District Co. at Joplin with the necessary current. Spring River also is low, and Empire's plant at Lowell, Kan., is likely to have trouble soon. In line with the Government's fuel conservation ideas, it is hoped sufficient current may be produced without using too much coal. Numerous mills are operating on afternoon and night shift in order that the peak load may be divided up.

An Attempt to Concentrate Labor at mines of larger companies that are not likely to be forced down by low zinc ore prices may be made by producers in this field. The cut in ore prices again last week put a final quietus on the efforts to stimulate a boom out of the raise in price of a few dollars during the last month, and it is likely that companies forced to close now will remain closed for some time. The fact that there is a continued and growing scarcity of capable labor is causing operators to consider favorably an attempt to concentrate available labor at those mines that are almost certain to be kept in steady operation, regardless of prices. It is argued that such a plan would benefit both workers and employers and therefore would be for the good of the district and the Government. Some of the larger companies in the district that are expected to continue operations despite poor ore markets include the Commerce Mining and Royalty, Eagle-Picher, Admiralty Zinc, U. S. Smelting, Underwriters, Golden Rod, Bilharz, Acme, Huttig, Blue Mound, Skelton, and Bethel-Domado-Croesus.

DULUTH, MINN.—Aug. 8

Labor Shortage on Mesabi Range is proving serious. As all industries are working at capacity, there seems to be no source from which to draw additional labor. This shortage appears to be affecting the smaller underground mines more than any other type of property. At present the minimum wage for common labor is $4 a day. Few receive less than $100 a month, and the average wage ranges from $100 to $125 per month.

HOUGHTON, MICH.—Aug. 7

Training of Soldiers in mining methods is being conducted at the Michigan College of Mines. Two hundred men, selected from the last draft, are being trained as infantry and are specializing in mining. They are being taught how to operate and repair machine drills, the handling of dynamite, timbering and various other details of mining. Half of their time is spent underground, where they are employed by the Hancock, Franklin, Isle Royale and Quincy mines.

SPOKANE, WASH—Aug. 8

Relief of the Gold Stringency is to be discussed at a conference to be held in Spokane, during the week of Sept. 2, under the auspices of the Northwest Mining Association, which has appointed a committee consisting of F. A. Ross, A. W. Boyd, F. C. Bailey and S. Norman to arrange all details. The conference is one of many similar gatherings to be held all over the country at the request of Secretary McAdoo. At each of these meetings representatives of metal interests will discuss what is most needed in each section. An invitation to attend the Spokane conference will be extended to financiers from British Columbia and other Canadian states.

COBALT, ONT.—Aug. 6

Mining Companies in Northern Ontario having machinery which has become second-hand, or that has been replaced by more modern equipment, are finding a growing demand for their discarded material, owing to the great increase in price of new mining machinery of all kinds. Another feature which makes desirable the purchase of the material in the district is the fact that deliveries over the railroads have been a source of much worry and waiting. A number of mining concerns in the district are having their discarded machinery overhauled and placed in a marketable condition, and in many cases this equipment is bringing a higher price than that paid for it when new, several years ago.

VICTORIA, B. C.—Aug. 6

Natural Gas of Northern and Southern Alberta is to be tested as to its value as a source of gasoline. The work is to be carried out under the direction of D. B. Dowling, of the Canadian Geological Survey Branch, Mines Department, Ottawa. It is probable intial tests will be made at the Dingman well, south of Calgary City, and that these will be followed by similar tests in the Viking and Peace River fields.

MELBOURNE, AUSTRALIA—July 2

Mines in the Westonia Field, situated on the Fremantle-Kalgoorlie Ry., Western Australia, and 207 miles from Fremantle, include the Edna May, Edna May Central, Edna May Deep, Edna May Consolidated, Edna May Battler, the two first mentioned being the only two opened up and completely equipped. The Edna May mine has been developed by six levels to a depth of 480 ft. From January, 1913, to the end of the last half year, a total of 151,914 tons has been treated, which yielded 132,000 oz. gold, valued at £620,169. Output for the last six months was 11,850 tons. In addition, 9900 tons of sands were cyanided and 605 oz. of gold with a value of £2071 recovered, as well as 8983 tons of slimes, which produced 1324 oz., of a value of £8013. Working costs, including development, averaged £2 4s 4.67d. Heavy inflows of water, uncommon in Western Australia mines, have retarded development, but an additional plant installed during the last half year appears to have mastered the flow, and the mill should be kept running continuously. Six months ago the normal quantity of water to be pumped did not exceed 40,000 gal. per hr., but while stoping operations were being carried on above the 385 level, the water increased to a maximum of 60,000 gal. per hr., necessitating the closing of bulkheads to prevent flooding.

CARACAS, VENEZUELA—July 5

Lawsuits Against Foreign Corporations attempting to operate mines in Venezuela have not only been internationally notorious but such cases as the Imataca iron deposits, the Bermudez asphalt concessions and the Guanta coal fields have been subjects of more or less energetic exchanges between foreign powers and Venezuela. The honest efforts of the American Magnesite Mining and Manufacturing Co., and the Magnesite Products Corporation, both of New York, to work the extensive magnesite deposits of the Island of Margarita, Venzuela, have resulted in lawsuits of a malicious and blackmailing character, and in both cases the courts have supported the claims of those suing. The result has been that both companies have abandoned operations and 300 laborers have been thrown out of work. President J. V. Gomez recently sent a telegram to the governor of the state that bids fair to stop the pernicious practice, which has persisted for the last 25 years, of making war on mines operated by foreign capital that are outside of Federal influence. The telegram was to the effect that judges who placed a wrong interpretation upon th embargo were liable to removal from of fice. The attitude of the President is o great importance to foreign mining an other interests, as it shows a desire to pro tect foreign capital from the persecutio of local authorities.

The Mining News

ARIZONA

Cochise County

PHELPS DODGE CORPORATION (Bisbee)—[illegible] shaft to be reopened and retimbered. [illegible] shaft has been sunk to [illegible] level, and is to be equipped with headframe from Spray shaft.

CALUMET & ARIZONA (Warren)—Smeltery production during July amounted to [illegible] lb. of copper, of which [illegible] lb. was available for Calumet & Arizona

Gila County

INSPIRATION CONSOLIDATED (Miami)—July production was 9,000,000 lb. of copper.

Maricopa County

SOUTH VERDE CONSOLIDATED (Mesa)—Driving tunnel to cut ore developed by shafts.

Mohave County

CACTUS QUEEN COPPER (Kingman)—New machinery to be installed and operations started soon.

FRISCO MINES (Kingman)—Work r sumed. Surface ores to be milled with t ores from lower levels.

GOLD ROADS MINES (Kingman)—300-ton crushing plant to be placed in ope ation soon.

GOLD TRAILS (Kingman)—Hoist to installed. Shaft down over 100 ft. and w be continued to greater depth. Contrac to be let for shaft sinking.

RECORD LODE (Kingman)—To inst a mill in six months. Shaft down 4 ft. To be sunk to 500 level.

STANDARD MINERALS (Kingman)—Cutting station at 350 level and will crosscut to vein.

Pima County

NEW CORNELIA (Ajo)—July production was 3,900,000 lb. of copper.

Pinal County

GREAT RAY (Ray)—Churn drill operating property.

Santa Cruz County

HARDSHELL MINE (Patagonia)—Installing large Hartz jig. H. K. Welch is manager.

HARDSHELL NO. 2 (Patagonia)—Has installed cyanide plant, which is in operation.

TRENCH (Patagonia)—To sink 200 ft. deeper and cut orebody at lower level.

Yavapai County

ADAMANA OIL (Holbrook)—Machinery received and preparations for drilling under way.

HOLBROOK OIL (Holbrook) — Contracted for sinking of 2600-ft. well.

HACKBERRY (Jerome)—Installing a 200-ton flotation plant.

CALIFORNIA

Alameda County

WESTERN MAGNESITE (Livermore)—To install 150-ton mill. Other properties in this district under development.

NOBLE ELECTRIC (San Francisco)—To erect new hoist on property developing manganese in Tesla district.

Amador County

BUNKER HILL (Amador City)—Dropping 20 stamps on day shift. C. E. Bunker is superintendent.

KEYSTONE (Sutter Creek)—Report for six months ended June 30, shows 40-stamp mill lost only 17 hours. Crushed 43,694 tons, yielding $85,802 net, after deducting freight and smelter charges on concentrates, from ore averaging less than $2 a ton. Mining and milling charges, $83,000; corporation license, stock tax, $133; interest, $509; secretary's office, manager's salary, etc., $1970. Total, $85,612. The 900-ft. level produced only 34 tons; 1000-ft. level produced 17,788 tons. Development on these levels has been discontinued until cost conditions are improved. Development on 1800-ft. level shows larger amount of ore than in sight six months ago. Main stope on 1200-ft. level is 80 ft. above drift in 8 ft. width of milling ore. Prospects good for large tonnage. C. R. Downs is manager.

Butte County

INSKIP (Chico)—To be reopened. Development by 2000-ft. tunnel. Cut vein 200 ft. below surface.

SURCEASE (Oroville) — Temporarily closed down.

Calaveras County

DUTCH-SWEENEY-APP (Jamestown)—Receiving material for new mill construction and installation is in progress. W. J. Loring is manager.

Del Norte County

CALIFORNIA CHROME (Crescent City)—Unwatering old mine on Chrome hill has commenced.

Eldorado County

ROCKY BAR (Placerville) — Installing gasoline engine, hoist, pumps and other equipment. Development in progress. J. A. Prentiss is superintendent.

Humboldt County

MANGANESE DEPOSIT being developed at Blocksburg and ore hauled to railroad for shipment.

Imperial County

IMPERIAL REDUCTION (Pasadena) — Application for U. S. patent on American Girl, American Girl Extension, Western, Homestake, Black Rock, Annex. Also mining claims situated near Ogilby, in southeastern part of county, northwest of Yuma and known and operated as American Girl mine.

Inyo County

MINERAL PRODUCTION in 1917, according to U. S. Geological Survey, is valued at $2,959,504. Total tonnage of ore treated, 84,508 tons; gold yield, $121,313; silver, 648,791 oz.; copper, 744,582 lb.; lead, 19,671,732 lb.; zinc, 3,956,343 pounds.

Madera County

TEXAS FLAT (Coarsegold)—to increase operations. Large supply of water anticipated, and mill will resume in fall.

MINARETS MINING (Mammoth) — Ore carrying silver and zinc disclosed in new development tunnel.

Placer County

FARMERS' LIME (Auburn)—Installing crusher and kilns.

Plumas County

BUSHMAN PLACER (Quincy) — Steam hoist and pumps to handle gravel and water to be installed and contracted to S. R. Ede and Louis Smith by San Francisco owners.

Shasta County

MAMMOTH (Kennett)—Smeltery production during July was 1,330,000 lb. of copper.

MOUNTAIN COPPER (Keswick)—Iron Mountain and Hornet mines averaging 800 tons of ore a day. Shipments to Martinez smeltery normal, in spite of labor shortage, which chiefly affects development. Enlargement of concentrating plant at Minnesota station to 300-ton capacity to be completed by September.

BIG PINE CHROME (Redding) — New deposit in Shotgun district discovered by Antone Orsini.

REID (Redding)—Quartz mining in Old Diggings district resumed. Contract for 150 to 200 tons daily delivered at Mammoth smeltery, at Kennett, has been made.

BULLY HILL (Winthrop)—Copper production in first half of 1918 amounted to 1,623,591 lb.; silver, 2623 oz.; gold, 449 oz. Construction of flotation plant progressing. Expect first unit ready in September.

Sierra County

WISCONSIN (Downieville)—Driving drift in gravel channel and developing. Wagon hauling to supplant packing by mules.

Siskiyou County

CHROME DEPOSITS are reported near Eddy Mountain. The Caldwell mine has 20 tons on the dump running as high as 50%. Prospectors are working south of Shasta. Liberty Mining Co., in Little Humbug district, has 100 tons on the dump to be hauled by motor trucks to Yreka for rail shipment. Installation of concentrating mill contemplated. Scott River district is producing about 20 tons a day, which is hauled by team 32 miles and transferred to motor trucks for Yreka. Concentrating mill at Yreka, enlarged to 150 tons, is operating.

Sonoma County

MANGANESE DEPOSIT near Lytton to ship ore to Noble Electrolytic Steel Co., at Heroult.

Tuolumne County

SPRINGFIELD TUNNEL (Columbia)—New tunnel making good progress through soft ground, requiring timbering. Raise to be driven for air at 1200-ft. point. Depth of gravel to be determined by drilling, and tunnel will be advanced to provide for drainage and economical working.

EAGLE-SHAWMUT (Shawmut) — Impounding dam for tailings, under construction, made necessary by closing down of chlorination plant and changes in milling methods.

Yuba County

MACEY (Camptonville)—Development to be resumed by L. C. Trent. Ore carries gold, silver and copper.

COLORADO

San Juan County

GOLD KING EXTENSION (Silverton)—Company recently incorporated has taken over old Gold King mine, at Gladstone, and six other claims between it and Sunnyside mine. Development work in new ground from Gold King workings to be immediately started under management of W. Z. Kinney.

IDAHO

Bonner County

FALLS CREEK (Sandpoint)—Has completed installation of compressor, 50-ton mill and power plant.

Shoshone County

AJAX (Burke)—Crosscutting north from Oom Paul tunnel for vein.

IDAHO-CARBONATE (Mullan)—Has cut galena in shaft. W. E. Greenough is manager.

SUNSET (Sunset)—Fire, caused by lightning, recently destroyed engine and compressor house.

AMAZON-MANHATTAN (Wallace) — To resume operations at 400-ton mill.

NATIONAL (Wallace)—Completed alterations to mill and to resume operations soon. Mining ore on 800 level in addition to lower levels.

MICHIGAN

Copper District

ALLOUEZ (Allouez)—Mined 54,000 tons during July.

SENECA (Calumet)—Sunk vertical shaft 202 ft. during July.

FRANKLIN (Demmon)—Closed down mill, pending decision of Government regarding freight rate.

QUINCY (Hancock) — Framework for skip-run of new hoist being placed.

ISLE ROYALE (Houghton)—Mined 77,000 tons during July.

AHMEEK (Kearsarge)—Has reopened No. 3 shaft, but No. 4 shaft will remain closed. Operating three shafts.

OSCEOLA (Osceola)—July tonnage amounted to 103,000, as against 104,000 tons in June.

COPPER RANGE (Painesdale)—To drill four more holes on land below Globe.

MICHIGAN (Rockland)—Cut epidote vein at 180 ft. in north drift. July tonnage was 3414 tons.

MINNESOTA

Mesabi Range

SARGENT (Keewatin)—Winston Dear Co. preparing to strip property for the Wisconsin Steel Co., operators. New camps being built.

MISSOURI

Joplin District

ST. JOSEPH LEAD (Herculaneum)—Announced by National Labor Board that award has been rendered granting general increas in wages, establishing minimum wage and providing a system of collective bargaining between employer and employee. Award is made retroactive to April 21.

MONTANA

Silver Bow County

BUTTE COPPER AND ZINC (Butte)—Shipments for six months ended June 30 were 22,700 tons zinc ore and 28,900 tons manganese ore, which netted to the company $268,337.59.

NEVADA

Clark County

MOUNTAIN TOP (Goodsprings)—Vanadium ore opened some time ago by Kennedy and Wilkinson, operating under lease from Campbell estate. Shipments now being made.

Douglas County

KENNEDY COPPER (Buckskin)—Development work from shaft to be pushed.

Esmeralda County

ATLANTA (Goldfield) — Following a brief walkout of miners, work resumed. Crosscut to foot wall of vein on 1850 level again being driven. Incline winze from 1750 level opened stringers of high-grade ore, and foot wall will be thoroughly explored.

GOLDFIELD MINING AND ORE REDUCTION (Goldfield)—Shaft down 200 ft. Four-drill compressor to be installed and sinking pushed. Company owns seven claims on Divide vein.

SILVER PICK CONSOLIDATED (Goldfield)—Shaft nearing 1200 level, from which extensive lateral work will be done.

Lyon County

NEVADA-DOUGLAS (Ludwig)—Change of management and staff being made. Regular shipments being made to Thompson smeltery.

McCONNELL (Mason)—Shipping carbcnate ore from surface workings.

Nye County

TONOPAH DISTRICT ore production for the week ended July 27 totaled 10,065 tons, of an estimated gross milling return of $171,105. Producers were: Tonopah Belmont, 1934 tons; Tonopah Mining, 3800; Tonopah Extension, 2259; Jim Butler, 351, West End, 1005; Halifax, 107; Montana, 294, and MacNamara, 315 tons. Production for the week ended Aug. 3 totaled 9722 tons, of an estimated gross milling return of $165,274. Producers were: Tonopah Belmont, 1985 tons; Tonopah Mining, 3700; Tonopah Extension, 2108; Jim Butler, 285; West End, 1049; Halifax, 48; Montana, 86; MacNamara, 315; Cash Boy, 39; Rescue, 68, and miscellaneous 39 tons.

MANHATTAN CONSOLIDATED (Manhattan)—Raise from the 300 level on the High Grade vein, when holed through, will improve ventilation and permit further development of High Grade and Mushett veins.

MANHATTAN DEXTER (Manhattan)—Making test run of ore from the Juhl Nelson lease at War Eagle mill.

UNION AMALGAMATED (Manhattan)—Crosscut from shaft on 700 level being turned toward orebody developed from the upper levels.

WHITE CAP (Manhattan)—Plans to sink working shaft another 150 ft. below fifth level on contract.

DIVIDE (Tonopah)—Shaft station being cut on 300 level and some ore of commercial grade opened.

GOLD ZONE (Tonopah)—West drift on 285 level being driven to connect with Tonopah Divide mine.

TONOPAH DIVIDE (Tonopah)—To install electric hoist and compressor, and advance development work as rapidly as possible. Crosscut on 350 level being driven to cut vein opened on level above, now in 60 ft. Electric power line to camp of Divide recently completed by Nevada-California Power Company.

NEW MEXICO

Grant County

MANGANESE CLAIMS are being worked 20 miles north of Lordsburg by Tuck Edwards and associates, of Duncan, Ariz. Trucks will be used to haul ore to Lordsburg.

ATWOOD (Lordsburg)—Sinking 200-ft. shaft started on Southern group. Old shaft has been re-collared, new compressor and Diesel engine installed. Old workings have been re-sampled.

BOUNDS AND RICE (Lordsburg)—Fluorspar properties 30 miles northeast to be worked under lease by H. M. Maple.

LAST CHANCE (Lordsburg)—Work started on 50-ton unit of mill. Viola, adjoining property, being unwatered for examination purposes, and if satisfactory will take mine over. Basil Prescott is general manager.

PHILLIPS (Steeple Rock)—Producing high-grade fluorspar and will ship from Duncan, Ariz. T. O. Phillips is superintendent.

Luna County

WATERLOO (Tres Hermanos)—Main shaft down 100 ft. to be sunk another 100 ft., and drift 300 ft. Vein carries lead-silver. This to be followed by concentrator.

OKLAHOMA

Joplin District

DORRIS (Miami)—Sinking shafts to deeper ore level and will drain ground.

R. P. SHARPE (Miami)—Has taken over Scott-Eagle and Gander mines, west of Quapaw, and will operate. Scott Eagle mill to be used for both mines.

DOROTHY BILL (Picher)—Started operation of new 100-ton mill between Tar River and Picher. J. R. Cole, of Tulsa, Okla., is manager.

ALAMO (Quapaw)—To sink shaft. Joe T. Burgher, of Dallas, Tex., is president.

BIG TEN (Quapaw)—To sink shaft on lease near Lincolnville mine.

OREGON

Jackson County

RAY & HAFF GROUP (Gold Hill)—A second strike has been made on the main vein in new drift on 600 level. New hoist and machinery being erected and reduction plant being assembled. J. G. Davies and associates, of Sacramento, Calif., are lessees.

RED OAK (Gold Hill)—Has been sold to R. E. Doan, of Gold Hill. Mine closed for 20 years. New owners to reopen and equip at once.

Josephine County

GOLCONDA (Waldo)—Shipped 450 tons of chrome ore in May; 1035 tons in June; and 1500 tons in July. R. J. Rowan is engineer in charge.

SOUTH DAKOTA

Custer County

FOYE (Custer)—Work has been started. Expects to make regular shipments of mica.

OLD MIKE (Custer)—Making regular shipments of mica to Chicago.

SPOKANE LEAD AND SILVER (Custer)—Plant in operation and producing lead-silver concentrates. Motor trucks to be used to haul to railroad.

Lawrence County

ECHO (Deadwood)—Pumps being installed. Shaft to be sunk deeper to develop lead-silver ores.

TITANIC (Deadwood)—To resume work and drive 1200-ft. tunnel under contract. Work to start this month.

BISMARK (Lead)—Tungsten being recovered, in addition to gold-silver ore.

TINTON (Tinton)—Concentrating tin ores. One shipment of concentrates made to Eastern market.

Pennington County

GOLD KING (Rochford)—Machinery has been installed and sinking of three-compartment shaft started.

TENNESSEE

Carter County

PATTON (Breamer)—Manganese properties have been taken over by L. D. Gasteiger and O. W. Richarson, who will install a two-log washer, with a second soon to follow.

WILLIAMS (Elizabethton)—Option taken by local interests and manganese has been found in promising amounts. Shaft to be sunk 100 ft. to prove depth of the ore, and, if satisfactory, a washer will be built.

H. V. MAXWELL (Hampton)—Shipped four cars high manganese ore during July.

UTAH

Juab County

TINTIC DISTRICT SHIPMENTS for the week ended Aug. 2 were: Dragon Consolidated, 52 cars; Chief Consolidated, 31; Tintic Standard, 18; Iron Blossom, 15; Centennial-Eureka, 15; Eagle and Blue Bell, 11; Colorado, 8; Gemini, 7; Gold Chain, 6; Grand Central, 5; Godiva, 2; Ridge and Valley, 2; Victoria, 2; Shoewers, 2; Scranton, 2; Sunbeam, 1; Gold Key, 1; Swansea, 1; Yankee, 1; Eureka Hill, 1. Total, 184 cars.

TINTIC SHIPMENTS during July amounted to 620 cars, as compared with 686 cars in June, 29 properties shipping.

APEX-STANDARD (Eureka)—Work to start immediately in hope of finding extension of Tintic Standard vein.

EUREKA LILY (Eureka)—Developing on 1400 level.

EUREKA METALLURGICAL (Eureka)—Small experimental plant using flotation making good recoveries from Tintic ores.

NORTH BECK (Eureka)—Shaft now down 1150 ft. to be sunk to 1200 level and drifting started.

DRAGON CONSOLIDATED (Silver City)—Shipping fluxing ores and silver-lead-gold ore from north end of property.

TINTIC MILLING (Silver City)—Treating 150 to 200 tons of ore daily, and making profit.

Salt Lake County

COLUMBUS-REXALL (Alta)—New ore opened in drift has widened out and is thought to be part of the old producing orebody.

SOUTH HECLA (Alta)—Ore being shipped from four different stopes. Mining in eastern zone is in sulphides, and carbonates in western.

MONTANA-BINGHAM (Bingham)—Marketed three cars of ore in the last three weeks.

OHIO COPPER (Bingham)—Third unit of new flotation plant treating 500 tons daily. Fourth unit expected to start before end of August and fifth about October 1.

Summit County

PARK CITY SHIPMENTS for week ended Aug. 3 amounted to 3,564,920 lb. the largest shippers being Ontario Silver, Silver King Coalition, Judge Mining and Smelting and Silver King Consolidated.

NAILDRIVER (Park City)—New strike reported promising. Operated under lease.

ONTARIO SILVER (Park City)—Owing to caving of one of principal stopes, July production was materially decreased. Another stope being opened on 1700 level.

SILVER KING CONSOLIDATED (Park City)—Progress being made in alterations to mill which will permit production of zinc concentrates.

Utah County

LIVE YANKEE (American Fork)—Body of ore exposed by wash-out in mountain by recent cloud-burst.

WASHINGTON

Okanogan County

GRANT (Chesaw)—Resuming operations and plan extension of tunnel.

NEUTRAL (Chesaw)—Have resumed hauling of iron ore for use of Northwest Magnesite Co. as flux.

Stevens County

ELECTRIC POINT (Northport)—Station cut at 800 level and crosscutting for ore. Difficulty in receiving material has delayed completion of tramway.

CANADA

British Columbia

GRANBY CONSOLIDATED (Anyox)—Strike has been settled and men have returned to work.

STEWART-CALVERT (Cascade)—Operating chromite claims and have made shipments.

MANGANESE SHIPMENTS are being made from property near Kaslo operated by B. F. Millard, of Seattle. Drying plant is being installed.

LADYSMITH SMELTING (Ladysmith)—Has purchased Double Header property at Nespelem and will develop on large scale.

Ontario

ANKERITE (Porcupine)—Opening up 350 level. Douglas Mutch is in charge.

OPHIR (Cobalt)—Sinking winze to develop veins at contact.

ADANAC (Coleman)—Continuing drift on mineralized vein to cut high-grade ore.

KEELEY (South Lorrain)—To enlarge operations. Property has been idle some time.

COBALT-ALADDIN (Kirkland Lake)—Crosscut at south workings being continued. North shaft has been sunk 300 feet.

KIRKLAND LAKE GOLD (Kirkland Lake)—Main shaft has been sunk 230 feet.

MINAKER-KIRKLAND (Kirkland Lake)—Shaft sunk 70 feet. Work being done by company.

MEXICO

Sonora

GREENE CANANEA (Cananea)—Production in July was: Copper, 5,000,000 lb.; silver, 146,000 oz., and gold, 1185 ounces.

The Market Report

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver		Aug.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
8	4.7530	99⅝	48 13/16	12	4.7600	99⅝	48 13/16
9	4.7530	99⅝	48 13/16	13	4.7600	99⅝	48 13/16
10	4.7550	99⅝	48 13/16	14	4.7600	99⅝	48 13/16

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
8	*26	†	8.05	7.75	8.07½@8.12½
9	*26	†	8.05	7.75	8⅛@8⅜
10	*26	†	8.05	7.75	8¼@8⅜
12	*26	†	8.05	7.75	8⅜@8½
13	*26	†	8.05	7.75	8⅜@8½
14	*26	†	8.05	7.75	8⅜@8⅝

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Aug.	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
8	122	122	137	387½	387½	29½	28½	54
9	122	122	137	387½	387½	29½	28½	54
10	...	...	...	...	...	...	...	..
12	122	122	137	387½	387½	29½	29½	54
13	122	122	137	387½	387½	29½	28½	54
14	122	122	137	385½	385½	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK, Aug. 14, 1918

The chief features of interest in the markets this week were the sharp advance in the price for spelter, and the temporary easing in the domestic situation in tin.

Copper—The meeting between the producers and the price-fixing committee last Wednesday, at which the 26c. price was continued until Nov. 1, passed without subsequent comment or gossip. The price having been thus arranged for 75 days to come, domestic manufacturers placed orders more freely. The Government's requirements continue to be large.

President Wilson approved on Aug. 9 the continuence to Nov. 1 of the existing maximum price of 26c. per lb. for copper.

Copper Sheets—Situation unchanged; prices not quoted. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—The large arrivals of Banka and Chinese tin in July and August have made the domestic situation very much easier, temporarily at least.

Banka tin is quoted at 92@93c., but sales as low as 90c. have been reported. However, these are for small lots. Much of this tin that has recently arrived was purchased many months ago, and the owners of it, being apparently fearful of a drastic downward regulation of price, are anxious to dispose of it quickly. Producers and merchants in the East take a different view, and we have therefore the situation of metal being obtainable in this market at 92@93c., while it is not to be had for prompt shipment from Batavia at less than $1.01@1.05.

Straits tin was quoted in Singapore at £388, c.i.f., London, on Aug. 8 and 9; at £383½ on Aug. 13; and £381½ on Aug. 14.

Lead—This metal is very scarce, there being nowhere near enough available to supply the demand. The lead producers' committee is handling the situation with the utmost fairness and with excellent judgment. All of the producers have practically pooled their supplies, and the committee is allotting among manufacturers according to their needs. To all intents and purposes lead is being rationed, like coal, sugar, etc. Manufacturers, especially the larger ones, understand the situation and are doing everything they can to make things easier. The market is therefore quite free from any frantic demands, and both looks and is quiet and orderly, but the mortifying fact remains that our lead supply is short.

Zinc—Producers on Aug. 8 made tenders to the Government on its inquiry for 3000 tons of common spelter, for acceptance Aug. 9. The order did not go to any one concern, the Government selecting the lowest parts of scale bids. The entire quantity was therefore obtained at a low price. However, the consummation of this business stirred up the market and caused a sharp advance in price, but producers did not succeed in doing much business, the upward movement being apparently due largely to the bidding of speculators.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Sheets are 42c. per lb. for 18 gage and heavier. Price established June 1 and continues to Sept. 1. Unchanged.

Antimony—This metal became decidedly strong on increased inquiry by consumers, which resulted in considerable business. The situation is such that even a moderate demand is bound to put up the price, for Chinese producers do not want to sell even at present prices, saying that the market is still below their cost of production. There were also reports this week that Japan had been buying antimony in China, which is not improbable, in view of the recent Japanese demand for other metals. In this market business in antimony was done at advancing prices, and at the close we quote spot at 14c., and very strong. We quote futures at 13c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted $1.50@1.75 per pound.

Nickel—Market quotation: Ingot 40c.; shot 43c.; electrolytic 45c. per lb.

Quicksilver—Unchanged at $125. San Francisco reports, by telegraph, $117.50, strong.

Gold, Silver and Platinum

Gold—The withdrawal by the United States of the offer made last October permitting the exportation to Peru of $6,000,000 in gold annually, and the transfer within three months after peace was signed of the Peruvian gold deposited with the Federal Reserve Bank in New York, according to the "Tribune," has caused the complete collapse of the Peruvian currency law. The Government will send to Congress a new project designed to meet the serious financial situation.

The general stock of money in the United States on Aug. 1, totaled $6,896,089,799; of this $3,080,767,801 was in gold coin and bullion, $473,197,959 in standard silver dollars and $232,222,651 in subsidiary silver. The money in circulation on Aug. 1 was $5,559,396,561, or $52.44. per capita. On Aug. 1, 1917, the per capita circulation was $46.53.

Silver—Silver quotations unchanged. China demand continues urgent, and there is a good profit in exchange by buying silver over $1 per oz. and shipping to China. It seems probable that our Government will take steps to prevent such shipments, otherwise the U. S. Government and her Allies will be unable to buy silver on the Government basis of $1 per oz. for war needs.

Mexican dollars at New York: Aug. 8, 77; Aug. 9, 77; Aug. 10, 77; Aug. 12, 77; Aug. 13, 77; Aug. 14, 77.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and 175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 10—Blende, per ton, high, $76.90; basis 60% zinc, premium, $75; Class B $65@60; Prime Western $47.50@45; calamine, basis 40% zinc, $37.50@30. Average selling prices: blende, $54.86; calamine, $35.81; all ores, $54.16.

Lead, high, $102.96; basis 80% Pb, $100; average selling price, all grades of ore, $100.75 per ton.

Shipments the week: Blende, 10,606; calamine, 399, lead 1092 tons. Value, all ores the week, $706,110.

The blende market strengthened materially today, with all buyers going out of the market short of purchasing the amounts ordered.

Though the lead basis is still quoted $100, active buying crowds up some settlements to a point that indicates a higher basis. Two of the buyers are finding it hard to compete and secure any ore.

No matter how light the buying next week, sellers will probably hold firm for stronger prices in line with the stronger spelter market.

Platteville, Wis., August 10.—Blende, basis 60% zinc, highest settlement price reported was $70 per ton; premium grade, base $75 per ton; high-lead blende, base $50 per ton.

Lead ore, basis 80% lead, $93 per ton base. Shipments reported for the week were 2510 tons blende, 146 tons galena, and 869 tons sulphur ore. For the year to date the totals are 79,667 tons blende, 4506 tons lead, and 31,219 tons sulphur ore. During the week 2906 tons blende were shipped to separating plants.

Other Ores

Chrome Ore—Considerable business was again done at $1.70 per unit for 50% material.

Manganese Ore—Unchanged.

Molybdenum Ore—Unchanged.

Tungsten—The market is very active in high-grade ores. Price of high-grade wolframite is $23-24.50; highest-grade scheelite is quoted at $24.50 to $25. Impure ores are much neglected, but are quoted at $18 to $20 per unit, according to amount of impurity.

Other Minerals

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight. Tonnage is extremely difficult to obtain. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines f.o.b. mines. Unchanged.

Iron Trade Review

PITTSBURGH—Aug. 13

The report of steel-ingot production in July shows an annual rate of about 42,250,000 gross tons, or 3% less than the rate in June. July was the first month since January to show a decreased rate, but considering the sharp decrease that has always occurred in July, the output is regarded as satisfactory. August, during which the weather has been still hotter than last month thus far, is likely to show a further decrease, but heavy outputs are expected in September and October.

Distribution of steel products to jobbers this month will be fairly adequate in the case of pipe and wire products, but bar, sheet and plate distribution will be extremely light. The regulations as to shipments to jobbers do not include tine and terne plate. The former is going entirely for food products, whereas the latter is now hardly made at all.

No additional information is forthcoming as to the project to build additional blast furnaces and openhearth furnaces to provide more steel for war purposes, but a favorable decision may be reached, the new construction to be more or less under Government auspices. Meanwhile, it is understood that the Jones & Laughlin Steel Co. has just decided to build an additional blast furnace on its own account.

The shortage of raw steel for the finishing departments that are not filled with Government orders continues acute. The sheet mills receive less than 60% of their full supply, this amount doing little more than take care of war orders, and merchant mills are not faring much better.

Pig Iron

Pig Iron—There is less selling of pig iron for delivery in the first half of 1919, as it has been made fairly plain that the War Industries Board does not favor such business as a rule. Sales for early deliveries are confined almost entirely to business caused by allocations. The furnaces in this general district are operating fairly well, with an adequate supply of coke, except in occasional instances. The market remains quotable at the set ilmits: Bessemer, $35.20; basic, $32; foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less.

Steel

Steel—Only small and occasional lots of discard steel are coming into the market, and there is no soft steel at all in billet or sheet bar form, except what is shipped on contract or comes out by allocations. The market remains quotable at the set limits: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys

Ferromanganese—The market is quiet, with demand limited and consumers apparently well supplied. Ferromanganese is quoted at $250, delivered, for 70%, with $4 a unit for higher manganese content and 16% spiegeleisen at $75, f.o.b. furnace.

Coke

Coke—There are fairly large offerings of foundry coke in the market, and some foundries are believed to be stocking up. Furnace coke rarely reaches the open market as the Fuel Administration has been watching the situation closely and surplus coke is promptly discovered and allocated where it will do the most good. Most of the furnaces would be glad to stock some coke, but they rarely have an opportunity to do so. Connellsville coke remains at $6 for furnace, $7 for foundry, 72-hour selected, and $7.30 for crushed, over ¾-in., these being the set limits. Coke screenings from old dumps when clean and over ¾-in. bring $6.50 as an open market price, the limit being $7.30.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1916	New York 1917	New York 1918	London 1916	London 1917	London 1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug	66.083	85.407	......	31.498	43.418	......
Sept	68.515	100.740	......	32.584	50.920	......
Oct.	67.855	87.332	......	32.361	44.324	......
Nov	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1917	New York Electrolytic 1918	London Standard 1917	London Standard 1918	London Electrolytic 1917	London Electrolytic 1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.330	......	122.391	......	137.000	......
Sept.	25.073	......	117.500	......	135.250	......
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York 1917	New York 1918	London 1917	London 1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	......	243.978	......
September	61.542	......	244.038	......
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(a) No average computed.

Lead	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	......	10.518	......	30.500	......
September	8.680	......	8.611	......	30.500	......
October	6.710	......	6.650	......	30.500	......
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.373	8.473	8.338	54.000	54.000
August	8.360	......	8.190	......	54.000	......
September	8.136	......	7.966	......	54.000	......
October	7.983	......	7.813	......	54.000	......
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡ 1917	Bessemer‡ 1918	Basic‡ 1917	Basic‡ 1918	No. 2 Foundry 1917	No. 2 Foundry 1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.91	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17		50.37		53.95	..
September	46.40		42.24	..	48.58	.
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	.
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Aug. 13
Alaska Gold M.	3⅜
Alaska Juneau	2
Am.Sm.& Ref.,com.	78¾
Am. Sm. & Ref., pf.	105
Am. Sm. Sec., pf., A	89½
Am. Zinc	18
Am. Zinc, pf.	49½
Anaconda	66⅞
Batopilas Min	1¼
Bethlehem Steel	84½
Bethlehem Steel, pf.	‡88¼
Butte & Superior	25⅞
Butte Cop. & Zinc	11¾
Cerro de Pasco	34¼
Chile Cop.	16
Chino	39
Colo.Fuel & Iron	47½
Crucible Steel	66¾
Crucible Steel, pf.	90½
Dome Mines	8¼
Federal M. & S.	10⅛
Federal M. & S., pf.	33
Great Nor., ore ctf.	32¼
Greene Cananea	43½
Gulf States Steel	83½
Homestake	75
Inspiration Con.	52⅛
InternationalNickel	30⅝
Kennecott	34
Lackawanna Steel	84⅞
Mexican Petrol	101
Miami Copper	28¼
Nat'l Lead, com.	58¼
National Lead, pf.	103
Nev. Consol.	20
Ontario Min	9⅞
Ray Con	24
RepublicI.&S.,com.	92¾
Republic I. & S., pf.	101
Sloss-Sheffield	62
Tennessee C. & C.	19½
U. S. Steel, com.	112
U. S. Steel, pf.	110¼
Utah Copper	82
Va. Iron C. & C.	72⅛

BOSTON CURB*	Aug. 13
Alaska Mines Corp.	.12
Boston Ely	.65
Boston & Mont.	.51
Butte & Lon'n Dev.	.14
Calaveras	.50
Calumet-Corbin	†.01
Chief Con.	2⅜
Cortez	.08
Crown Reserve	.17
Crystal Cop.	.37
Eagle & Blue Bell	2¼
Gila Copper	‡17
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	19½
Mexican Metals	.45
Mines of America	1
Mojave Tungsten	.09
Nat. Zinc & Lead	.15
Nevada-Douglas	.51
New Baltic	.90
New Cornelia	18½
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.07
Yukon Gold	1

SAN FRAN.*	Aug. 12
Alta	.03
Andes	.05
Best & Belcher	.03
Caledonia	‡.03
Challenge Con.	.03
Confidence	.06
Con. Virginia	.21
Gould & Curry	.01
Hale & Norcross	‡.01
Jacket-Cr. Pt.	.07
Mexican	.18
Occidental	‡.51
Ophir	.06
Overman	.02
Savage	.03
Sierra Nevada	.03
Union Con.	.38
Utah Con	.01
Belmont	2.75
Jim Butler	.58
MacNamara	.32
Midway	.04
Mont.-Tonopah	.09
North Star	.07
Rescue Eula	.09
West End Con.	1.05
Atlanta	.03
Booth	.04
Comb. Frac	‡.02
Florence	.11
Jumbo Extension	.09
Kewanas	.03
Nevada Hills	.01
Nevada Packard	.27
Round Mountain	.18
Silver Pick	.03
White Caps	.26
Big Jim	‡.75
United Eastern	3.50

COLO. SPRINGS*	Aug. 12
Cresson Con.	4.75
Doctor Jack Pot	.03
Elkton Con.	.04½
El Paso	10
Gold Sovereign	‡.02
Golden Cycle	1.66
Granite	.18½
Isabella	.04¾
Mary McKinney	.07½
Portland	.81
United Gold M.	14
Vindicator	40

BOSTON EXCH.*	Aug. 13
Adventure	‡.60
Ahmeek	75½
Algomah	‡.15
Allouez	50
Ariz. Com., ctfs.	15¼
Arnold	‡.20
Bingham Mines	‡9¼
Bonanza	‡.15
Butte-Balaklava	‡.25
Calumet & Ariz.	67½
Calumet & Hecla	460
Centennial	‡12½
Copper Range	48½
Daly West	‡2¼
Davis-Daly	5¼
East Butte	9¼
Franklin	‡4¼
Granby	‡79½
Hancock	‡6
Hedley	‡12
Helvetia	‡.15
Indiana	.50
Isle Royale	26
Keweenaw	‡1
Lake	‡5¼
La Salle	‡2¼
Mason Valley	‡3½
Mass	‡5
Mayflower	‡2¼
Michigan	2½
Mohawk	57
New Arcadian	1½
New Idria	‡14
North Butte	14½
North Lake	‡.60
Ojibway	‡.50
Old Dominion	‡42
Osceola	50
Quincy	68½
St. Mary's M. L.	‡50
Santa Fe	.60
Seneca	1½
Shannon	‡3½
Shattuck-Ariz.	‡16
So. Lake	‡1
So. Utah	‡.13
Superior	‡5
Superior & Bost.	1½
Trinity	‡3
Tuolumne	1¼
U. S. Smelting	42½
U. S. Smelt'g, pf.	‡43½
Utah Apex	‡1½
Utah Con.	‡10
Utah Metal	‡2
Victoria	‡2½
Winona	1
Wolverine	‡26½
Wyandot	‡.50

N. Y. CURB†	Aug. 1
Big Ledge	1⅛
Butte & N. Y.	‡.75
Butte Detroit	.11
Caledonia	.48
Calumet & Jerome	1¼
Can. Cop. Corpn.	1¼
Carlisle	‡2
Cashboy	.05
Con. Ariz. Sm.	1¼
Con. Coppermines	4¾
Con. Nev.-Utah	‡¼
Emma Con.	‡.10
First Nat. Cop.	‡2
Goldfield Con.	‡.24
Goldfield Merger	‡.03
Greenmonster	
Hecla Min.	4½
Howe Sound	‡4½
Jerome Verde	.50
Kerr Lake	5½
Louisiana	‡¼
Magma	‡32
Majestic	‡.18
Marsh	.04
McKinley-Dar-Sa.	.40
Milford	‡.75
Mohican	‡.06
Mother Lode	.36
N. Y. & Hond.	‡12½
Nipissing Mines	8.65
Nixon Nevada	.50
Ohio Cop.	‡1
Rawley	‡2½
Ray Hercules	4½
Richmond	‡.56
Rochester Mines	.37
St. Joseph Lead	14
Standard S. L.	
Stewart	‡.13
Success	‡.12
Tonopah	‡2
Tonopah Ex.	1
Tribullion	‡
Troy Arizona	.12
United Cop.	‡
United Verde Ext.	37
United Zinc	‡1
Utica Mines	‡.08

TORONTO*	Aug.
Adanac	.0
Bailey	.0
Beaver Con.	.2
Chambers Ferland	.1
Coniagas	2.5
Hargraves	.0
La Rose	.3
Peterson Lake	.0
Temiskaming	.3
Wettlaufer-Lor	.0
Davidson	.2
Dome Exten.	.1
Dome Lake	.1
Hollinger	4.5
McIntyre	1.4
Newray	.1
Porcu. Crown	.1
Teck-Hughes	.1
Vipond	.1
West Dome	.0

* Bid prices. † Closing prices. ‡ Last Quotations.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	4.25	5.52	5.52	6.50	5.495	9.50
No. 12	4.30	5.57	5.57	6.55	5.545	9.55
No. 14	4.35	5.62	5.62	6.60	5.595	9.60
Black						
Nos. 18 and 20	4.80	6.32	6.32	7.40	6.295	9.80
Nos. 22 and 24	4.85	6.37	6.37	7.45	6.345	9.85
No. 26	4.90	6.42	6.43	7.50	6.395	9.90
No. 28	5.00	6.52	6.52	7.60	6.595	10.00
Galvanized:						
No. 10	5.25	6.97	6.97	....	6.845	.....
No. 12	5.35	6.97	6.97	7.95	6.795	.....
No. 14	5.35	6.97	6.97	8.10	6.945	11.65
Nos. 18 and 20	5.65	7.17	7.17	8.25	7.245	11.85
Nos. 22 and 24	5.80	7.32	7.32	8.40	7.295	12.55
No. 26	5.95	7.47	7.47	8.55	7.445	12.70
No. 28	6.25	7.77	7.77	8.85	7.745	13.00

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$55.00	$38.00	$65.00	$38.00
Standard openhearth rails	57.00	40.00	67.00	40.00
Light rails, 8 to 10 lb	3.13½*	83.00	3.13½*	68.00
Light rails, 12 to 14 lb	3.09*	82.00	3.09*	67.00
Light rails, 25 to 45 lb	3.00*	75.00	3.00*	65.00

* Government price per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, 9/16-in. and larger	$3.90	$5.00	$4.50	$5,30	$6.70
Track bolts	4.90	6.25	5.50	Premium	8.00
Standard section angle bars	....	3.65	4.45	Premium	5.15

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$4.245	$5.25	$4.27	$4.27	$5.25	$5.50
Channels, 3 to 15 in.	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Angles, 3 to 6 in. ¼ in. thick	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Tees, 3 in. and larger	3.00	4.245	5.30	4.27	4.27	2.55	5.50
Plates	3.25	4.495	9.00	4.52	4.52	5.50	6.50

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4–5	$3.10

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾-in. and larger	$4.65	$5.65	$7.00	$5.57	$5.55	$7.15	$8.00
CONE HEAD BOILER							
¾ in. and larger	4.75	5.75	7.10	5.67	5.65	7.25	8.00
⅝ and 11/16	4.90	5.90	7.25	5.82	5.80	7.40	8.15
½ and 9/16	5.25	6.25	7.60	6.17	6.05	7.75	8.50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	List +20%
Galvanized cast steel rigging	Net List
Bright plow steel	30%
Bright cast steel	17½%
Bright iron and iron tiller	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$5.75	$7.00	$6.50	$6.25	$8.00	$7.50
Assorted	5.90	7.00	6.50-7	6.40	8.25	7.75

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh

Iron bars.................. 3.5c. Steel bars.............. 2.90c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
$0.12	$0.16½	$0.18	$0.19	$0.17	$0.16½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	15c.	14c.	15c
Hollow	24c.	25c.	.

PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Butt Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅜, ¼ and ⅝	44%	17%	¾ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

Lap Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

Butt Weld. Extra Strong Plain Ends

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

Lap Weld. Extra Strong Plain Heads

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2¼ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
¾ to 3 in. butt welded	33%	43%	41.9%
3½ to 6 in. lap welded	15%	39%	37.9%

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
¾ to 3 in. butt welded	16%	28%	26.9%
3½ to 6 in. lap welded	3%	25%	23.9%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 5 and 5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$2.50*	List	$1.40	$1.65	$1.05	$3.00
Hot pressed hexagon	2.50*	List	1.20	1.50	.85	3.00
Cold punched square	2.50*	List	.75	1.40	1.00	1.75
Cold punched hexagon	2.50*	List	.75	1.40	1.00	2.25

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	30—5%	46%	45%
Larger and longer up to 1 in. by 30 in.	15%	40%	45%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York........ $2.50 Cleveland....... $3.00 Chicago......... $2.50

For cast-iron washers the base price per 100 lb. is as follows:

New York........ $5.00 Cleveland....... $4.00 Chicago......... $3.50

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tarfelt (14 lb. per square of 100 sq. ft.)	$64	$65
Tar pitch (in 400-lb. bbl.)	21	22
Asphalt pitch (in barrels)	37	42
Asphalt felt	72.50	77.20

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.30	$1.55	$1.60	$1.75	$1.90	$2.50
No. 2 grade	1.15	1.30	1.45	1.60	1.75	1.90

Asbestos asphalt-saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.95 per roll in carload lots and $2.20 for smaller quantities.

Shingles, red and green slate finish, cost $5.25 per square in carloads, $5.50 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul	.056	.11	.162
Kansas City	0786	.15	.205
Seattle	.09	.175	.30
Los Angeles	.0633	.1071	.1966
Cincinnati	.07275	.1361	.1834
Boston	11	.15	.24

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Y. P.	Fir	Hemlock	Spruce	Y.P.	Fir
Boston			Government only		...	...
Cincinnati	$39 00		$38 00		$43.00	$42.00
Kansas City	38 00	45 50	40.50	$38.50	43 00	42.50
Seattle	24 50	24 50	24.50	24 50	24.50	24.50
St. Paul		52 00	48.00	48 00	...	60 00
Denver	43 00	36.50		.	.....	40.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y P.	Fir
Boston			Government only	...	....
Cincinnati	$45 00		$41 00	$44 00	$40.00
Kansas City	45 50	$24 75	54.75	52.25	60 00
Seattle	24 50	24 50	24 50	24.50	24 50
St. Paul	62 50	45 00	43 00	47.50	47.50
Denver	43.00	34.00	34.00	......	32.50

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3 50	$4.50	$4.75	$4.32	$5 05
Cut	4.00	5.40	....	4.47	6.40

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags.

	Current	One Month Ago	One Year Ago
New York	$2 85	$2 85	$2.22
Jersey City	2 84	2.84	2.16
Boston	2 90	2.81	2.77
Chicago	2.45	2.36	2.31
Pittsburgh	2 15	2.45	2 31
Cleveland	2.32	2 68	2 44
Denver	3.02	2.99	2.39

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.50	$13.50	$2.35	$2.10
Kansas City	22.00	20.00	2.20*	2 10*
Chicago	18.00	17.50	1.80*	1.10*
St. Louis	14.00	......	.....	1.50
Boston	21.50	16.50	3.55	3.05
Dallas	16 50	......	.....	....
San Francisco	19 50	......	.....	1.90
St. Paul	20 00	14.00	1.40	1.30
Cincinnati	14.20	13.20	.....	11.95(ton)
Denver	......	26.25	.....	2.40*
Seattle	23.00	23.00	.....	2.50†

* 200-lb. barrels. † Per 180-lb. barrel.

Note—Refund of 10c. per bag, amounting to $2 per ton.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$1.86	$1.16	$2.10	$1.20	$2 05	$1.17
5-gal. cans	1.96	1.26	2 25	1.35	2.25	1.27

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14 00	14.50	13.25	13.50	14.00	13 00
25- and 50-lb. kegs	14.25	14.75	13.50	13.75	14.25	13 25
12½-lb. keg	14 50	15 00	13.75	14 00	14.50	13.50
5-lb. cans		....	15.25	15.50	16.00	15.50
1-lb. cans	.....	.....	.....	...	17.00	.....

MINING AND MILLING SUPPLIES

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2½-in	75c. per ft.
Common, 2½-in	40⅓ %

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.60	$0.35	$0.30

Steam—Discounts from List

First grade 25% Second grade 30% Third grade......40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	40 + 5%	35%
Chicago	45%	40 + 5%
Birmingham	35%	35%
Denver	40%	30%
Cincinnati	40—10%	40%

RAWHIDE LACING—40—5% off list.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ¾-in., 8 ft.; ⅞-in., 6; 1-in., 4¼; 1¼-in., 3⅓; 1½-in., 2 ft. 10 in.; 1¾-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0 34½	Denver	$0 35½
New York	.36	Kansas City	.34
Cincinnati	.33¾	San Francisco	.32
Chicago	.33	Seattle	.34
St. Paul	.34	St. Louis	.34

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Chrome brick	net ton	$175.00
Chrome cement	net ton	75.00
Clay brick, 1st quality fireclay	per 1000	50.00—$55.00
Clay brick, 2nd quality	per 1000	35.00— 40.00
Magnesite, raw	ton	30.00— 35.00
Magnesite, calcined	ton	32.00— 35.00
Magnesite, dead burned	net ton	32.00— 35.00
Magnesite brick, 9 x 4½ x 2½ in.	net ton	110.00—125.00
Silica brick	per 1000	50.00— 60.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade, $55; St. Louis grade, $40.
Birmingham—Fire clay, $55–60; silica, $55–60.
Chicago—Second quality, $25 per ton.
Denver—Silica, $35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
St. Louis	No. 1 White Oak	$1.45	$1.25
Chicago	Plain	1.40	1.25
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2.70	1.92

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	Cincinnati	Chicago	St. Louis	Birmingham	Denver
Cup	7	5¼	13.	8½	12½
Fiber or sponge	8	6	13.	8½	20
Transmission	7	6	13.	9	20
Axle	4½	4	4.1	3¾	5½
Gear	4½	4½	7.0	8	9
Car journal	22 (gal.)	3½	4.3	5¼	8½

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	$0.58	$0.65	$0.30	$0.27
Pure destructively distilled pine oil	.58	.52	.30	.....
Pine tar oil	.35	.34	.24½	.19
Crude turpentine	.45	.....	.44	.38
*Hardwood creosote, sp. gr. 0.96-0.99	.23	.....	.34½	.31

* F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11.00 to 13.00	13 00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13¼ x 13¼	13¼ x 20½
Cleveland	$52.00	$58.00
Chicago	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder*
New York	......	$0.27½	$0.34½	....	$2.40
Boston	$0.24¼	.27¼	.34¼	.41¾	2.40
Kansas City	.20	.26¼	.33¼	.43¼	2 45
Seattle	.17½	.23¾	.31¾	.41¾	2.35
Chicago	.18¾	.22¾	.33	.43	2.35
St. Paul	.19	.23	.28	.43¼	2.75
St. Louis	.19	.26¼	.33¼	.43¼	2.35
Denver	.18	.25¼	.32¼	.42¼	2.45
Dallas	.23	.30½	.37½	.47½	....
Los Angeles	.22	.28	.36	....	....
San Francisco	.19¼†	.26½†	.33¼†	.43¼†	2.35

* Per keg. † In carload lots.

CHEMICALS

SODIUM CYANIDE—New York price is 39c. per lb.; Denver, 44c.; Chicago, .38.5; St. Louis, 45c.

SODIUM SULPHIDE—In New York the price per pound is 4c. to 4¼c. for concentrated, 2¼c. to 2½c. for crystals. The Denver price for 60% is 6 to 10c.; the St. Louis price, 5c. for concentrated; the Chicago price is 6¾c. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb.; Chicago, 18¾c.; Denver, 13c. f.o.b. Pueblo; St. Louis, 35c.

ALUMINUM DUST—Chicago price is $1.65 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drums Per Drum
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A	115.50	110.50	1 63
Texas (except El Paso)	124 00	119.00	1 74
El Paso, Texas	126 00	121.00	1.77
Denver, Colo	124 00	119 00	1 74
West Coast	129 00	124 00	1 81

Engineering and Mining Journal

August 24, 1918

Volume 106

Number 8

PORTAL OF AKRON TUNNEL, WHITEPINE TOMICHI DISTRICT, COLORADO

The Whitepine Section of the Tomichi District

BY JAMES E. DICK*

The Gunnison County, Colo., mining district was first prospected in 1879, and has produced silver and lead carbonate ores from shallow depths. A 3750-ft. tunnel has been driven, and the mines of the district have been consolidated. Ore developed shows lead, zinc, copper and silver sulphides containing certain amounts of gold. Orebodies are replacements along fault fissures in intruded sedimentaries, and recent developments bid fair to revive interest in this field.

THE Whitepine mines are in the southern section of the Tomichi mining district and are situated near the eastern boundary of Gunnison County, Colo. The town of Whitepine lies 11.5 miles north of Sargent, a station on the Marshall Pass division of the Denver & Rio Grande R.R. and the shipping point for the district. The elevation of Whitepine is 10,000 ft. and that of Sargent 8500 ft. above sea level. The district lies on the western slope of the continental divide in a country of rugged topography.

The first discoveries in the Tomichi mining district were made in the Whitepine section in 1879, and until 1893 a large production of silver and lead came from the carbonate deposits at and near the surface. Litigation, and the appearance with depth of increasing quantities of zinc and heavy flows of water, and finally the demonitization of silver, discouraged the miners and brought about an almost complete abandonment of the field. Occasional attempts to work the abandoned mines followed, but without notable success. From 1900 to 1905 the Akron tunnel was driven 3750 ft. into Lake Hill, but it never reached its objective and the work was discontinued. In 1913 the continuation of the Akron tunnel was undertaken, and since then the consolidation and exploration of the most promising of the properties have been proceeding under the name of the Akron Mines.

Whitepine includes a sedimentary area roughly one by three miles, bordered on the north, east and south by granite and on the west by quartz monzonite. The mineralized area is confined largely to these sedimentaries, though at least two fissure veins of importance are known to exist in the granite.

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*Agent, Akron Mines, Whitepine, Colorado.

With the possible exception of a small quantity of pre-Cambrian quartzite, the sedimentaries are of Paleozoic age and embrace the Cambrian, Ordivician, Devonian, Mississippian and Lower Pennsylvanian beds, which form a syncline resting on pre-Cambrian granite. The principal mineralized area is along the west side of the syncline, and there the beds dip toward the east at angles ranging from 40 to 60 degrees.

There are numerous minor faults, and at least two that are large and extensive, namely, the Morning Glim and the Star. The former, a reverse fault, strikes northwest and southeast and cuts off the sedimentary area on the northeast. The throw exceeds the thickness of the Paleozoic rocks, which have been completely eroded from the upper portion, exposing the pre-Cambrian granite. This fault can be traced for a distance of 2¼ miles.

The Star fault strikes roughly north-south, through the west-central part of the district, and dips to the east with the stratification. It is likewise a reverse fault and shows a vertical displacement approximating 2000 ft. The granite at this point has also been faulted and elevated to the lead of the sediments, and where exposed at the surface there is a complete repetition of the entire series again dipping into the hill. The fault can be traced for a mile and may or may not intersect the Morning Glim fault in the northern corner of the area. It has been the most productive fault of the district, and from it came the ore of the May-Mazeppa, Morning Star and Victor mines.

Veins and Faults Are Numerous and Complicated

The North Star fault, somewhat less prominent, crosses the district in a northeast-southwest direction and intersects both the Star and Morning Glim faults. Its dip is to the northwest. Minor faults are frequent and occur at least in two distinct sets or systems. The fault and vein systems, however, are as yet not thoroughly worked out, and therefore complete information is not available. Sufficient work, however, has been done to demonstrate that veins and faults are numerous and that a complicated condition exists in this respect.

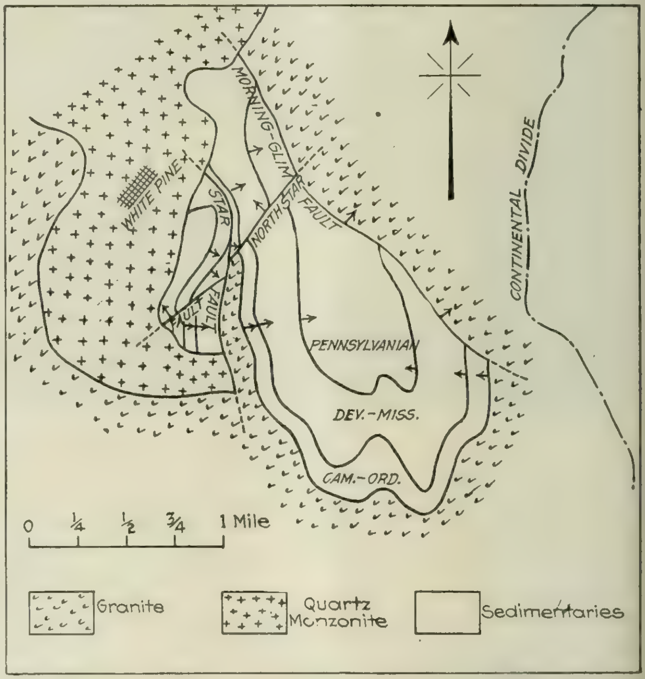
Porphyry dikes have been intruded into the sedimentaries in many places. In most instances the intrusion is a rhyolite-porphyry and is fringed, where it comes in contact with the limestone, with 6 to 18 in. of pitchstone. These dikes usually conform to the bedding and often follow along the veins.

Replacement Deposits Found Along Fault Fissures

The orebodies are replacement deposits and are found along the larger fault planes and in veins, which have walls of limestone and quartzite, porphyry and limestone, and porphyry and granite. The latter two combinations are more likely to be the walls of orebodies in the larger faults, whereas limestone and quartzite are often the walls of veins other than the main faults. Intersections of veins or faults, or of both, are most favorable for ore. It has also been noted that the ore forms in sags in the strata, and that the proximity of porphyry seems to have had an important genetic influence. One pronounced feature of the deposits is that, though comparatively small in cross section, they have remarkable continuity vertically to all depths so far obtained.

Carbonate ores change to sulphide at less than 300 ft., but oxidation of the wall rocks and vein matter is still in evidence at 700 ft. The depth of the groundwater level is about that of the carbonate zone. Secondary enrichment of the sulphide ore shows at all depths where it has been exposed. The silver content of the ore decreases with depth, whereas that of zinc increases rapidly. There is also a gradual slight increase in the quantity of gold. The lead appears to remain fairly constant.

The North Star and May-Mazeppa (Lost Contact) mines are reached through the Akron tunnel, which has now been driven over 4000 ft. into Lake Hill, and, though the principal work up to the present has been in development, some production has resulted and a stope has been opened on the North Star orebody. In the last half of 1917, 1800 tons of crude ore was shipped from this stope, and returned an average metal content of 0.03 oz. Au, 6.5 oz. Ag, 18% Pb, and 24% Zn. Considerable second-grade ore was concentrated. An inclined raise has been driven 500 ft. on the vein, and levels have been started at 100-ft. intervals, but the levels are not yet far enough advanced to make it possible to judge the size or shape of this oreshoot. It is exposed on four of the five levels, as well as on the tunnel level.



GEOLOGICAL SKETCH MAP OF WHITE PINE MINING DISTRICT, COLORADO

The Lost Contact vein is likewise opened by an inclined raise from the Akron tunnel workings. The raise is not in the vein, but has been connected by three crosscuts from this raise, and two levels have been extended along the vein for a distance of approximately 150 ft. each. Also, a drift along the vein at the tunnel level has been driven over 250 ft. This work indicates a continuous oreshoot above the tunnel level of an average grade of 0.03 oz. Au, 10 oz. Ag, 12% Pb, and 14% Zn. The Lost Contact vein is in reality the northward extension of the Star fault, and the oreshoot occurs at a point where a dike of rhyolite-porphyry has been intruded into the fault. The porphyry forms the hanging wall and the underlying limestone makes the foot wall for the ore. The highest point at which the ore has been exposed is 375 ft. above the Akron tunnel, or 200 ft. (measured on the vein) below the surface. At this elevation the ore is still unoxidized.

ORES SHOW LEAD, ZINC, COPPER, SILVER AND GOLD

The Erie mine lies 1000 ft. ahead of the Akron tunnel and is being worked through a 280-ft. shaft. This shaft penetrates the sulphide zone for about 100 ft., and levels have exposed an oreshoot of workable dimensions and milling grade. A typical assay will give 0.04 oz. Au, 3 oz. Ag, 14% Pb, and 17% Zn. The ore differs from any other in the district in that it is extremely hard. Extensive stopes of low-grade carbonate have been taken out. The deposit has the appearance of being a more tabular form of orebody than is generally seen in the district.

The Spar Copper group and Ensign claim are reached through the Parole tunnel, which is 2000 ft. long. It is a crosscut tunnel for 700 ft. and follows the vein for the rest of the distance. The Spar Copper is the only mine now in operation which shows ore in a vein. The vein is a fissure in the granite, and strikes across the country in a northeast-southwest direction. It stands almost vertical. Frequent lenses of high-grade copper-silver ore are found connected by stringers and seams of the same ore. The vein material, mined as a whole, makes a good grade of milling ore, which concentrates readily to a product containing 30 to 40 oz. Ag, and 5.5 to 6% Cu. The principal valuable minerals are cupriferous pyrite, chalcopyrite, and chalcocite, all carrying silver, and the gangue mineral is mainly quartz, with occasional small quantities of barite.

In the Ensign claim, at the intersection of the Spar Copper vein and Morning Glim fault, there is a shoot of lead-zinc-copper-silver ore. Nothing has been done to determine its extent, but at the point where cut it has a cross section 26 by 40 ft. There is also a body of copper-silver ore on the claim, from which in 1917 about 1000 tons, of an average grade of 3 oz. Au and 6% Cu, was shipped. The copper is present as malachite and chalcocite in a mass of limonite. The exact geological conditions bearing on this occurrence are not entirely obvious, but the walls are limestone and quartzite, and it is believed to be another intersection deposit in the Morning Glim fault.

The Morning Star mine is now idle. It has been worked to a depth of 400 ft. and has reached water level. A long drift is being driven, by lessees, from the Morning Star tunnel under the Victor claim, with the purpose of undercutting the oreshoots which were worked so successfully in the Victor mine in the early days of the district.

The exploration work of the last four years indicates strongly that bodies of ore of commercial value exist along the western side of the district, and that these bodies may be expected to occur at fairly frequent intervals. It further indicates that this ore forms in shoots of comparatively small horizontal extent and of persistence with depth, and that the shoots come at certain well-established horizons and usually under a known set of conditions. Because of these facts, exploration work can be conducted along scientific lines and with generally satisfactory results.

BETTER POWER AND TRANSPORTATION FACILITIES NEEDED PROPERLY TO DEVELOP DISTRICT

The elevation and climate are similar to those of many Colorado mining camps and present no serious problems. Nor does there appear to be anything unusual in the metallurgy of the ore. However, the greatest obstacle to the development of the district is its present isolation, both as to transportation and power facilities. But neither of these conditions is an insurmountable difficulty, and in due time, and as conditions warrant, the needed transit and power will no doubt be provided.

Development of ore is in progress, and the various operating problems are being solved. With sufficient ore assured and the necessary improvements in mining, milling and transportation methods, there is no reason why this old, abandoned mining district should not again contribute to Colorado's production of lead, zinc, copper and silver. Past production, as shown by mint reports and old records and settlement sheets, makes a creditable showing and gives much encouragement as to what may be hoped for from the sulphide zone.

Electrolytic Iron Manufacture In France by the Burgess Process*

The Société des Aciéries, of Firminy, France, in order to overcome the difficulty, during the war, of obtaining, for the manufacture of steel, an iron as pure as Swedish iron, has started the manufacture of electrolytic iron at its Rioupéroux shops. Several tons have already been obtained, and the installation of a plant of a capacity of 25 tons per day is under way. The process employed is that invented by Professor Burgess, an American, who first began experimenting with electrolytic iron in 1904. The method is characterized by the use of an electrolyte which does not alter in composition for a long time, nor does it require additions or complicated chemical control.

The electrolyte is a mixture of ferrous sulphate and chloride, and ammonium sulphate, and the process requires that the materials utilized be already pure. The elimination of continuous circulation of the electrolyte, a current density of one ampere per 100 sq.cm., and a temperature as low as 30°, but better at 60° C., have been found to be satisfactory conditions for deposition. The cost of producing the electrolytic iron is expected not to exceed $10 per ton. The following is an analysis representing a lot of a few tons: Carbon, 0.015 to 0.064%; silicon, 0.004 to 0.020%; phosphorus, 0.002 to 0.009%; sulphur, 0.001 to 0.007%; manganese, traces.

Aimé Coutagne, the engineer of the company, has published[1] an interesting study of the process, and has compared it with the methods used by Cowper, Cowles, Merck, Fisher, the Langbein and Pfanhauser-Werke and the Boucher-Société le Fer.

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*Translated from "Texte de L'Echo des Mines et de la Metallurgie," April 28, 1918.

[1] "Bulletin de la Société de l'Industrie Minérale."

A New Method of Estimating Zinc In Zinc Dust

BY L. A. WILSON*

A brief résumé of previous work in estimating zinc in zinc dust is given, but the object of the paper is to present a method that will render the analysis simple, accurate and rapid. Although similar to that ordinarily used in the hydrogen evolution method, the importance of maintaining solutions saturated with hydrogen and minimizing temperature variations is emphasized. The arrangement eliminates sources of error inherent with previously proposed apparatus and decreases the time required for analysis. A drawing is included to illustrate this arrangement.

ZINC DUST, or "blue powder," as it is commonly known, is being used in constantly increasing amounts for organic reductions, sherardizing, precipitation of gold and silver in cyanide practice, and in certain classes of paint. Owing to the demands of the trade for a material superior to the ordinary spelter furnace blue powder, the zinc dust sold today is largely a specially prepared product. The two particular qualities usually demanded by the consumers of zinc dust are fineness and high metallic zinc content. The fineness is best determined by microscopical examination, but as usually carried out in practice it is a simple matter of carefully sieving a sample through a nest of screens. On the other hand, the determination of the metallic zinc content, or reducing power as metallic zinc, is not so easily obtained; and determinations by different methods, or even with the same method by different analysts, show considerable variations. There is need for a standard method which will obviate the misunderstanding originating from variant analyses.

The method and apparatus to be described in this paper are the outcome of experimental work extending over several years, starting with the apparatus proposed by Franz Meyer and adding improvements and modifications as the work progressed.

RÉSUMÉ OF METHODS PROPOSED

Practically all previous methods of analysis are based upon the reducing power of the zinc dust. This may be determined in many ways, although the results from different methods will not be concordant. Fresenius dissolved the zinc dust in dilute sulphuric acid, and, after drying, passed the hydrogen over heated copper oxide in a combustion tube, absorbing the water formed in a U-tube and weighing. This method is accurate, but long and tedious.

Drewsen used a known quantity of standard potassium-chromate solution for reduction by the zinc dust. The excess of chromate solution was titrated with ferrous sulphate, and the metallic zinc content was calculated from the amount of chromate reduced.

De Koninck found that ferric ammonium sulphate accelerates the reduction of chromate. He used a potassium-dichromate solution rather than one of the normal chromate.

Wahl gave a rapid method for evaluating zinc dust, based upon the reduction of neutral ferric sulphate in solution. The resulting ferrous sulphate was titrated with potassium permanganate and the percentage of metallic zinc calculated.

Beilstein and Jawein carried out the evaluation by conducting the hydrogen, resulting from the reaction of the zinc dust and dilute sulphuric acid, into a flask filled with water and measuring the amount of the latter displaced.

Kosmann and Liebschutz carried out determinations by moistening the sample of zinc dust with alcohol, and adding a warm neutral solution of copper sulphate. The mixture was slightly acidified, the copper separated, washed, dissolved, and determined.

Morse made determinations of the metallic zinc content by measuring the hydrogen gas evolved with acid in a eudiometer.

Topf used a weighed quantity of iodine to oxidize the metallic zinc in the zinc dust and then titrated back the excess of iodine.

Barnes also used the volume of hydrogen gas liberated, devising a special apparatus for its measurement.

Weil made determinations by treating the zinc dust sample with cupric-chloride solution and titrating the excess copper with stannous-chloride solution.

Klemp has worked out a method of determining the metallic zinc content of zinc dusts by reduction of potassium iodate in alkaline solution.

Fraenkel modified Drewsen's method by adding potassium iodide to the solution containing the excess of bichromate remaining after the reaction with the zinc dust, and titrating the liberated iodine with standard sodium thiosulphate.

Besides the apparatus of Morse and Barnes for the volumetric determination of zinc dust, there have been many others. The best of these is that proposed by Franz Meyer. This apparatus has been widely used and with proper precautions excellent results may be obtained.

De Koninck and Grandy made comparative investigations of the several methods proposed up to 1902 and concluded that the gasometric determination of the hydrogen evolved gave the most precise results. More recently Sharwood and Herz have proposed using the precipitation of silver from a solution of silver cyanide in potassium cyanide as a means of evaluating zinc dusts.

From the brief outlines of the methods given, it will be seen that they may be grouped into three classes, and that a discussion of inherent errors and accuracy in any one method is also generally applicable to the class in which that method belongs.

1. *The Reduction of a Known Amount of Oxidizing*

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*Abstracted from a paper presented at the 21st annual meeting of the American Society for Testing Materials.

Agent—The bichromate method is simple and rapid. The reduction proceeds, theoretically, without evolution of hydrogen gas, but this is probably not always true in practice. It frequently happens that particles of zinc dust will be seen floating on top of the solution with bubbles of hydrogen attached. The reaction with the acid in the solution is an inherent error in this method. The tendency is to get low results, since the reaction of the zinc dust with acid results in less bichromate being reduced.

The volumes of standard solutions used in carrying out the bichromate method are relatively small, compared with the volume of hydrogen gas which the same weight of zinc dust would liberate. The accuracy required in standardizing, reading of burettes, and determining the end point on titration is of a much higher order than that required in the hydrogen evolution method.

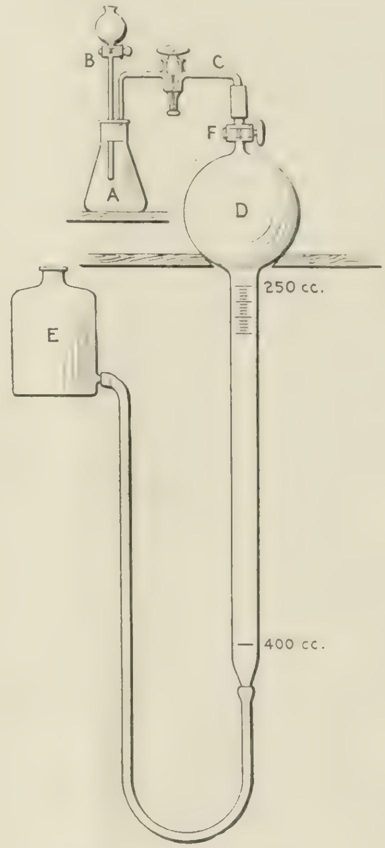
The ferric sulphate method is based on the reduction of the oxidizing agent, ferric sulphate, in neutral solution. The ferric sulphate requires careful preparation for this work. The reduction theoretically proceeds without evolution of hydrogen gas. The results obtained by this method are lower than those obtained by the hydrogen evolution method. The only explanation for this difference is the possible hydrolysis of the ferric sulphate and the reaction of the zinc dust with the small amount of sulphuric acid formed. In this case the hydrogen liberated would not be visible, but would remain dissolved.

2. *The Precipitation From Solution of a Metal With Lower Solution Pressure Than Zinc, i.e., Lower in the Electropotential Series Than Zinc*—The precipitation of a metal from a solution, e.g. copper or silver, by zinc dust does not give the metallic zinc content of the precipitant, but merely an empirical result influenced by many factors. The three most important of these are the fineness of the zinc dust, the kind and condition of the solution, and the equilibrium that is reached between the metal and the zinc with their respective ion concentrations in solution. It is obvious that when a particle of zinc dust becomes completely coated with the precipitated metal, it cannot throw out more of the latter. For this reason the method using the precipitation of silver from a solution of silver cyanide in potassium cyanide is not to be considered as a method for actually determining the metallic zinc content of zinc dust, although it may give an indication of its so-called "precipitation efficiency," as applied in cyanide practice.

3. *The Solution of the Zinc Dust With Acid and the Measurement of the Volume of Hydrogen Liberated*—The hydrogen evolution method is the one most used by responsible analysts. It is based on measuring the volume of hydrogen gas evolved from the action of zinc dust on pure dilute sulphuric acid. This volume is then calculated to standard conditions (correcting for the vapor tension of water). The percentage of metallic zinc is determined, on the basis that, at standard conditions, one gram of pure zinc liberates 342.5 cc. of hydrogen.

The Franz Meyer apparatus has the disadvantage of generating the hydrogen gas adjacent to the outlet for the liquid being displaced. Consequently, small bubbles of hydrogen and often small particles of zinc dust are carried out with the displaced liquid. However, both of these causes for error may be eliminated by inserting a relatively large glass tube between the apparatus and the leveling bottle. The Meyer apparatus has also the other disadvantage of being slow in operation.

The use of a factor to correct for the solubility of hydrogen in water and acid is not entirely satisfactory, even though determined with c. p. zinc. The solubility of hydrogen is affected by temperature, and the factor must include a temperature correction. Furthermore, the volume of liquid in contact with hydrogen long enough to become saturated is not the same in any two tests. Errors from this source can be avoided by starting with all solutions saturated with hydrogen and maintaining nearly constant temperature.



ZINC-DUST TESTING APPARATUS

Experience with these three types of methods on all grades of zinc dust and granulated c. p. zinc has proved that the hydrogen evolution method will give more accurate results than any other method recommended. This more than compensates for the longer time required for making the determination.

The procedure and apparatus recommended are fundamentally the same as in the Franz Meyer method, but accuracy has been insured and the time required materially shortened.

The method and apparatus will be understood by reference to the diagram. A 1-gm. sample of zinc dust is weighed and transferred as rapidly as possible to a small Erlenmeyer flask *A*, of 100- or 200-cc. capacity, in which is placed a piece of sheet platinum about 1.5 cm. square. About 5 gm. of clean unoxidized ferrous sulphate crystals are added on top of the zinc dust, and the flask is nearly filled with distilled water saturated at room temperature with hydrogen gas. The object of adding the sheet platinum and ferrous sulphate is to increase the rate of hydrogen evolution by catalytic action. A further reason for adding the ferrous sulphate on top of the zinc dust sample is to coagulate the latter as much as possible when it becomes wetted, and thus prevent the floating of more than an unappreciable amount.

The rubber stopper containing separatory funnel *B* and connecting tube *C* is tightly inserted into the neck of the flask. A little distilled water is poured into *B* and the three-way stopcock in *C* turned to connect the flask with the downward outlet. Enough water is now run in from the separatory funnel to displace all the air in the flask and the connecting tube through the bore in its stopcock. The stopcock in *C* is now turned so that the downward outlet is in connection with the measuring tube *D*. By raising the leveling bottle *E*, containing 10% sulphuric acid, also saturated with hydrogen at room temperature, all the gas in *D* is displaced. The stopcock in *C* is now turned through 90°, so as to connect the decomposing flask *A* with the measuring tube *D*. The system is hence completely filled with liquid and ready for the generation of hydrogen. The measuring tube *D* has a total capacity of 400 cc. and is graduated from 250 to 400 cc. by 0.25 cubic centimeters.

Thirty cc. of 1:1 sulphuric acid is now poured into the separatory funnel. A small part of this acid is allowed to run into the decomposing flask until a brisk but not too rapid evolution of hydrogen takes place. The acid, being much heavier than water, settles to the bottom of the flask and the action begins immediately. The gas evolved, together with some solution and a small amount of zinc dust, passes over into the measuring tube, displacing the acid there. When the action in the decomposing flask has slowed down, more strong acid is introduced, until all has been added. During this time the acid in the measuring tube and flask is shaken so as to wash down the particles of zinc dust from the upper parts of the flask and tube now filled with gas. The particles in the measuring tube on coming in contact with the 10% sulphuric acid are readily dissolved and generate their portion of hydrogen.

When all the zinc dust has been dissolved, water is run in from the separatory funnel to force the hydrogen over into the measuring tube and to fill the flask and connecting tube with water through to the stopcock *F*, which is then closed. After leveling with the leveling bottle, the volume of hydrogen generated from the 1-gm. sample at the prevailing atmospheric conditions is read from the measuring tube. The percentage of metallic zinc in the sample is then calculated from the following expression:

$$\text{Per cent. of metallic zinc} = \frac{V \times (P - p) \times 0.29196}{(1 + 0.00367t)760}$$

in which V = volume of gas in measuring tube at atmospheric conditions, P = barometric pressure, p = vapor tension of water above 10% sulphuric acid at room temperature, and t = room temperature.

To obtain accurate results it is necessary, when weighing out samples of zinc dust which are finely divided, to minimize the oxidation that takes place on exposure to the air. It is also highly important that samples are kept in ground-glass stoppered bottles, completely filled, and sealed with paraffin or wax. The two variables most likely to affect the results are temperature and barometric pressure. A careful estimate of the barometric pressure is necessary. A temperature change affects not only the volume of gas but also the vapor tension of water, and hence the actual pressure on the hydrogen when measured. Unlike barometric variations, changes in temperature can to a large extent be avoided by making the analyses in a room maintained at a nearly constant temperature, enclosing the apparatus in a cabinet with door fronts that are opened only when measurements are to be taken, and keeping all water and acid saturated with hydrogen.

The rubber connection between the connecting and measuring tubes must be of heavy rubber and should be painted with shellac.

Use of Filtros in Centrifugal Washers

By M. H. Merriss*

An interesting problem arises in many copper refineries in connection with nickel recovery, in which process, in most cases, after several preliminary steps, crude anhydrous nickel sulphate is separated out as a yellowish green slimy substance from a mother liquor of concentrated impure sulphuric acid, by boiling in either iron or lead pans. The salt is drained and partly air dried by throwing it up on slanting drain tables, but a large quantity of entrained acid remains with it. A successful apparatus for making this peculiarly difficult washing is the centrifugal extractor manufactured by the Tolhurst Machine Works, of Troy, N. Y., which uses for the filtering medium various combinations of copper or monel-metal screens. It is essential to the process that these screens have fine slotted holes punched in them, but, even with the resistant metals noted, the slots enlarge rapidly and allow the extremely fine nickel sulphate to pass through. This in tur throws the revolving basket out of balance, necessitating frequent repairs, with consequent expense and loss o time, to say nothing of the unsatisfactory separatio work done by the screens in the period preceding repairs. Filtros, a siliceous filtering medium, manufactured by the General Filtration Co., has been trie and proved successful from the start. It is, of cours unattacked by acid, the pores do not clog, and yet ther is no leakage of the finely divided nickel sulphate, so tha the machine never gets out of balance. A set of curve plates of Grade B—1¼ in. thick—is so made as to f nicely against the side of the Tolhurst basket. Filtr can be drilled easily, although it dulls the drills badl and can be cut with a hacksaw, so there is no troub in putting it in. Then a piece of monel-metal heavy wi screening, with through bolts and strap washers, is p in to hold the plates snugly. For caulking material, a bestos wicking is used. The manufacturers' Grade —¾ in. thick—is probably even better, taking up le space as well as being lighter. With such an install tion, the only repairing necessary is the changing the through bolts. These can be made of copper, a therefore should be resistant to acid, whereas forme the screens themselves wore out and had to be chang frequently.

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*Superintendent, Electrolytic Refinery and Silver Departm Raritan Copper Works, Perth Amboy, New Jersey.

Construction and Operation of an Electrolytic Copper Refinery*

By J. E. McALLISTER

A detailed description of the probable cost of construction of an electrolytic refinery to handle 50,000 tons of blister copper annually. Economic aspects are discussed, the basis of cost estimate is defined, proposed practice is outlined, and estimated initial and operating expenses are given.

THE investigation which is the subject of this report had for its object the determination of the cost of constructing and operating an electrolytic copper refinery in the Niagara Peninsula of Ontario, having a capacity of 50,000 tons of refined copper per annum. The estimates which follow are based upon the data given under the head of "Basis," and a conclusion is arrived at that the expenditure for constructing a plant of this type would amount to $1,502,800, and the cost of operating the same would be $13.112 per ton (of 2000 lb.) of refined copper produced.

In selecting the location of an industry of this type, the governing considerations are electric energy, temperate climate, fuel and other supplies, and labor conditions. Adequate transportation facilities are a necessity, and a location on tidewater possesses the obvious advantage of facility in receiving supplies by water freights, and in shipping the refined product by the same means. The location of a refinery, however, at or near that of the producing mines does not possess distinct advantage, for the reason that the raw material coming in for refining would undoubtedly be a bessemerized product carrying 99% copper. This could therefore be shipped from the point of smelting to the destination of the refined-copper product under the one freight charge, the product being merely stopped for "refining in transit." In compiling the following report, the services, in a consulting capacity, have been utilized of R. W. Deacon, Superintendent of the United States Metals Refining Co. at Chrome, New Jersey.

Conditions—The refinery is to be equipped to handle 50,000 tons per annum of bessemerized copper (commonly known as blister copper) containing gold and silver, the output consisting of refined copper in the shape of wire bars, cakes or ingots; gold in the form of fine gold bars, and silver as fine silver bars. The value of the precious metal carried by the blister copper will have its bearing on the cost of operation, as, should the gold contents run high, the speed of deposition of the copper must, for economic reasons, be retarded. On this account it is assumed that the blister copper will assay not over 100 oz. of silver or 5 oz. of gold to the ton, these quantities being within the range of the precious metals contained in ordinary blister-copper production. The ground is also taken that the impurities in the blister do not consist of one seriously damaging element, such as arsenic or nickel, but are distributed over the various usual elements. It should be noted that blister copper, aside from the conditions named, would require special treatment.

The present cost of materials and labor in the Niagara Peninsula has, in the main, been used as a basis of calculation, and the following are the chief items which have entered into the same:

Labor—A base rate of 22½c. per hr. on a 10-hr. day for unskilled labor, from which all other rates are scaled.

Power—High-tension alternating-current power delivered at low-tension terminals of transformers at the rate of $15 per horsepower-year.

Structural Steel—Fabricated and delivered f.o.b. plant, 5.5c. per pound.

Copper—Rated at a quotation of 20c. per lb. for electrolytic wire bars.

Antimony Lead—Per lb., delivered, 13.5 cents.

Building Brick—Per M. delivered, $13.

Siliceous Refractory Brick—Per M. delivered, $30.

Machinery—Prices prevailing at the present time (March, 1916.)

Bituminous Coal—Per ton, delivered, $4.

Coke—Per ton, delivered, $4.25.

Cement—Per barrel, delivered, $1.35.

Lumber—Prices prevailing at the present time ($25 to $35 per M., March, 1916).

PLANT ARRANGEMENT

There is ample territory in the factory district of the Niagara Peninsula for the selection of a suitable site. A ground plan of a refinery of this capacity is given herewith (see plan), and under this arrangement the plant would occupy a space of approximately 22 acres. It is to be noted that the incoming material is delivered to the plant by standard-gage railroad, the fuel to one side and the blister copper to the other. Subsequently the material is handled by an industrial railway system, operated by steam, and of either 24- or 30-in. gage. Following a shipment of blister copper through its various steps on this plan, it would be received over the railroad spur *B*, weighed in the control weighing room *E*, sampled in the sampling room *F*, and then placed in the storage under the craneway *L*, from which it is taken as required to the furnace building *K* and brought up to pitch in reverberatory furnaces, from which it is cast into anodes, the anodes being stored under the craneway *O*. From this storage the anodes are delivered to the tank house *U*, where the electrolytic copper is produced, leaving the tank house in the form of cathodes, and placed in storage under the craneway *O*, from which point it is delivered to the reverberatory refining furnaces *J*, where it is melted and cast into the form required by the consumer.

During the electrolytic action from anode to cathode, slime is formed in the tanks, consisting of the impurities contained in the blister copper, as well as its precious metals, this slime being subsequently treated in the department *W*, where the gold and silver are separated and turned out in the form of bars.

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*From the first report of the Canadian Munition Resources Commission.

A small cupola furnace is added, in which the slags from the reverberatory furnaces are treated, and their valuable metallic contents recovered.

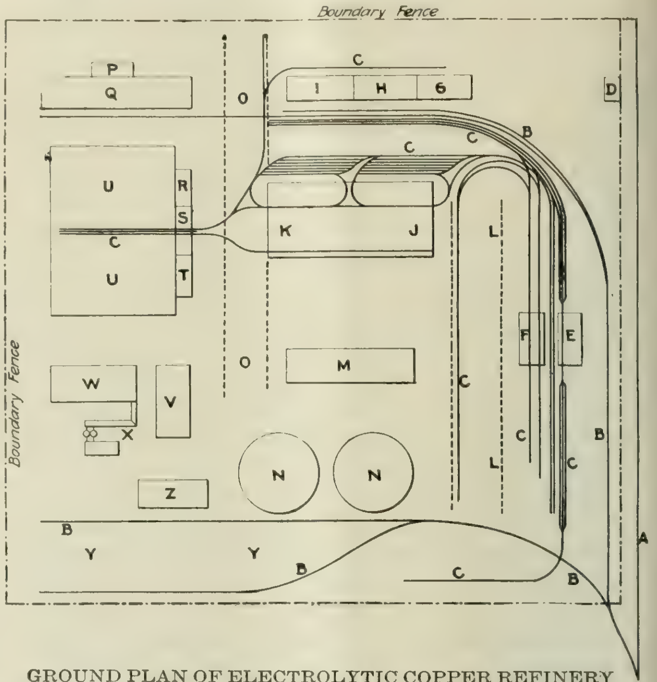
In considering the equipment of the plant, its capacity permits of the installation of modern labor-saving devices in each department. In this connection the cost of installation is governed by the balance which obtains between decreased operating cost and the amortization of construction expenditure incurred to acquire such decrease. Special apparatus should be installed for transferring blister copper from railroad to industrial cars, and refined copper from industrial to railroad cars. In the scale house *E*, tandem scales would be installed for control weighing of the blister, one scale checking the other. The accuracy of these scales is of first importance and would be aided by their capacity being considerably in excess of the ordinary load. In this case the copper would probably be weighed in quantities of five tons, and the capacity of the scales should therefore be not less than 12 tons, or double the weight of the industrial railway car with its load. After weighing, the blister copper proceeds to the sampling room, where it is sampled by drilling a ½-in. hole through each cake, for which purpose an ordinary drill press is used. After sampling, the blister copper is stored in the yard *L*, whence it proceeds to the anode furnace. It is necessary to maintain a sufficient quantity of sampled raw material in storage to permit of the continuous operation of the anode furnaces.

The furnace building *JK* should be of steel construction, containing at one end two anode furnaces for melting the blister; and, at the other, two refined-copper furnaces for melting and converting the cathode copper into merchantable form. Each anode unit would consist of a reveratory furnace lined with siliceous refractory brick and having a 24-hr. capacity of 100 tons. The furnace would be fired by slack coal and be fitted with a waste-heat boiler to conserve the heat for maintaining the necessary temperature required by operations in other buildings, this boiler being also equipped for auxiliary firing for use when the furnace is not in operation, thus saving a separate boiler installation. The raw material would be charged into the furnace on one side from the industrial railway by means of a charging crane, and the molten copper automatically tapped from the other into anode molds, the furnace being served at this side by a Walker casting wheel and a 10-ton traveling crane.

The depth of the bath of molten metal for a furnace of this type would be from 21 to 24 in., and a cycle of its operation throughout the 24-hr. period would consist of:

	Hours
Charging	1½
Melting down	9
Rabbling and poling	7
Casting	6½
Total	24

A sufficient storage of coal fuel should be carried to cover two months' operations of both the anode and refined-copper furnaces. It is necessary to maintain an excess of anodes in storage in order to feed the tank house, and for this purpose a storage yard is provided between the furnace house and the tank house. In this same storage is also held the cathode copper as delivered from the tank house for melting in the refined-copper furnaces, of which there are two, each being a duplicate of the reverberatory anode furnace, with the same capacity and equipped in the same manner with waste heat boilers, charging crane, and Walker casting wheel. The tank house building should be a steel structure with either brick-filled or concrete walls, and a fireproof heat insulating roof, and should be laid out in two bays housing 512 tanks, arranged into 16 sections of 32 tanks each, or 8 sections to each bay with a separate electrolytic circuit.



GROUND PLAN OF ELECTROLYTIC COPPER REFINERY

LEGEND: A, Railroad, main line. B, Standard gage R.R. tracks in plant. C, Industrial railway—principal tracks. D, Time clock, office and plant entrance. E, Control weighing room. F, Sampling room. G, Office. H, Laboratory. I, Warehouse. J, Furnace building, refined copper end. K, Furnace building anode end. L, Storage craneway for refined and blister copper. M, Machine and repair shop. N, Bosh water reservoirs. O, Storage craneway for anodes and cathodes. P, Transformer house. Q, Power house. R, Circulating system pump room. S, Anode and cathode weighing scales. T, Tank-house heating plant. U, Tank house. V, Regeneration plant. W, Slimes refinery. X, Slimes refinery flue system. Y, Coal and coke storage. Z, Cupola furnace building for slag reclamation, etc.

The circulation and heating systems are housed in annexes, and each bay should be provided with two 10-ton traveling cranes. The anodes would be lifted from the storage *O* by "finger" crane hooks in batches of about 30, placed in rack cars, transported by the industrial railroad to the tank house, and unloaded by traveling crane, which would also deposit each anode to its allotted space in the tanks. Scales for interdepartment accounting are provided to weigh the incoming anodes and outgoing cathodes from the tank house.

The power house would be of steel frame, with brick fill or concrete wall, and equipped with a hand-power traveling crane to facilitate the handling of parts for repairs. In it would be installed five electrolytic units, each consisting of a motor generator set designed to give a constant current of 5000 amperes at a varying voltage of from 60 to 115, four of these being arranged to work in groups of two in parallel, directly to the two separate circuits in the tank house. The fifth would be connected to act as a spare for any of the others.

All the plant in the power house would be motor driven, and in addition to the above units it would contain bosh pumps, general service pumps, hydraulic pumps, fire pumps, motor generator set to supply d.c. electric current to cranes, high pressure air compressors for the operating of handling devices and other necessary apparatus.

The slime carrying the precious metals is transferred from the tank house to the slime refinery, the latter being equipped with steel tanks, boiling tanks, filter press, roaster, reverberatory furnace for production of doré bar, silver melting furnace, and gold crucible furnace. These three furnaces would be connected to an outside collecting flue system. The department also contains a motor generator set operating on 36 cells for the electrolytic parting of silver from gold; gold refining pots, bullion balance, and safety deposit vault for the storage of doré, fine silver and gold.

CONSTRUCTION COSTS

Costs are segregated by departments, and also into the various units that go to make up the same, and would be as follows:

Furnace building	$ 67,500	
Two anode units	95,500	
Two refined-copper units	92,200	
Four cranes, two service, two charging	40,600	
Auxiliary equipment	84,800	
Total furnace department		$380,600
Tank house building	$127,000	
Sixteen 32-tank sections and circulation system and equipment	258,000	
Electrolytic circuit conductors, etc.	96,000	
Four service cranes	25,000	
Auxiliary apparatus	51,000	
Total tank house department		557,000
Power house building and crane	$ 42,000	
Five electrolytic motor generator sets and equipment	116,000	
Motor driven pumps, etc	32.200	
Auxiliary apparatus	30,200	
Total power house department		220,400
Slime refinery building	$ 38,000	
Settling and boiling tanks, filter press and roaster	16,500	
Furnace and flue system	22,100	
Electrolytic parting cells and equipment	18,800	
Gold-refining equipment	2,600	
Auxiliary apparatus	11,700	
Total slime-refining department		109,700
Shops building and equipment	$ 31,000	
Office and laboratory and warehouse equipment	44,000	
Sampling apparatus	7,500	
Control weighing scales and housing	7.400	
Storage cranes, craneways and locomotive crane	36.700	
Receiving and shipping apparatus	3 600	
Industrial locomotives and cars	47,800	
Industrial tracks and railroad sidings	24,500	
Miscellaneous auxiliary apparatus	7,600	
Bluestone and acid necessary to make up electrolyte	25,000	
Total miscellaneous		235,100
Total		$1,502,800

In addition, there should be the emergency department, consisting of repair shops, machine, blacksmith, and carpenter shops, and like equipment; also a warehouse for supplies, a plant office, and a laboratory equipped for the accurate control of assays and determination of the various products of the different stages of operation. The equipment should also include a locomotive crane for the handling of fuel from the storage and for other miscellaneous requirements.

The plant should also be properly fenced, the operatives being passed by an attendant, both in coming in and going out. In this connection it is necessary to provide the slime refinery with suitable accommodation so that operatives may change their clothing before entering and after leaving.

The raw material handled by the plant will be almost entirely in the form of blister copper, consisting of cakes about 30 in. long by 20 in. wide and 3 in. thick. Its quantity and value are determined by the scale house, sampling room, and laboratory. It is first weighed and then sampled by drilling a ½-in. hole entirely through each slab. An ordinary drill press will be used for this purpose, and the slabs drilled alternately from top and bottom by the so-called checker-board method. The location of the hole drilled in each slab will be governed by a templet covering the entire surface of the slab, and having a ½-in. hole in the center of each square inch. The holes in the templet are numbered and used in consecutive rotation, and templets are provided for both top and bottom surfaces of the slabs. The drillings from each shipping lot are put through a grinding machine, and the quantity is reduced by means of a splitting machine to about 5 lb. in weight, which constitutes the sample. This should be ground and reground until all passes through a 16-mesh sieve. If the blister copper contains appreciable quantities of precious metals, the sample should subsequently be sifted through a 40-mesh sieve, and the coarse material and fines kept separate, in order to insure accuracy of the determination, as the precious metals have a tendency to stay with the larger particles.

METAL LOSSES

In the manipulation of the various steps of refining the copper, there will be unavoidable mechanical losses, which, however, will to some extent not be in evidence, as there are corresponding mechanical losses in determining the contents by assay. This is particularly the case where the blister copper contains minute quantities of gold, in which event the unavoidable loss in assaying will sometimes be greater than the proportionate loss in refining, and the gold recovery by the refinery will be more than 100% of the amount as determined by assay. In general, however, it is safe to figure that a plant of this type will operate with a recovery of:

	Per Cent.
Copper	99.6
Silver	100.0
Gold	100.0

Two methods of accounting for the incoming copper by the refinery are generally employed. The refinery will either pay for the blister copper, with its contained precious metals, deducting sufficient to cover its metal losses and making a charge for refining, or else it will undertake to return to the shipper refined metals corresponding to those contained in the blister copper after deducting its refining charge. In the latter case the refining charge must include the metal losses of the refinery as well as the operating cost and profit.

The tank house must be kept at a uniform temperature of about 80° F., causing a tendency in cold weather to "sweating" on roof and walls, on account of the large amount of moisture evaporated from the electrolytic tanks. For this reason the heating should be preferably by the circulation of dry hot air to absorb the evaporated moisture. The tank solutions must be maintained at a temperature of approximately 150° F., the copper electrolyte consisting of about 4% copper in the form of sulphate, together with about 12% of free acid. During the deposition of the copper, the electrolyte becomes, in course of time, polluted by the impurities contained in the anode copper, on account of which a certain amount of the electrolyte is periodically drawn off and treated in the regenerating plant, the purified solution being returned to the copper electrolytic tanks. The rate of deposition of copper on the cathode will be governed by the current density, which should not amount to more than 20 amperes per sq.ft. of anode surface for copper carrying up to 100 oz. of gold and silver to the ton. Should the amount of precious metals be appreciably less, the current density may be increased up to, say, 30 amperes, thereby increasing the speed of deposition and shortening the time of operation. Should the deposition take place too quickly, there is danger of occluding precious metals with the cathode copper. A cycle of operations in the tanks at the 20-ampere current density would occupy from three to four weeks.

One section of the tank house is devoted to the preparation of cathode starting sheets, for which purpose a copper plate coated on each side with oil or graphite is used as a cathode blank, and a thin layer of copper deposited thereon by electrolysis. This is stripped off from each side and forms the cathode starting sheet. In the routine operation the electrolytic tanks are first charged with anodes, and then hung with cathode starting sheets, and the current is started. It is kept on for a prescribed number of days, varying from 10 to 12; then the cathodes which have been formed on the starting sheets are removed, the solution is lowered in the tanks, the anodes are taken out temporarily, and the slime is removed and sent to the slime refinery. The anodes are then replaced, fresh cathode starting sheets hung, and the current is turned on for another period of 10 to 12 days; then the "pulling" is repeated, except that upon this occasion what is left of the anodes is removed and goes back as scrap to be remelted in the anode furnaces. It will be noted, therefore, that for each anode going to the tanks two cathodes of lighter weight are formed. The theoretical deposition of the copper would be approximately 0.062 lb. of copper per ampere day, and a current efficiency of at least 90% should be acquired. The necessary pressure would be about 0.4 volt per tank, and upon this basis the rate of deposit should amount to about 6 lb. of cathode copper per kilowatt-hour.

The cathodes are weighed on leaving the department, and stored, from which point they are fed to the refined copper furnace for melting into the shape required by the consumer, for example, ingots, wire bars, and cakes.

The precious-metal slime reclaimed from the electrolytic tanks would amount to about 30 tons per month, containing about 440,000 oz. of gold and silver. The slime is first freed of the electrolyte by settling until it contains about 50% moisture. It is then boiled with sulphuric acid to remove soluble copper, after which it is put through a filter press and roasted. This roasted product is combined with a portion of unroasted slime to make up a furnace charge. The result will be the melting of about 20 tons per month of slime containing from 15 to 25% moisture, the melt taking place in a small reverberatory furnace, the product of which is doré bars. These form the anodes for an electrolytic deposition, which takes place in an electrolyte slightly acidified with nitric acid, the silver being deposited on cathode blanks in crystalline form, and the gold settling as a black mud containing about equal quantities of gold and silver. The resulting silver crystals are scraped off the cathode blanks, washed and melted into fine silver bars. The gold mud is purified by treatment with nitric acid to part the gold from the silver, the solution going back to the silver electrolytic tanks, and the gold sand melted with borax into fine gold bars.

It has been pointed out that there should be a storage of blister copper maintained previous to the melting operation for the production of anodes, and also a storage of cathode copper between the tank house and the final resmelting furnace. In addition, there is the time occupied by the operations in the furnace building and the tank building. As a result of this, the time occupied by the plant under consideration between receiving the raw material and obtaining therefrom the metals in refined form would be from 50 to 60 days in the case of the copper, 65 to 75 days for the silver, and 70 to 80 days for the gold. The value of the material, with its consequent interest loss during this elapsed time, must therefore be taken into consideration, either in the refining charge imposed by the plant, or in the form of a deferred date in paying for the incoming blister copper. The latter is the usual method; but the shipper is, on the other hand, entitled to draw upon the refinery, upon presentation of bill of lading, for from 90 to 95% of the value of the shipment by paying the usual bank interest charge for the amount of the draft during the period agreed upon, which would correspond to approximately the elapsed time noted above. It should also be noted that the settlement quotations, in the case of metals of fluctuating value like copper and silver, should be based on the market quotations at the time the refined metals are ready for sale, and not at the time the blister copper is shipped by the consignor. By this means the refinery protects itself from violent fluctuations in the price of copper.

OPERATING COSTS

In compiling the following costs of operation, it is assumed that metal losses, and also interest on payments advanced, will be included in the charges made by the refinery. The costs have been figured in dollars per ton of refined copper on the basis of the unit of production of each department, and finally converted into a total cost for all operations, in each case segregating the amount for labor and material. This would be the manner in which the actual operations of the plant would be recorded in order to control the efficiency of the different departments.

The following operating costs would probably result from the operation of a plant arranged as proposed:

	Labor	Material	Total per ton
Anode making	$1.155	$1.213	$2.368
Electrolytic refining	2.025	2.464	4.489
Refined-copper casting	1.00	1.304	2.404
Slime refining	.463	.461	.924
General expenses	.926	.464	1.390
Int. on investment (5%)	....	1.537	1.537
Totals	$5.669	$7.443	(a) $13.112

(a) Per ton of refined copper.

In order to indicate the expenditure of the refinery on various items, the above costs may be transposed to the following basis:

Labor	$5.669
Material	1.332
Fuel	1.895
Power	1.301
Overhead	1.378
Interest on investment	1.537
Total	(a) $13.112

(a) Per ton of refined copper.

SUPPLIES

The approximate monthly quantity of supplies used by the plant would be as follows:

Electric power	1,465,000 kw.-hr
Soft Coal	1,750 tons
Coke	140 tons
Fuel oil	10,000 gal.
Sulphuric acid	50 tons
Siliceous brick	39,000 (9 in. equivalent)

EMPLOYEES

The operations of the plant would require about 350 men, divided in about the following proportions:

Unskilled	110
Semi-skilled	155
Skilled (mechanics, power house men, etc.)	85
Total	350

The figures given do not include executives, clerks or foremen.

Some Legal Decisions on Mine Shaft Accidents

By CHESLA C. SHERLOCK*

The courts have been called upon on several occasions to express an opinion on accidents where miners have been injured by objects falling down mine shafts, and a few recent cases clearly illustrate the law covering the subject.

In an Oklahoma case (Osage Coal and Mining Co. *vs.* Miozvany) it was shown that a miner was working at the bottom of one compartment of a shaft, and while so engaged he was struck on the head and killed by a lump of coal which fell down the shaft after being knocked from the bunting of the tipple by an ascending cage in another compartment. The court found that the evidence tended to show that the lump of coal had been left on the bunting by an overloaded car; and, as this raised a question of negligence, held that it was a matter for the jury. The court also held that it was a question for the jury to determine whether the failure on the part of the defendant to furnish a properly constructed bonnet or other appliance for the protection of the deceased from falling coal amounted to negligence.

In a Missouri case (Ridenour *vs.* Wilcox Mines Co., 164 Mo. App. 576, 1912) the plaintiff's father was a tub-hooker who sustained injuries resulting in his death while working in the bottom of a shaft when struck on the head by a large piece of rock which fell from a can being hoisted in the shaft. The plaintiff alleged that the defendant "carelessly and negligently failed to build or cause to be built a box or continuation of said shaft from the place where it entered into the said underground room or drift to or near the floor of said drift, so that cans ascending from said room or drift would be guided by said box or continuation of said shaft and render said cans less liable to jar against the sides of said shaft and so that any rocks or boulders falling down from said cans would fall straight down." It was contended by the defendant that this petition did not sufficiently show a cause of action, in that it did not show a connection between the defendant's negligence and the death of the plaintiff. The court, however, did not coincide with this view, but held that a cause of action was sufficiently alleged, and allowed a verdict of $2000 in favor of the plaintiff.

In a Michigan case (Maki *vs.* Mohawk Mining Co., 176 Mich., 497, 1913) a trammer in defendant's mine was put to work for the first time as a mucker in one of the mine shafts. While so engaged he was struck and injured by a loaded bucket, which broke away from the wire rope cable by which it was being hoisted. It was shown that the shaft had an incline of 36° and was completed to the 13th level, and at the time of the injury the work had proceeded to the 14th level, or nearly so, the rock taken out being hoisted to the 13th level in buckets. As the loaded bucket started up the shaft, one of the employees took hold of the rim of the bucket with one hand and told another workman to do the same. They then gave their disengaged hands to a third miner, and in this way all three were hoisted with the loaded bucket. After they had passed out of the perpendicular part of the shaft and had entered the part inclining at an angle of 36°, they released their hold on the bucket. It passed up about 10 ft. higher, the cable suddenly parted; and before the plaintiff could get out of the way he was struck by the loaded bucket.

The defendant contended that having furnished a safe cable it was incumbent upon the employees to make inspection of it before using it in any such manner as indicated. But the court held that it was not only the duty of the defendant to furnish a safe cable, but to reasonably inspect it, so that it would remain safe.

In a Kentucky case (Saylor *vs.* Bon Jellico Coal Co., 153 Ky. 474, 1913) the plaintiff was injured while working at the bottom of an airshaft in the defendant's mine by the fall of a piece of rock weighing about 6 lb., which struck him on the head. The court held that it was not only necessary for the plaintiff to allege negligence on the part of the employer and to show facts amounting thereto, but to show that the injury resulted from such negligence. In this case, there was no evidence to show that the injury was due to the negligence of the employer or any of his servants. There was no evidence to show how the rock happened to fall down the shaft or what caused it. The court therefore held for the defendant.

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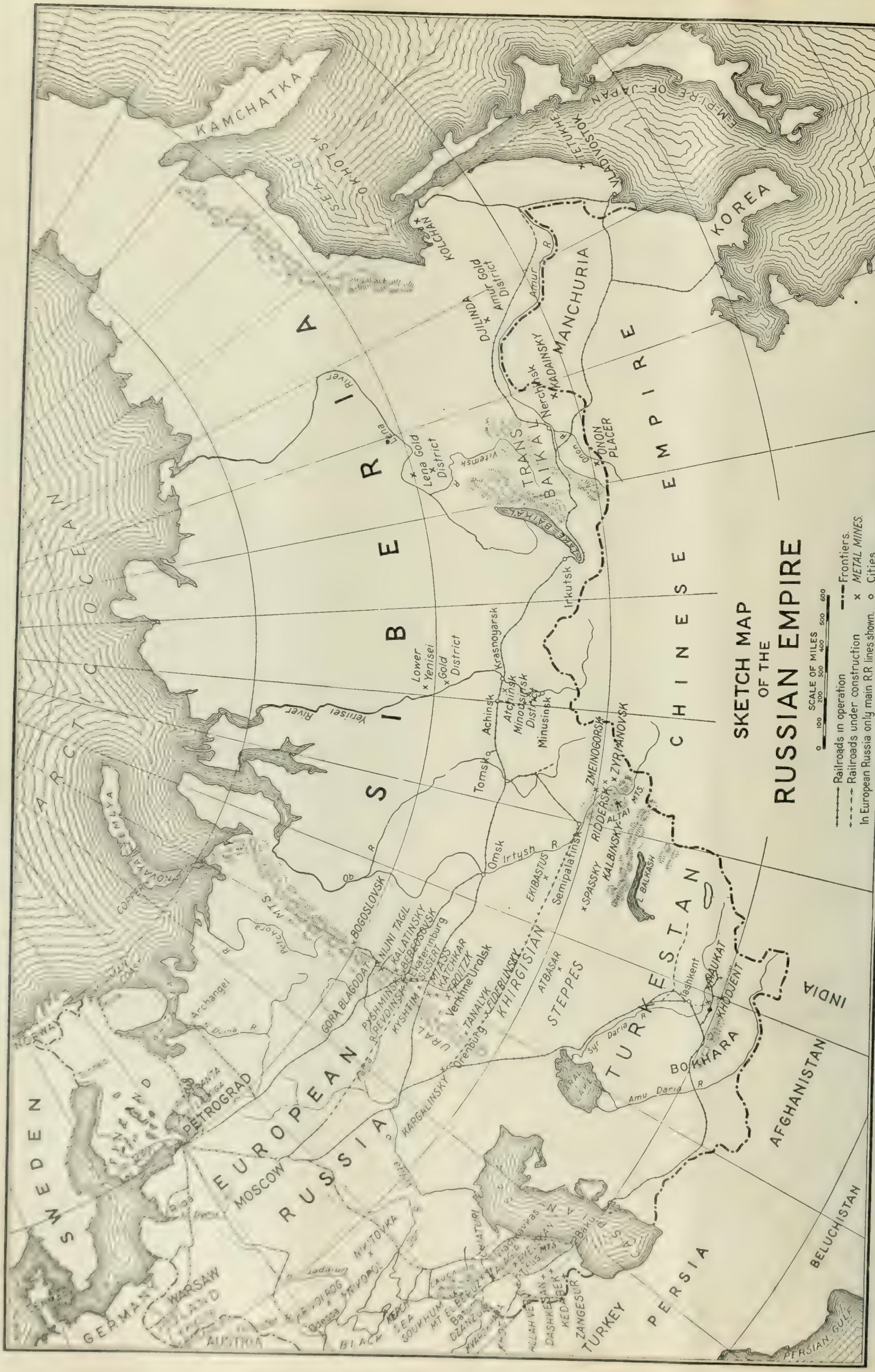
*Des Moines, Iowa.



MAP OF THE RUSSIAN EMPIRE, SHOWING SITUATION OF THE PRINCIPAL MINING AND MINERAL DISTRICTS

A Gasoline-Driven Diamond-Drill Outfit

BY J. M. LONGYEAR, JR.*

Rapid exploration progress was made in the northern Michigan iron-ore district by the use of a gasoline-driven drill. Nearly 7000 ft. of holes were put down, at a total cost of $2.152 per ft. The apparatus used was so designed that minimum time was consumed in moving from hole to hole, being, for moves of 250 ft., only five hours. Operation possible at 20° below.

EARLY in the spring of 1916 I was engaged to organize an exploring company, the chief object of which was to be a rapid proving up of certain lands in the iron district of the Upper Peninsula of Michigan, and the results obtained in the use of gasoline as a motive power in this connection were interesting. It was necessary that the drilling outfit which the company intended to use should provide dispatch in moving from hole to hole, ability to drill to a depth of at least 750 ft., and efficiency of operation in labor and fuel per foot for drilling.

TOO MUCH TIME CONSUMED IN MOVING STEAM-DRIVEN APPARATUS

Upon investigating common types of steam-driven drilling machines, however, it was found that considerable time was required in moving the apparatus. An extended trip to several diamond drill camps showed that the average time necessary to move a steam-driven outfit from one hole to another, from the time the casing was pulled until the crew started to sink again, was two and one-half days. The plan of campaign adopted anticipated putting down several short drill holes, rather than a few big ones, in order to prove up a property, so that, other things be equal, in the event that use was made of the common, steam-driven type of drill, more than half of the time would be consumed in moving.

GASOLINE- AND STEAM-DRIVEN MACHINES BOTH CAPABLE OF DEEP DRILLING

The ability of steam-driven machines to drill to a depth of 750 ft. was also found in the gasoline types, and it was decided to adopt a "BD" drill made by the E. J. Longyear Co. This type uses "E" rods, gives a $\frac{15}{16}$-in. core and is belt driven, using both steam and gasoline power. The efficiency of operation could be determined only by trial, but it was realized that if the time of moving could be cut in half, the labor cost would be reduced 25% per ft. of hole, and it is well known that for nearly all purposes gasoline is cheaper per unit of power than steam.

All of these things considered, it was decided to try the gasoline drill, although many experienced operators expressed the opinion that its use would be impracticable in the winter, but at least two members of the exploring organization were good automobile mechanics, and it was decided to make the attempt.

Most of the designing was left to the E. J. Longyear Co., of Minneapolis, Minn., and Marquette, Mich., as that concern has built many drills of different types and is well qualified to tackle something new in this line. Further, its manufacturing plant is situated in the same city as the Longyear company's offices, so it was possible for local representatives to watch the progress of construction. The outfit as furnished consisted of two motor-pump units, a churn buck and frame and a belt-driven diamond drill. The motor-pump units were interchangeable, and could be used either to drive the drill or to pump water from a distance to the drill. The motors were 22 hp. Red Wing marine type, four cylinder, four cycle, and were mounted in a special frame. This frame also held a train of gears and a countershaft, which ended in a specially constructed sprocket wheel. This sprocket wheel drove the pump through a friction clutch and chain, and also was provided with an attachment for a universal joint and shaft, by which the churn buck could be operated. The universal joint and shaft were made so as to be detached easily when being moved.

MACHINE USED AS CHURN OR DIAMOND DRILL

The churn buck was a small one, equipped with a connection for another universal joint, through which the power from the shaft was delivered. On the side opposite the motor-pump unit, the churn buck was provided with a belt pulley, through which the diamond drill was operated. The diamond drill was on posts with adjustable braces, and could be pushed back out of the way, or completely removed. In operation, when sand-piping, the diamond drill was entirely removed, but was set into place when the ledge was encountered. For ease in handling the drill rods, the drill was pushed back on the sliding brace while the rods were being hoisted or lowered.

MANNER OF ERECTING AND TEARING DOWN OUTFIT

As first used by the exploring party, the outfit consisted of the apparatus mentioned, with a 12 x 12-ft. platform consisting of loose planks and stringers and a spruce tripod 37 ft. high. Then the motor pump and churn buck were skidded on the platform, lagscrewed into place and connected. Next the tripod was placed on the ground, two poles behind and one in front, and connected. The center was then raised about six feet off the ground, and the forward pole pulled toward the machine by the churn buck, thus raising the tripod. Minor adjustments were completed by hand. Finally, the scaffold holes were nailed to the tripod, the scaffold was laid and the outfit was ready to begin work. In tearing down, the tripod was lowered by hand, using the churn buck to tie to, so that the timbers would not slide away. Then the churn buck and motor pump were disconnected and skidded off the platform, after taking off the lagscrews. After the platform was pried out of the ground, the outfit was ready to move.

The platform was moved first and placed over the position for the next hole while the team went back for the machine. When this had been brought up, it was skidded on the platform by the team. While the machine was being lagscrewed and connected, the team brought the rest of the outfit, so that little time was lost in the moving operation. The average time was approximately five hours under these conditions for moves of about 250 feet.

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*President and general manager, Longyear-Michigan Exploring Co., Marquette, Michigan.

INADEQUATE HEAT PREVENTED DRILL OPERATION

This outfit was satisfactory in the summer, but as winter drew on it was realized that it would be necessary to provide some sort of shanty around the drill, so the regulation type of knock-down shanty used by most diamond-drill outfits was built, and by means of a sheet-iron stove it was possible to keep warm for about a month, but when the real freezing weather came on, this type of shanty was found to be entirely unsuitable, as the motor could not be kept sufficiently warm to run, and everything became frozen.

SPECIAL INDUCEMENTS TO NEW CREW

About this time a shake-up in the crew occurred, and they all left. They probably realized that the outfit was not one on which it is desirable or comfortable to work in the winter. In hiring the new crew special emphasis was laid on the nature of the work, and assurance was given that the outfit would be placed on a bonus basis in the matter of wages. Finally four men were hired, two of whom had worked on a drill before, but who practically had to be taught all over again. The foreman, however, was more than anxious to coöperate in trying improvements, and most of the subsequent changes must be credited to his invention and persistence.

SUBSTANTIAL DETACHABLE SHANTY BUILT

The first improvement was to build a shanty that would keep the heat in and the cold out, and one which could be moved more easily than the old one. It was constructed on wooden skids, 14 ft. long and 11 ft. apart. On these skids five stringers were fastened, to which the floor was nailed and the machinery lagscrewed. The floor was made of 2-in. hemlock planks covered with tar paper, and 1-in. pine boards over this. The shanty was built of two layers of boards, with tar paper between, and was made detachable. Whereas the old shanty had three sections to a side, the new one has only one section. The floor, roof, each side, the front and the back each forms a separate section, and all are firmly bolted together. With the exception of the maple skids and the hemlock planks on the floor, the shanty is built of spruce and pine, using spruce for the stringers, wall supports and roof joints and pine for the boards to cover them.

DETACHABLE FEATURES FACILITATED MOVEMENT

All the machinery and tools were placed in the shanty, and a team of horses could easily pull the whole outfit over the snow. The tripod, when taken down, was laid on the roof, as were much of the pipe and drill rods, so that the time of moving was cut down materially. In fact, from the time the casing was pulled until the first length was started down again, was rarely over an hour, all of last winter.

The gasoline pumping station, however, had to be given up when the weather got around 20° below, so a small shanty was built, of the same type as the drill housing, and a five hp. steam boiler and a small duplex Canton pump were placed therein. This outfit could also be hauled around without tearing down. The exhaust steam from the pump was fed into the suction just above the water line and kept the water warm enough to prevent freezing during the entire winter. In order to keep water in the tank at the drill warm, the exhaust water from the water jacket of the gas engine was allowed to fall into the tank.

FRAME TO BE SUBSTITUTED FOR TRIPOD

Several other little wrinkles were found that helped matters in connection with the work, so that this coming winter no trouble with the outfit is expected. It is planned to dispense with the tripod, and instead to put a frame with four legs on the roof, so that it will not be necessary to tear it down at every move. This frame can be inclosed with canvas, so that the man on the tripod will be able to keep as warm as the man in the shanty. This arrangement will also lessen the chance of freezing in the hose and connections.

COST OF EXPLORATORY DRILLING WITH GASOLINE-DRIVEN MACHINES

Feet Drilled	No. of Holes	Gasoline, Gal.	Gasoline, Cost	Explosives	Diamonds	Labor	Other Expense	Total Expense	Depreciation	Grand Total
6,739¼	69	1,386.5	$302.91	$104.97	$99.45	$8,860.33	$3,652.73	$13,020.39	$1,500.00	$14,520.39
Per ft. of hole..		0.206	0.045	.016	.015	1.311	.542	1.930	.222	2.152

The matter of cost is particularly interesting, and I understand that it is far below anything that can be expected on a steam-driven drilling outfit having the same capacity. The costs per foot, especially, were extremely low. The total cost of the entire equipment as now used is $13,311.08. This includes the two motor-pump units, two churn bucks and two diamond drills, one pumping station, nine shanties (drill, bunk, cook, pump, barn, and other necessary structures), all built on the same plan; also all of the tools and paraphernalia needed and the labor which was necessary to build the shanties and other shacks. In fact this is the original price of the complete outfit, counting extra supplies that are kept on hand, and covers all money paid out on the equipment proper.

The machinery itself cost $2970, not counting the pump and boiler. These were bought second hand, and amounted to $95. The cost of the lumber used in building the shanties was $603.11 and the labor necessary to build them amounted to $226.64, which makes the total $829.75 for the nine shanties. The rest of the equipment, which includes all the tools, pipes, drill rods, diamonds, etc., amounts to nearly $9716.33, making a grand total of $13,311.08 expended for equipment.

TOTAL EXPENSE AND COSTS PER FOOT

For purposes of comparison, in costs per foot of hole, two columns of total expense are given in the tabulation above. The first represents merely the total expenditure of money charged to the work; the second represents the same amount, with the addition of a depreciation charge on the outfit of $100 per month, which is less than 10% on the investment in equipment.

The fuel cost of 4½c. per foot of hole is especially remarkable. The superintendent of a large diamond drill company said that the cost of 25c. per foot of drilling for wood, cut to burn in their boilers, was their lowest fuel cost figure; so naturally any drilling outfit that will cut 20c. per foot from the drilling cost is worth having. The labor charge is also to be noted. It should be remarked that it includes not only the men actually at work on the drill, but the pay of a teamster and the expense of a team all charged to drilling, and the cook's wages are also included. In some of the cedar swamps which the machine traversed two or three men kept ahead of the drill all of the time to cut roads, and this expense is also included. The men actually at work on the drill are paid a bonus per foot figured on the basis that the crew receive $1 for every foot sunk. Thus, the actual labor on the drill costs only $1 per foot of hole, the remaining 31.1c. representing all the additonal labor referred to.

FURTHER IMPROVEMENTS CONTEMPLATED

I do not think, by any means, that the machine, apparatus and method are perfect yet, for several improvements are contemplated, but it takes time to try them out, and there is no disposition to interfere with the operation of the drill at present. I do believe, however, that it is better than the old-style steam outfit, which has not been changed since 1885.

Evaluation and Saving of Power Loss In Belt Slippage

One of the easiest power losses to overcome, and that at small expense, is belt slippage; and since belts are used to such a great extent, it is worth while to look into the matter with more thoroughness than has been accorded generally. The extent of the loss of power, and its value in money, through the slipping of one belt, is indicated by means of the accompanying chart, designed by the Cling-Surface Co., of Buffalo, N. Y. A glance at Column D of this chart indicates that the cost of avoidable belt slips per year ranges into the thousands of dollars.

Where steam power is generated and the energy transmitted to the main line shaft by belt, if the latter slips, which it should not do, a part of the coal value is lost in the form of wasted heat. A main belt is merely a "link" connecting the engine with the generator or with the machine direct. In fact, every belt that transmits power is a connecting link, and the efficiency of that link depends largely upon the freedom from slippage and the avoidance of undue strain on the shaft. Slipless, easy-running belts are most effective.

Where all the power passes through a single main drive belt, this is especially important, as each per cent. of slip in such a belt represents an approximate loss of 1 per cent. of the available energy in the coal used. Roughly, 2 per cent. of the potential power in the driving pulley of the prime mover is represented by "belt creep." This loss is unavoidable, because of the inherent elasticity of the belt. This has been recognized and provided for in the chart, and Column D gives the avoidable money loss. As shown by the broken lines drawn across the chart, if the total belt slip is 6 per cent. (Column A), and the cost of coal is $4 per ton (Column B), run one straight line through these two points and locate its intersection with Column C. From this point draw a line to the tons of coal burned per year (Column E), which is assumed as 1000, and the loss in avoidable belt slip per year, as shown at the intersection of the second broken line and Column D, is $160.

Yearly loss due to belt slip is often considerably greater than $160, for this calculation obviously applied only to one belt—the main belt. If all of the distributing or secondary belts slip equally as much, the annual loss is doubled, tripled or even increased four-fold.

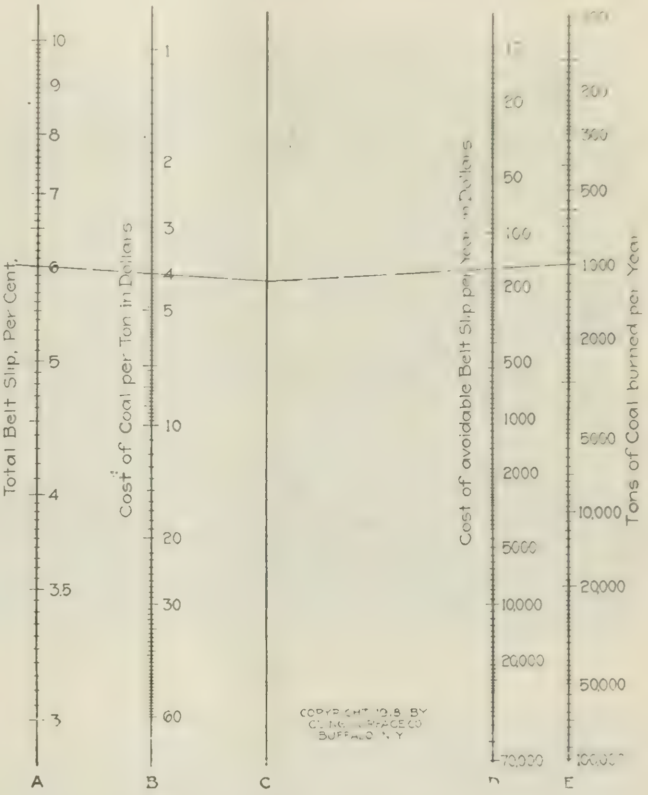
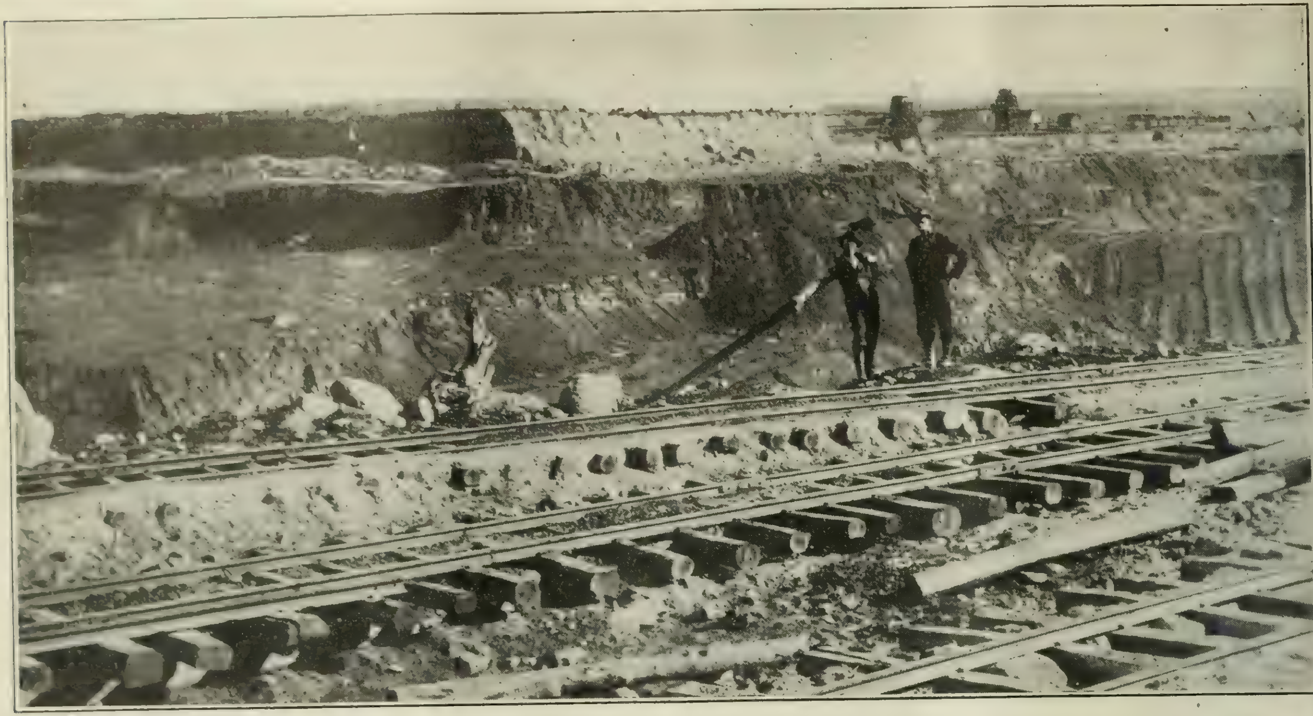


CHART FOR THE DETERMINATION OF LOSS IN MONEY BY AVOIDABLE BELT SLIP

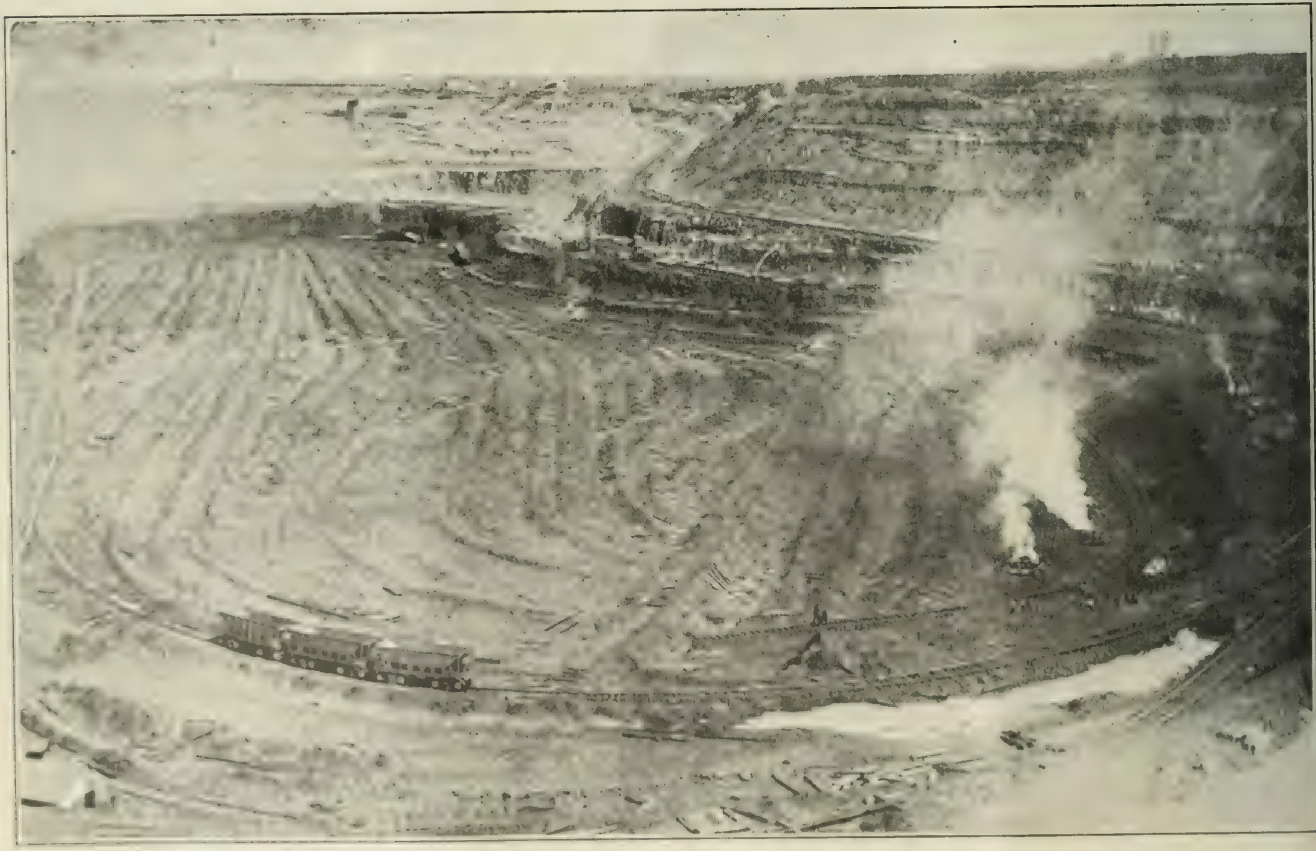
As an example of the total belt slip per cent.: If by means of a revolution counter it is found that a driven pulley is making only 940 r.p.m., and that without slip it should make 1000 r.p.m., 60 r.p.m, therefore, are being absolutely lost. Dividing 60 by the r.p.m. that the pulley should make, 0.06 is obtained, or 6 per cent., which is the belt slip. After having made this determination, it is a simple matter to apply the data to the chart. Belts to which a proper belt dressing has been applied do not slip and do not require high tension, and therefore can be allowed to run with plenty of slack. Every belt thus relieved of undue tension reduces by that amount the total frictional loss, and this means also a longer-lived belt, cooler bearings, less oil consumption, less time lost in repairs and more power delivered at the machine.

The Increased Demands for Asbestos due to the war have been met largely by increased imports from Canada, states the U. S. Geological Survey. The imports of asbestos from South Africa and Italy have been largely cut off. The demand for imported asbestos for use in filters is being supplied by residual deposits of the crystalline rocks of Maryland.

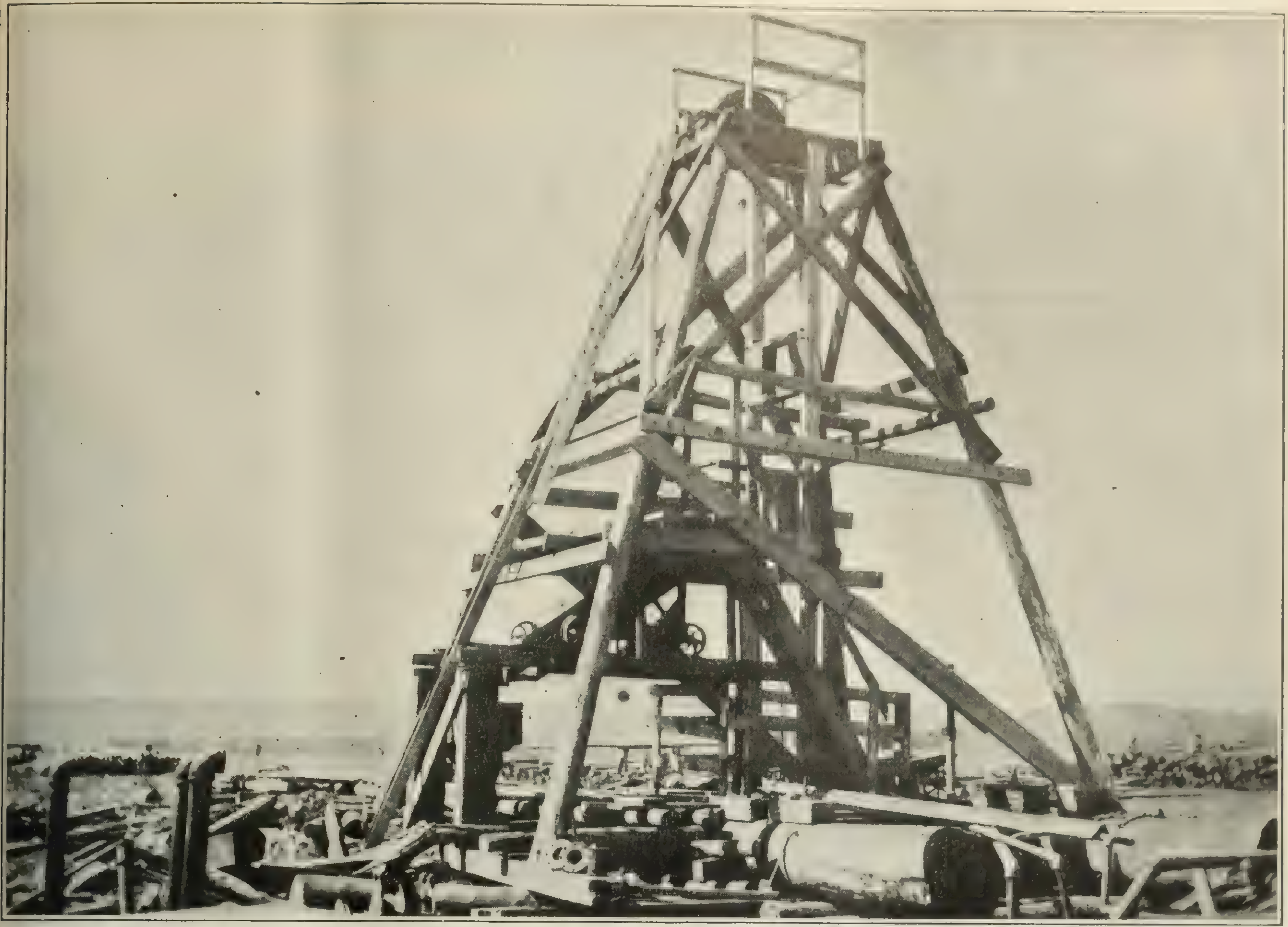
Photographs from the Field



MORRIS MINE AT HIBBING, MINN. ONE OF THE LARGE OPEN-PIT PRODUCERS OF THE MESABI RANGE



BUFFALO AND SUSQUEHANNA OPEN PIT AT HIBBING, MINN. VIEW LOOKING EAST



TEMPORARY HEADFRAME, SHOWING BEARING TIMBERS, GUIDE AND SINKING BUCKET AND DUMPING CAR

REMOVING ORE FROM A MESABI RANGE OPEN PIT AFTER COMPLETING STEAM-SHOVEL OPERATIONS

The Vital Need for Gold*

By JOHN CLAUSEN†

The economic history of the distribution and use of gold as currency is outlined, and the imperative need for ample output shown. The proposition to raise the value of gold is considered impracticable, and a Government bonus for gold production is suggested as a feasible method of alleviating the situation menacing the industry.

NO MORE interesting chapter will be written in economic history than that which deals with the problem of the proper distribution of the world's gold supply. The greatest war the world has ever known has so altered conditions that new methods and customs must necessarily take the place of the old in order to keep abreast of the times. In reality an important issue is presented; namely, whether the standard of value of the world will in future be gold or become a combination of silver and gold, and, if so, what effect such changes would have on the trading powers of nations.

Early Shortage of Specie

There are many interesting angles from which to view this important subject, but it may be of general benefit to recount what happened in this country during and after the Civil War and what has occurred in Europe since the beginning of the present hostilities.

As an inevitable result of Government policy which had placed upon the banks a burden too heavy for them to carry, the financial institutions in New York and other sections were, during the Civil War, forced to discontinue specie payments, which subsequently brought about the suspension of the national treasury.

At the beginning of 1862 a bill was introduced which had for its purpose the making of Government notes legal tender. The issue of greenbacks payable to bearer was authorized up to a maximum of $400,000,000. When the greenbacks were issued it was expected that they would circulate at par with the gold dollar, containing 23.2 grains of pure metal, but a year after the first legal-tender act had been passed, paper money had an exchange value equal only to 14.5 grains of gold. Its value rose in August, 1863, to 18.4 grains, but fell in July, 1864, to nine grains, which was its lowest point. The premium on gold was then such that a dollar in paper money was not worth more than 36c. in gold coin.

Gold Cornering in 1864

The most striking example of profiteering during that period was the "Black Friday Conspiracy" of Sept. 24, 1864, when a group of speculators bought up large quantities of gold—creating an artificial scarcity—and, as a result, that commodity could be obtained only from this clique at ruinous terms. This brought about many failures, and to check gambling in gold and reduce the premium on it, the anti-gold law was passed, but as it did not bring the premium on gold to a materially lower level, it was soon repealed.

In June, 1862, Congress authorized the use of postage and other stamps of the United States because of the enormous increase in demand for small currency, notwithstanding the circulation of the so-called "shin-plasters," which were issued in denominations of 5, 10, 20, 25 and 50 cents.

In some of the Western states attempts were made to maintain specie payments after they had been given up in the East, but California alone had the distinction of remaining on a gold basis during the Civil War, and it was not until 1876 that gold again sold at par throughout the United States.

Export of Gold Causes Shrinkage

The panic of 1893 was followed by a depression throughout the nation, with the result that a large amount of gold was drained from this country to Europe. The Treasury's reserve became so low in November, 1894, that a sale of Government bonds was resorted to; in fact, the stock of coin was reduced to such an extent that there were outstanding more gold notes than coin, leaving a part of the certificates represented by bullion in the form of bars. Again during February of 1895 and also in July of the following year, strong syndicates headed by leading bankers in New York accomplished the difficult task of bolstering up the finances of the United States Government; and it was due largely to their activities that the United States remained on a gold basis. The success of these combinations had a far-reaching influence on business, and as soon as it was seen that the gold obtained from abroad was not going to be lost at once, as in previous bond sales, confidence was again revived and the financial position of the United States improved so favorably in the eyes of Europe that it was possible to float large blocks of American securities abroad.

In August of 1914 foreign exchange became demoralized, and to remedy that situation a gold pool was again created, when leading banks and bankers throughout the country joined in an agreement to provide for mail and telegraphic transfers to Europe in lieu of gold for export, which proved a helpful factor in restoring order and confidence.

International Scramble for Gold

For several years prior to the declaration of war in Europe, the countries of France, Russia and Germany especially had been engaged in a competitive scramble for gold, which resulted in the holdings of their great state institutions expanding rapidly. The embargo which was universally adopted clearly demonstrates the desire of every commercial nation to control and retain its supply of gold. As far as the United States is concerned, except for the necessity of obtaining Government permission to export gold in coin for bars, its circulation in this country has not been restricted.

It has lately been said that the world is divided into two classes of countries; those which refuse to accept gold and those which refuse to part with it. Gold in bars or foreign coins is not legal tender anywhere. No person in Scandinavia, for example, could be made to take gold bars or American eagles in reimbursement for goods or to meet a required payment in legal-tender currency of that country.

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*Excerpt from an address to the American Gold Conference, at Reno, Nev., Aug. 13, 1918.

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CREDIT CANNOT DISPLACE GOLD

There are comparatively few who really understand to what a great extent mere credit can be made to do the work of wealth, although the time will come when credit will assuredly break down unless it is built upon a solid foundation. The issue and circulation of paper credits throughout the leading nations of the world has been proportionately far greater than their holdings of gold and has naturally resulted in inflation on an alarming scale.

The thought, however, that Europe may possibly repudiate part of her war debts for the sake of reducing the amount of currency outstanding against government bonds or notes, is obviously superficial. Finance has become an international, rather than a national, question, and the monetary history of any one country tends to become more and more merged in the monetary history of the whole civilized world. International credit is firmly established on a gold basis, and unless the flow of gold is not too strong in one direction, no country has any interest in upsetting the present standard, although it is contended that, notwithstanding a great production of new gold, it may not necessarily make universal gold standardism possible, as it would be a mere drop in the bucket of future needs. If the world's credit, therefore, is to be carried on after the war with gold, every ounce that can possibly be produced will be required.

PRODUCTION OF GOLD VITAL

The production of gold is a vitally essential industry, which, for obvious reasons, should be promoted to the fullest extent. It is apparent, however, that with a fixed value for the yellow metal, together with the rapidly increasing cost of material, labor and transportation, this particular industry, as now developed, is seriously affected, and it would seem inevitable that unless some form of Government bonus—but only as a temporary measure—is given to the producing mines, many of them will inevitably be compelled to discontinue operations.

Some persons argue that if the Government would agree upon a plan to increase the value of gold from $20.7 to, say, $40 or $50 a fine ounce, it would make a settlement of obligations possible with only half the metallic requirement otherwise necessary to redeem outstanding paper credits. This course, radical to say the east, would have a disastrous effect upon all credits, and especially reflect upon the cost of living, which, in all probability, would climb to limits beyond the reach of the average citizen. Increasing the value of gold or giving it a premium does not necessarily give it a higher purchasing power, but, on the other hand, in the final adjustment seriously disrupts the basis of international credit.

When peace comes, all the world will be faced with a period of great financial and industrial uncertainty, and to pass through it successfully will be a task that will need all the statesmanship civilization can muster. To increase this uncertainty by tampering with the standard of international payment would be an extraordinarily futile means of handling the situation and would only make the confusion worse confounded.

The principal nations of the world have adopted gold as the basis of their currency system. The market price for it is everywhere the same. It may be an anomaly that economic civilization should depend for means of payment on the supply of a particular metal, but it will take much ingenuity to find a practical substitute for gold and secure for it the popularity and confidence that gold now enjoys. The mere fact that it has been chosen by the most enlightened commercial nations is strong proof that it is the best single commodity for practical use as a standard.

ADEQUATE GOLD FOUNDATION IMPERATIVE

The disproportionate distribution of gold among world nations attracts attention to the study of the part that this metal plays and is to play in future in the world's economic affairs, and the question naturally arises whether the production of gold is keeping pace with the world's expansion or credit.

The vast obligations piled up by the nations at war; the huge issues of paper currency; the refunding of debts and resumption of specie after the war, are among the most urgent and difficult problems with which the world will be confronted. This makes it only too apparent that gold is a necessity for the credit and financial unity of nations, and it is therefore essential that an adequate foundation of gold must be created to uphold that system.

The United States stands in the unique position of possessing more gold than any nation has ever before owned at one time, but if America is to perform the part that destiny seems to have laid out for her as the world's banker, it will without doubt be necessary to further increase the nation's gold holdings, and for this reason encourage gold production to the fullest extent.

Eucalyptus-Oil Production in Australia

The eucalyptus-oil industry is now of considerable importance in New South Wales, states the *Perfumery and Essential Oil Record*. The oils are used for three purposes—in pharmacy, in the separation of metallic sulphides, and for perfumery and flavoring. *Eucalyptus macathuri* grows very rapidly, and is being cultivated freely. The leaf oil consists mainly of geraniol, together with geranyl acetate, of which not less than 60% is present in the crude oil. *E. citriodora* yields about 0.75% of an oil consisting almost entirely of the aldehyde citronellal. *E. staigeriana* gives a high yield of citral-bearing oil. There are about 300 species of eucalyptus in Australia, but of these not more than 25 varieties can be utilized for their oil. Up to the present the oil products of about 160 eucalypts have been determined. The value of eucalyptus oil exported from Australia to the United States in 1917 was $24,000 and to Canada $6000; the corresponding values for 1916 were $12,000 and $900.

Adsorption*

Though modern colloid chemistry began with Graham, his distinction between crystalloids and colloids has been dropped, and it is customary to speak of a colloidal state instead of a colloidal substance. Any phase which is sufficiently subdivided is called colloidal, the particular degree of subdivision being entirely arbitrary. According to this definition, colloid chemistry is the chemistry of drops, grains, filaments and films. Though apparently of slight importance, a knowledge of colloidal chemistry is essential to any one who wishes to understand about cement, bricks, pottery, porcelain, glass, enamels, oils, soaps, greases, mineral flotation, smoke prevention, and many branches of industrial chemistry.

Adsorption of Gases and Vapors by Solids

In an extremely subdivided phase, the surface is very large relative to the mass of the phase; and therefore the first step in the study of colloid chemistry is to discuss the properties of surfaces, beginning with the behavior of solids in contact with gases or vapors. All substances tend to adsorb or condense upon their surfaces any gases or vapors with which they come in contact. The amount of adsorption varies with the nature and physical state of the solid and with the nature of the gas; in other words, the adsorption is specific and selective. The amount of gas adsorbed is greater the higher the pressure and the lower the temperature. For example, at 20° C. the respective quantities of different gases adsorbed by 1 c.c. of a finely divided charcoal are: H_2, 7.3; N_2, 21; CO, 26.8; O_2, 25.4; CO_2, 83.8 cubic centimeters.

As a first approximation it is often stated that a gas or vapor is adsorbed more readily the higher its boiling point, but this conclusion is not consistent, since adsorption is specific and varies with the nature of the gas and of the adsorbing solid. The adsorption of gases by charcoal has been extensively studied, because charcoal adsorbs so many gases and adsorbs them so readily. Finely divided quartz will adsorb water vapor, but not to the same extent as amorphous silica. Platinum black may take up 100 volumes of hydrogen, but it is not certain whether this hydrogen is all adsorbed or is partly dissolved. Ramsay considers that the nitrogen found in zinc is due to ammonia adsorbed from the air by zinc.

If the film of adsorbed air on a small particle remains approximately of the same thickness, irrespective of the diameter of the particle, the ratio of air film to mass of particle will increase as the particle grows smaller. Cushman and Coggeshall found that a rock powder which would pass a 200-mesh screen surged like a liquid. When poured into a vessel, it filled only 46% of the space, though coarser powder filled more. It is not surprising that the air cushion around each particle makes the grains move over one another like a liquid. The probable density of the adsorbed gas has been calculated by Mitscherlich in the case of carbon dioxide and boxwood charcoal, and found to be only 1-56th of its original volume.

Since a gas or vapor may be adsorbed by a solid, one might expect to find selective adsorption by a liquid as well, and this proves to be the fact. Lord Rayleigh found that impinging drops of water did not necessarily coalesce. If they were slightly electrified, they coalesced readily, while stronger electrification kept them apart. A film of adsorbed air keeps the uncharged drops from coming into actual contact, and a slight electrification removes this film sufficiently to permit coalescence. Highly charged drops repel each other. Rolling drops are often formed when water drops from an oar on the water, and these depend on the presence of adsorbed air and are also sensitive to the presence of electrified substances. Soap bubbles being hollow drops, it is to be expected that they would behave like liquid drops, though not necessarily like the drops of a pure liquid. It is possible to knock two bubbles together with considerable force without causing them to coalesce. This is due to the presence of adsorbed air films on the surfaces. If the bubbles are electrified slightly they coalesce readily without bursting. If a vapor is adsorbed by a liquid, it will condense to a liquid film at a temperature above that of the normal dew point.

Adsorption of Liquids by Solids

There is selective adsorption of a liquid by a solid. If a liquid is not adsorbed by a solid, it does not wet the latter. Question has arisen whether the liquid meets the wall at a definite angle, the contact angle. Lord Rayleigh states definitely that the contact angle must be zero. This must be true if the liquid is adsorbed by the solid. For a liquid to wet a solid in the presence of air, the liquid must be adsorbed more strongly than the air and must displace it. The floating of metallic powders on water is due to the slowness with which the water wets them. By oiling the meshes of a fine screen it is found that air can pass, but water does not wet the wires, and consequently surface tension prevents it from passing the holes.

The adsorption of liquids by solids is selective, an a given solid will adsorb one liquid more than second liquid. Consequently the first liquid will dis place the second from contact with the solid. N systematic study of this phenomenon seems to hav been made, but it is known that kerosene will displac water in contact with copper and water will displac kerosene in contact with quartz; and that alcohol wil displace oil in contact with metal and linseed oil wi displace water in contact with white lead. The whol process of oil flotation depends on the fact that or adsorbs oil more strongly than does the gangue.

There is hardly any quantitative data on selectiv adsorption. Graham made a few rough measuremen on the selective adsorption of liquids by palladiu and found that 1000 parts of palladium foil retaine 1.18 parts of water, 5.5 of alcohol, 1.7 of ether, 0.5 of acetone, 4.5 of glycerine, 10.2 of castor oil, ar 18.1 parts of oil of sweet almonds.

Intense strains may be set up if the adsorption very marked. Gelatine is adsorbed so strongly b glass that the gelatine film in drying will often te away fragments of glass. On the other hand, it w not adhere to plates of mica or calcite.

Dried glue may be considered either as a solid as a super-cooled liquid. Considered as a solid, t adsorption of gelatine by glass is a case of adsorption of a solid by a solid. If a metal is polished with rouge which is not kept sufficiently moist, the rouge adheres so firmly to the metal surface that it cannot be removed without spoiling the polish. In the case of blue powder, grains of zinc are coated with zinc oxide that adheres even when the zinc is melted. Aluminum and nickel are always coated with solid surface films which have marked effects on the properties of the metals. All patinas on metals involve adsorption; otherwise they would come off readily. Passive iron owes its peculiar properties to the adsorption and stabilization of a higher oxide, either FeO_2 or FeO_3.

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*Condensed from a series by Wilder D. Bancroft, professor of physical chemistry, Cornell University, in the "Journal of the Franklin Institute," "Outlines of Colloid Chemistry," Jan., Feb., Mar., 1918.

There is an apparent case of adsorption of a solid by a solid if a moderately coarse powder is shaken with a much finer powder. Instead of the finer powder filling the voids in the space occupied by the coarse powder, it tends to coat the coarse particles.

Adsorption of Liquids by Liquids

The spreading of one film over another is usually considered to depend on the relative surface tensions, but a simpler way to treat it is to consider it as a case of adsorption. If oil is adsorbed by water, it wets the water and spreads over the surface. The adsorbed layer is very thin. If the oil is not adsorbed by the water there is no spreading.

Adsorption of Solids by Liquids

A solid which is wetted by a liquid adheres to the liquid. With two liquids and one solid, there is selective adsorption of the solid. Finely divided red lead when shaken with water and benzene adheres to the surface of the benzene, making a practically continuous coating around the organic liquid (if proper relative amounts are used). Des Condres explains this by stating that if water displaces benzene from the surface of a given solid, the solid will tend to stay in the water phase; if the benzene displaces the water, the solid tends to remain in the benzene phase. Only when fairly fine do the solid particles stay in the interface or in the upper liquid layer. Where copper powder is shaken with kerosene and water it goes into the interface, producing an effect of molten copper. If allowed to stand, the metallic powder creeps up the side of the vessel above the surface of the liquid.

Adsorption from Solution by Solid

Selective adsorption from a solution by a solid may show itself by relatively more of the dissolved substance being adsorbed than of the solvent, or by relatively less being adsorbed. Infusorial earth will remove all the color from aqueous solutions of some analine dyes. The adsorption of dyes by hydrous alumina, stannic oxide or other mordants, as they are called, is of great importance. As in all cases, the adsorption is selective, some dyes being taken out and others not.

General Observations

Since adsorption is essentially specific, the amount will necessarily vary with the nature of the adsorbing agent, the liquid and the substance to be adsorbed.

Selective adsorption connotes the possibility of chemical decomposition as a result of adsorption. If a given solid adsorbs a base more strongly than an acid, for instance, there will be a tendency for the salt to hydrolize, the base being adsorbed to a greater extent than the acid. Thus a neutral solution will become acid if shaken with a solid which adsorbs the base more strongly than the acid; it will become alkaline if the solid adsorbs the acid much more strongly than the base, and it will remain neutral in case the solid does not adsorb either base or acid at all, or in case it adsorbs the two in practically equivalent quantities.

America Supports Britain in Protest To Mexico

Great Britain's protest to Mexico, that the oil decree of Feb. 22 was confiscatory and in violation of the rights of British companies holding oil claims, provoked a vigorous reply, in which it was maintained that Mexico is free to adopt such fiscal legislation as it pleases, that recourse to the local courts rather than to diplomacy should be adopted to test the justice of any decree, and that it would be equally unjustifiable for Mexico to object to the war taxes in England. Unfortunately, history has shown that the local courts are controlled in their decisions by certain branches of the government, and that it is often impossible for foreigners to obtain justice. Mexico contended that the new decree affected foreigners and Mexicans alike, which is literally true; but the fact remains that practically all the oil properties are owned by foreigners, and it is upon them, and not upon Mexicans, that the burden and injustice of the new decree would fall.

The American authorities indorsed the British protest, and the oil companies of both nationalities united in agreement to refuse to acquiesce in the Mexican government's demands and relied on their respective governments for support. Manager Ballin, of the Hamburg American Line, is reported to have recently stated in public that "After the war is over, we are assured of extensive oil possessions overseas"—an anticipation which doubtless inferred the elimination of American and British oil holdings in Mexico in the meantime. Under the decree of Feb. 22, Mexico attempted to make oil the property of the nation. Mexican petroleum would then become a nationally owned contraband, and, as such, might not be sold by a neutral country to a belligerent under the existing international laws.

Fortunately, recent advices from Mexico indicate that the government is inclined to modify its view; and although the cancellation of certain provisions in a former decree are not completely satisfactory, it appears that a basis of agreement may be reached which will be acceptable to the governments concerned.

Lake Copper Co.

The report of the Lake Copper Co., of the Michigan copper district, for the year ended Apr. 30, 1918, indicates a net loss of $30,834. The production amounted to 1,461,893 lb. of copper, which sold at an average of 25.57c. per lb. and netted $373,814. Miscellaneous receipts increased the income to a total of $390,165. Operating expenses were $391,647, taxes, $21,804, and new equipment cost $7547. Rock stamped was 63,191 tons, yielding 2,246,145 lb., averaging 65.07% copper.

Changes in Alaska Juneau Mill

It is frequently a matter of surprise to both managers and owners of mining enterprises that delays occur in bringing newly constructed plants to capacity; also that costs of construction and operation exceed the engineers' estimates. Such matters often lead to exchanges of acidulated pleasantry between managers and engineers, and between engineers and operators, with the result that a considerable amount of time is wasted in futile attempts to place the responsibility, on the one side, and to evade it, on the other. Delays of this kind do not always call for caustic comment. A large proportion of the "mistakes," as they are called, in the design of a plant, are in the nature of experiments needed to indicate the correct procedure. Again, incompetent and inexperienced men are sometimes intrusted by equally incompetent managers with the design of important metallurgical works—with obvious and inevitable results.

The annual report of the Alaska Juneau Gold Mining Co., whose mill began crushing early in 1917, gives a summary of the difficulties encountered and the changes that were found necessary in order to insure smooth operation. This matter should be of interest to mill operators and designers of new plants, as it illustrates several common shortcomings in mill construction. It should be even more useful in indicating to operators, managers, and stockholders in mining ventures the vicissitudes and delays to which such a plant may be subjected, even when under competent direction.

Mill Tonnage and Costs Disappointing

The mill was designed to treat 8000 tons per day, but for nine months the best it could accomplish was less than half its promised capacity, at an operating cost of more than double the estimated expense per ton. As soon as one ball-mill section was started, it was evident the machines were not crushing the amount of ore anticipated. Various reasons were suspected and investigated, but the coarseness of the feed was finally determined as being the deterrent factor that limited the ball-mill output. Finer preliminary crushing was then adopted, with the result that the amount of ore reduced per ball-mill day was increased from 253 tons in April to 436 tons in September. Serious breakages of the No. 9 gyratories, which precede the ball mills, made it necessary to reduce the duty to about 370 tons per day. It was evident that the ultimate capacity of the ball mills when fed with material crushed to pass a 1½-in. ring is not less than 700 tons per mill day, and arrangements will be made to install intermediate crushers between the gyratories and ball mills. The fallacy of ignoring the high efficiency of a crusher for primary reduction and the mistake of expecting good results from a ball mill fed with too coarse a product are often complementary errors.

The report for 1916 indicated the milling equipment as follows:

Coarse crushing plants: Two revolving tipples, each with a capacity of four 10-ton cars; coarse-ore bin of 2000 tons' capacity; four 60-in. apron feeders; four 8 x 5 ft. grizzlies with 8-in. openings; two 36 x 48 in. jaw crushers; four 4 x 8 ft. grizzlies with 3-in. openings; four No. 9 Gates crushers; four 30-in. conveyors; four distributing boxes; two 36-in. shuttle conveyors.

Concentrating department: Mill ore bin of 8000 tons' capacity; twenty-four 30-in. apron feeders; twelve 8 x 6 ft. ball mills; 12 revolving screens; 12 V-tanks; 12 mechanical distributing boxes; 48 roughing tables; 24 classifiers; 12 shovel wheels; twelve 6 x 12-ft. tube mills; 24 settling tanks; 24 mechanical distributors; 96 finishing tables and 12 Wilfley tables.

Retreatment plant: Two 5 x 5-ft. "ball-peb" mills; two 4-in. centrifugal pumps; one 4-spigot classifier; and the necessary number of concentrating tables, which can be added to from time to time to meet any improvements made in the re-treatment methods.

Among the changes and additions needed to remedy mechanical defects and weaknesses of the plant as first built are those given in the following list, and taken from the 1917 report:

COARSE CRUSHING PLANT

Six-inch faced tight-and-loose pulleys installed on feeders in place of 4-in. faced cone pulleys and clutches.

Six-inch grizzlies removed and all feed put through jaw crusher.

Slide plate and lip installed under jaw crusher.

Concaves on all gyratories set out 1¾ inch.

Spacing of grizzlies changed from 2½ in. to 1½ inches.

Runway built over jaw crushers, and shafting levers installed for operation of feeders.

Gallery platform built around feeders.

New concrete foundations built under jaw-crusher columns.

Trenches built under 30-in. apron conveyors, and launder system installed from trenches to ball mills.

Launder and hoppers installed for sluicing feeder drippings to ball mills.

Alterations made to 30-in. belt-conveyor hoppers.

Pump and 3-in. pipe line installed for pumping water to coarse crushing plant for cooling and sluicing.

INTERMEDIATE CRUSHING DEPARTMENT

Revolution counters installed on all ball-mill feeders.

Hopper bottom built under ball-mill feed, and pipe line installed for sluicing drippings to ball mills.

One additional concrete pier poured under each ball-mill pinion shaft.

Ball-mill feed hoppers enlarged 16 inches.

New plate scoop built for ball mills.

Trunnion screens lengthened from 30 to 34 inches

Large junction boxes installed and launders giver greater inclination, and lined with cast iron for ball-mill tunnion screen oversize to tube mill.

Heavier cables installed on all ball-mill belt tighteners.

FINISHING DEPARTMENT

One Deister classifier installed in each section ahea of V-tanks.

Goosenecks on all V-tanks lowered 12 in. and new discharge boxes installed.

Hydraulic water mains to V-tanks enlarged from 1 to 2 inches.

Greater inclination given all launders and distribut to finisher tables.

RE-TREATMENT DEPARTMENT

Four additional Deister tables and one 4-spig classifier installed to treat reground iron concentrat

Alterations made to 4-in. pump discharge pipes from pump to equalizing box on finisher floor to divide the product to the two Deister classifiers.

Amalgam barrel and plate installed to amalgamate all "rougher" concentrates.

Pump and launder system installed for the continuous treatment of shipping concentrates.

Two tables installed for re-treating "rougher" iron before regrinding.

Two 10-in. elevators installed in place of two 6-in. elevators. Elevator main-shaft drive changed from "ball-peb" pinion shaft to independent motor drive.

Two tanks and floor installed for handling shipping concentrate.

Larger floor-wash launders installed for re-treatment floor.

New tailing flume installed and all connecting launders thereto.

A 9 x 8-in. air compressor and pipe lines installed for general mill use.

The capacity of the receiving bins was less than expected, and this interfered both with tramming and milling operations. Every interruption to tramming interfered with coarse crushing and every interruption to coarse crushing interfered with tramming. The bins have a theoretical capacity of 2000 tons each, but owing to the steep angle of flow of the mine rock and to the position of the discharge openings their effective capacity is not more than 1200 tons each.

Caylloma Silver Mines*

The silver mines of Caylloma, Peru, are located in the Province of Caylloma, Department of Arequipa, about a league from the small mountain town of Caylloma. The altitude varies from 14,000 to 16,000 ft. above sea level. The climate is healthful and the average rainfall 26 in. Practically all of this falls during the wet season from December to March.

The shipping port of Caylloma is Mollendo, at which place all goods arrive for the mines and whence all ores are shipped. Sumbay, the nearest station to the Caylloma mines, is 285 km. from Mollendo on the line of the Southern Railway. From Sumbay a mule road leads to the mines, 120 km. distant, passing through the native villages of Callalli and Sibayo, where it crosses the river Colca. This road cannot be used during the wet season, owing to the impossibility of fording the river at that time; so another road through the village of Chivay has to be used, an old Spanish bridge permitting the passage of the river.

The silver mines of Caylloma were discovered by the Spaniards about 1630, but they were worked previously to this by the Incas. Judging from old official documents kept in order to collect the royalty of "one fifth" due to the King of Spain, the amount of silver produced must have been enormous. The town of Caylloma was made a "Caja Real," or Royal Treasury, to facilitate the collection of this royalty and to distribute the necessary quicksilver.

The San Cristobal lode, the largest in the district, is nearly two miles long and averages 25 ft. in width. This lode was worked by the Spaniards to a depth of 400 ft., when they were driven out by the war of independence in 1821. Until 1880, practically nothing was done, on account of the unsettled state of the country. About 1886, the formation of several small companies to work the mines is recorded; and in 1889, the Caylloma Silver Mining Co., a London corporation, was established and took over the greater part of the holdings. This company worked the mines until 1905, producing about 7,000,000 oz. The capital of the Caylloma Silver Mining Co. was £250,000, and that company had paid £150,000 for the property in 1890. By 1900 the surplus capital had all been spent in plant and equipment.

From 1900 to 1904, operations at the properties of the Caylloma Silver Mining Co. were greatly curtailed. Practically nothing was done except to ship high-grade ore from the San Cristobal and Santa Cata mine. In 1905 a new company was formed, largely with Chilean capital, the name of the concern being altered to the Sociedad Esploradora de Caylloma. In 1905-06 machinery was purchased for a hydro-electric power plant and for transmission line, electric pumps and compressors for sinking the Santa Cata shaft, and 12 km. of narrow-gage railway was built from San Ignacio to the Bateas mine, and also to connect the San Pedro and Santa Isabel mines with San Ignacio. In addition, a 60-ton concentration mill was brought in and began operation in 1907. The electric power station was put in commission in 1910. The water power for this station is taken from Villafro lake, which gives about 1000 ft. fall and is one of the sources of the Amazon. This mill and station were operated until about 1912, when the mill was shut down. The power station continued operation for development and production at the mines.

In 1913 there was a further reorganization of the company, new capital being raised and the name of the company altered to Sociedad Esploradora de Caylloma Consolidada. A capital expenditure of about £40,000 was made, with the object of increasing the capacity of the mill and concentration plant. A mill was installed with 12 Nissen stamps to treat 100 tons of ore per day, after which a preliminary concentration followed by cyaniding was planned. Double-cyanide treatment of sand and slimes was arranged for. The entire mill was electrically operated, and the power increased by the installation of a 160-hp. plant, equipment previously having supplied 360 hp. The whole plant was to be in running order by the middle of 1915, with a capacity of treating 36,000 tons of ore per month, running 30 oz. of silver to the ton. It was stated in 1914 that the mines were exporting 12,000 oz. of silver per month from picked ore running as high as 300 to 400 oz. per ton.

The connection of the mines of San Cristobal, Santa Cata and Flor del Mundo was completed about 1913, a tunnel 3 km. in length being driven from one side to the other of the hill in which these mines are situated. The cyanide mill and extra power station were completed and placed in operation about June, 1916, since when they have been running more or less continuously to the present date; but not with the expected result. In 1917 a flotation plant was added, and so far the results are said to have been satisfactory. Early in the present year a new directorate was formed and more capital was raised.

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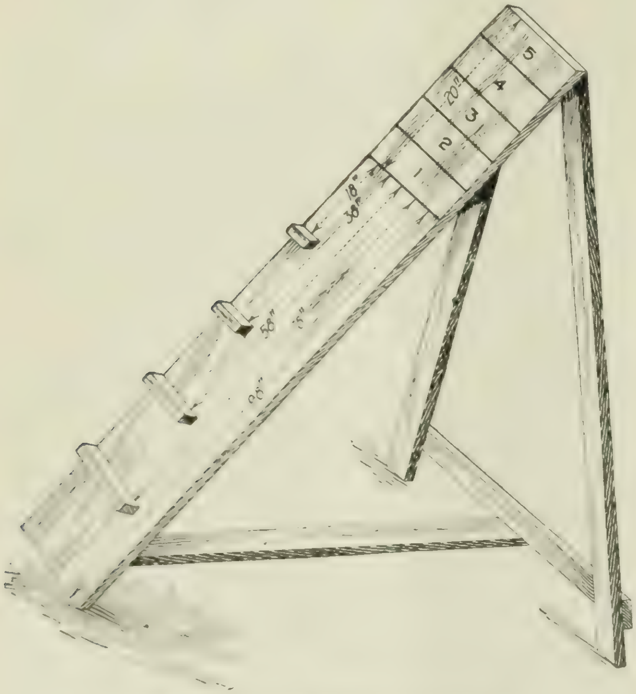
*Excerpted from "The West Coast Leader."

Details of Practical Mining

Conservation of Drill Steel

That it pays to keep a large number of drills in service has been often maintained, and not without sound reason, the main object being to reduce the amount of breakage that may be attributable to "fatigue" of the steel. Records show that a reduction in the number of broken drills may be accomplished by giving each drill an occasional "rest." In a large shop a great many steels must be sharpened on every shift, and there is a constant demand from the mine for additional drills of the lengths of which there is a shortage. Under such conditions, the problem of controlling the periods of work and rest for each drill must be difficult, demanding an exceptional degree of competency and attention to detail.



RACK USED FOR SORTING DRILLS

At present the industry is confronted by a serious shortage of supply of drill steel, and few mines have an excess stock. Those with ample supplies will do well, therefore, to profit by the unfortunate experience of others and make their steel last as long as possible.

The usual problem is to get enough steel to keep all the machines running, so that the mine's output may be maintained, or increased, if possible. This calls for keeping all the steel on the job all the time, and precludes the possibility of giving it an occasional rest. Yet at many plants there are five or six times as many drills in the mine and shop as are used every shift. And these are just the cases where there is always an apparent shortage of steel. Any manager who thinks this condition doesn't apply to his mine ought to make a complete drill inventory and compare the total with the number of drills used per shift. The ratio may not be as high as five or six to one, but there are few cases, indeed, where it is less than three or four to one.

Assuming that it is advisable or necessary to run the mine on the smallest possible amount of steel, how can it best be done? First, run the drill sharpener the same number of shifts as the mine. There is thus required, theoretically, twice as much steel as is used on one shift, one shift's supply being in the shop and another underground in actual use. Compare this with the condition where a mine is operated two shifts and the sharpening is all done on one of them, and there are twice as many dull drills in the shop to be sharpened as there are sharp drills in the mine to be used, or a theoretical ratio of three to one. Three shifts drilling and one sharpening would give a four to one ratio.

Of course, the theoretical minimum ratio of two to one would not work out in practice, because the miner cannot use all the drills he gets for his shift's work. Aside from those that are soft or that break, many are too long or too short to work in with the rest of the set. As a rule, these are put aside and, in consequence, collect dust or become buried. Many drills stand idle for long periods or become lost in this way. A good "nipper" can do a lot to overcome such a condition, but why depend on a "nipper," who is generally more intent on putting in a shift than on straightening out difficulties that concern the miner and the blacksmith?

To obviate the loss and inconvenience due to neglect of drills, it is necessary to make sure that all the drills issued to one particular miner or party of miners using the same steel are of such lengths that any second drill will follow any starter, any third drill will follow any second drill and so on progressively through the series. With these conditions, it would be reasonably certain that all the steel could be used except those pieces that had improper temper. Thus is eliminated the setting aside of drills that are too long or too short, with the consequent waste of steel and delay and inconvenience to the miner.

LENGTHS IN INCHES OF CLASSIFIED STEEL DRILLS

Starters	18 22	22 26	26 30	30 34	34 - 38
2nd drills	38– 42	42 46	46– 50	50– 54	54 - 58
3rd drills	58 - 62	62 66	66– 70	70 74	74 - 78
4th drills.	78– 82	82 86	86 90	90– 94	94 98
5th drills..	98 102	102 106	106 110	110–114	114 118

The most practical way to conserve the drill equipment is to sort over the steel before it is sent underground. How this should be done depends on conditions. Generally, where there is about 20 in. difference in length between two successive drills and the shortest starter 18 in. long, by classifying the steel according to length, one could get it sorted into five different piles represented by the five columns of the accompanying table. In each column the lines represent the starters, second drills, and other sizes, as shown, their lengths in inches being within the limits given by the figures stated.

In the first column, for example, all the starters are from 18 to 22 in. long, all the second drills from 38 to 42 in., the other sizes being confined to the lengths indicated. Thus no second drill is more than 24 nor less than 16 in. longer than any starter, and the same applies to each successive length, and a miner whose drills all conformed to the lengths given in Column 1 could use them all without inconvenience.

The accompanying sketch shows a simple and inexpensive method of sorting the drills. They are merely stood up on the various cleats and placed in a rack the number of which is the same as that of the space on the measuring board on which the end of the drill falls. One man could do the classifying rapidly. Then the steel could be sent out in rings and so distributed that each miner or party has steel from only one rack.

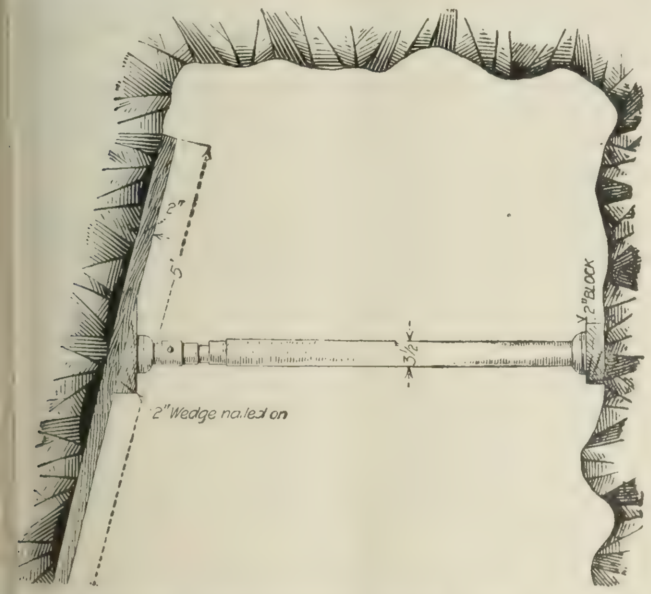
Another way in which a saving in steel can be accomplished is by using smaller steel. In many places where 1¼-in. steel is being used through force of habit, 1-in. steel may be employed to good advantage. In fact, the suggested arrangement makes it possible to use smaller bits and thus materially increase the speed of drilling.

It would be to the interest of drill-steel manufacturers to induce their customers to use smaller steel in order to conserve the present supply of raw material.

A Machine-Drill Crossbar Set-Up

By C. T. Rice

To make a satisfactory set-up with a machine drill crossbar when the sides of a drift diverge considerably from the face at the point where the bar must be placed, a 2-in. plank is placed horizontally along the receding wall, and the bearing face squared up by means of a



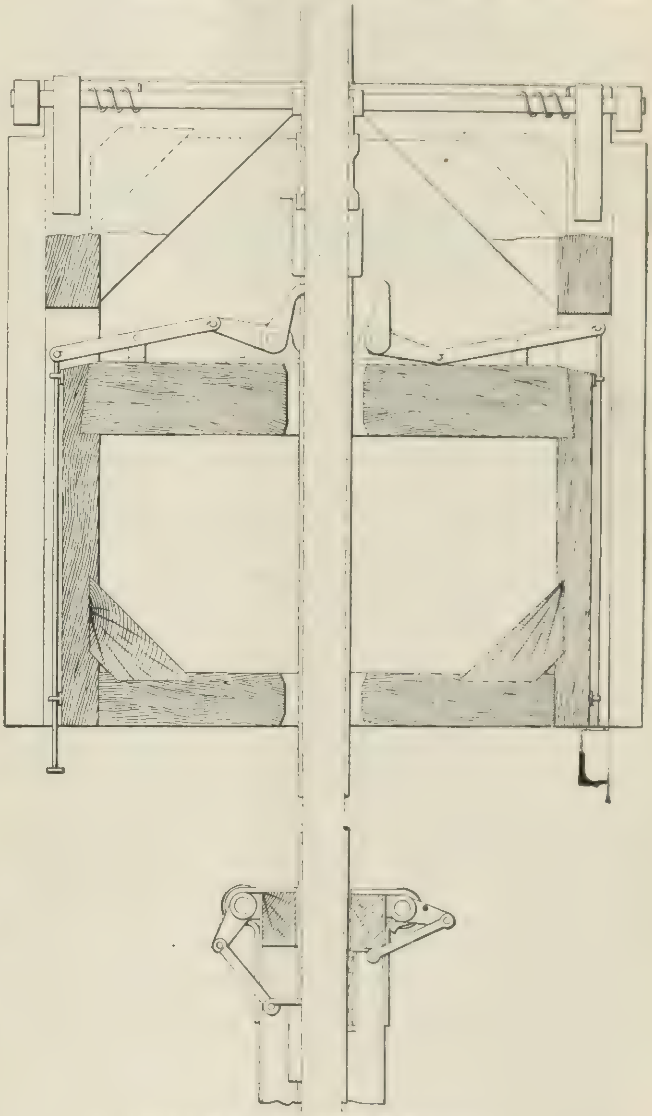
'LAN VIEW OF DRIFT HEADING WITH RECEDING WALL, SHOWING SET-UP OF HORIZONTAL DRILL BAR

edge nailed to its middle point where the crow-foot ears. A couple of powder boxes can be used as a supfort or one end can be propped until the horizontal lank can be properly positioned, and the jack-screw rned until the bar holds itself in place. It does not atter if the plank does not rest directly against the all right behind the head of the crossbar. Such a discrepancy is easily remedied by means of filling pieces which will stick as long as the horizontal piece, and this plank has such a contact along the wall that once the bar is jacketed tight it cannot kick out.

Improved Safety Crosshead

By J. B. Calkins*

A safety crosshead as illustrated herewith has met success in shaft-sinking work connected with salt mining in New York State. The construction is exceedingly simple, and it will be noted that as soon as the bucket leaves the crosshead the rope clamp, on which the crosshead rides, will release the safety dogs and then be engaged by the clamps in the center, thus preventing the bucket from going further. The rope clamp has new features, as it is self-tightening, cannot damage the rope, and has no nuts or bolts in its construction to become loose. It consists of a set of four split conical wedge blocks around the rope, screwed tightly into the casing from each side. Any tendency for the rope to slide through will cause the blocks to engage tighter. It will be noticed that the wedge blocks are set in pairs in each direction to prevent movement either up or down.



IMPROVED SAFETY CROSSHEAD

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*Assistant general manager and chief engineer to the Rock Salt Corporation, Ithaca, New York.

Assayer and Chemist

Analysis of Ferrozirconium And Zirconium in Steel

By J. D. Ferguson*

Ferrozirconium is the most recent arrival in the ferroalloy family. I found no little difficulty in working out a method more especially suited to the determination of zirconium where iron and also aluminum are present in large quantities, and append the following description:

For ferrozirconium use a 1 gm. sample; for zirconium in steel a 3 gm. sample. Dissolve in a mixture of 10 cc. H_2O, 5 cc. conc. HNO_3, and 5 cc. conc. HCl, using about 25 cc. for 1 gm. and 50 cc. for 3 gm. This mixture boils down with little bumping, and the residue, on evaporation to dryness, is in a small ring at the bottom of the beaker. A 250 cc. beaker is suitable for the purpose. Evaporate to dryness and absence of white fumes. Cool the beaker, add 30 cc. of hot water, then 1 cc. of conc. H_2SO_4 and heat till all soluble salts dissolve.

Filter, using suction, and wash the SiO_2 several times with boiling water, then with a mixture of 1 cc. conc. H_2SO_4 dissolved in 20 cc. H_2O heated to boiling, pouring it drop by drop around the edge of the filter. By using care, this is sufficient to wash a small filter several times. Then wash again several times with boiling water. The purpose of this is to have only the necessary amount of H_2SO_4 present in solution. (Those who wish to use more acid may do so, but a careful neutralizing must be performed afterward.) Save the filtrate. Burn the paper in a platinum crucible and ignite thoroughly. If the silica is dark gray in color, insoluble zirconium silicide may be present. Weigh, then add 3 cc. of conc. H_2SO_4 and 3 cc. of HF and evaporate to white fumes of SO_3; cool, and add 3 cc. more of HF and repeat till you are sure all SiO_2 has been removed. Finally evaporate to dryness. If any appreciable residue is left, fuse for ½ hr. with Na_2CO_3, using a large excess; dissolve the fusion in hot water. Filter off the insoluble sodium zirconate, ferric oxide, etc.; ignite the filter and fuse the residue thoroughly with $KHSO_4$. Dissolve the $KHSO_4$ fusion in hot water and add to the filtrate from the SiO_2.

Dilute to 400 cc., heat to boiling, then add slowly and with constant stirring a boiling solution of sodium thiosulphate, dissolving 6 gm. for each gram of alloy taken in the smallest quantity of water necessary. The liquid becomes lighter in color, till finally it is almost colorless and further additions of thiosulphate precipitate sulphur. A little sulphur does no harm, but avoid precipitating a large excess.

Now add, while stirring well, a boiling solution of Na_2HPO_4 (1 gm. dissolved in a small quantity of water). If any appreciable quantity of zirconium is present, it precipitates almost immediately as a whitish or greenish flocculent precipitate. Place on hot plate, boil for a few minutes, let stand for about ½ hr. and filter through a 15 cm. filter paper, not using suction and decanting the excess of liquid carefully at first. In washing, stir up thoroughly by directing a forcible jet of hot water against the sides of the filter and allowing the excess of water to dry away before the next washing. After washing about ten times with hot water in this way, dry the filter thoroughly and burn the precipitate and filter separately. Weigh as zirconium phosphate containing 0.3828% Zr.

The principal points to be noted in this determination are:

1. The iron must be reduced to the ferrous condition.
2. The solution before precipitation must be approximately 1% acid (H_2SO_4), to prevent iron and aluminum from precipitating.
3. A pinkish color to the freshly precipitated zirconium phosphate indicates the presence of titanium. The precipitate containing titanium is washed, dried, and burned as usual, fused with at least 30 times its weight of Na_2CO_3 for ½ hr. to 1 hr., the fusion dissolved in water, and the soluble sodium carbonate and sodium phosphate filtered off, leaving the insoluble sodium zirconate and sodium titanate on the filter. Burn the filter in a platinum crucible and fuse the residue thoroughly with $KHSO_4$. Dissolve the fusion in boiling water. Make 1% acid with H_2SO_4, heat to boiling, and add 20 cc. of 3% hydrogen peroxide to oxidize titanium, then precipitate the zirconium as phosphate as previously done.
4. Minerals containing zirconium are analyzed by th same method as in the case of zirconium precipitates, ex cept that if much iron is present it must be reduced wit thiosulphate before zirconium is precipitated.
5. In nickel zirconium alloys dissolve and bake t dryness and filter off SiO_2 as usual. Make filtrat strongly ammoniacal and plate out nickel. Filter off F Al, and Zr precipitates, ignite and treat ignited oxide as minerals are analyzed. Treat SiO_2, if necessary, fo zirconium present.
6. In treating all SiO_2 precipitates with HF, whe zirconium is present, an equal quantity of H_2SO_4 at lea must be used (an excess is desirable) to prevent loss zirconium as fluoride.
7. Scant zirconium precipitates should stand 24 h before filtering.

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[*] Detroit, Michigan.

Illuminating an Assay Or Chemical Balance

In arranging the illumination of a balance, in ad tion to securing satisfactory lighting of the graduat beam, pans and pointer, care must be taken to av unequal expansion of the balance arms, due to heat disturbance of equilibrium arising from air curren, says B. D. Porritt, in the *Journal of the Society Chemical Industry.* For these reasons the source light should be placed symmetrically to the beam at the top of the balance case and should be as extensive as possible, in order to reduce heat radiation to a minimum and to distribute uniformly such as is unavoidable.

The type of electric lamp in which the light source consists of a metallic filament suspended along a narrow tube seemed to be free from the defects of the ordinary type, since the heat evolved would be slight and widely dissipated, and, further, owing to the shape of the lamp, it could easily be arranged so that any slight heating effect should be uniformly distributed over the beam of the balance.

In the arrangement suggested, a "tubolite" metallic filament lamp of 16 cp., 8½ in. long, is employed, inclosed in a semicircular aluminum reflector, which serves both to direct the light through the glass top into the balance case and to screen the light source from the view of the person weighing. Both these fittings are standard articles in the electrical trade.

In order to insure the lamp and reflector always being placed symmetrically to and slightly in front of the balance arm, two upright brass springs are attached to the woodwork of the balance case; and into circular counter-sunk holes in these are sprung the bosses at each end of the reflector. The lamp and fittings can therefore be removed for cleaning or other reasons by merely loosening the springs; and, to facilitate this operation, they are each screened by a standard of polished ebonite or hard wood. By this device the balance and its source of illumination are self-contained, and the case may be altered in position at will by merely lengthening the flexible lead or by making connection to another point of the electrical supply.

Experiments indicate that the increase of temperature inside the balance case under normal conditions of weighing by such artificial illumination should not amount to more than 2 or 3° C. Such a variation, when uniform, should not affect the accuracy of an ordinary analytical balance giving trustworthy results over the range of temperature variation experienced in ordinary laboratory practice. Evidence has also been adduced that no disturbance of equilibrium due to uneven heating of the balance arms or air currents need be feared when employing this form of illumination.

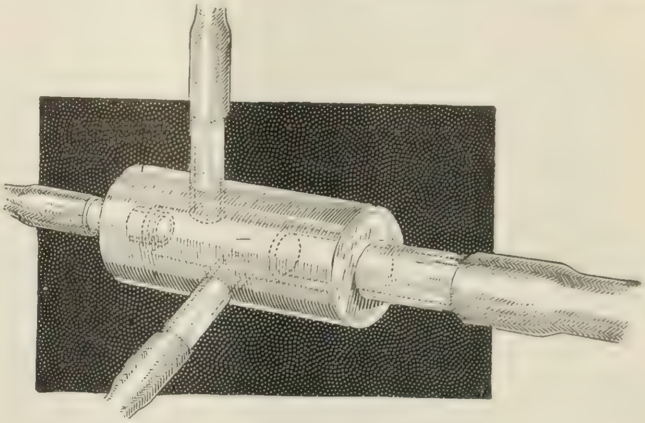
Preventing Hydrogen Sulphide Leaks

A stopcock for controlling the flow of hydrogen sulphide and preventing the gas from leaking is described by Carl H. Classen in *Journ. Ind. and Eng. Chem.* for February, 1918. The device, which is in use at the Rice Institute, Hampton, Tex., is simply a glass "pearl" inserted in a piece of rubber tubing attached to the branch pipe of the hydrogen sulphide main. The glass tubing from which the "pearl" is made should be slightly larger in diameter than the rubber tubing. The "pearl" thus completely chokes the passage in the latter, stopping the flow of the gas. The H_2S can be "turned on" at the will of the operator by squeezing the rubber tubing around the pearl between thumb and forefinger. Thus a small opening between glass and rubber will be formed through which the gas may flow. The opening, of course, disappears as soon as the pressure of the fingers is removed.

An Emergency Laboratory Manifold

By L. D. Lauther

A laboratory manifold which may easily be made for an emergency is shown in the illustration. The device comprises a cylindrical rubber stopper, through the center of which a hole is bored by means of a cork drill, short pieces of glass tube being inserted at each end.



EASILY MADE AND INEXPENSIVE LABORATORY MANIFOLD

As many more holes are drilled into the side of the stopper, connecting with the central hole, as are required for the manifold. Each hole is fitted in the same way with a glass tube; thus the glass tubes are all connected by rubber tubing. They may be made at small cost.

Modification of Benzol Method For Water Determination in Mineral Oils

By F. C. Fuchs*

The most accurate methods for the determination of water in mineral oils make use of metallic sodium, calcium carbide, or distillation with a non-miscible liquid, generally xylol, benzol or toluol. The last method, although not so accurate as the others mentioned, is the simplest one, as it requires only a distilling flask, a condenser and a burette for receiving and breaking the distilled emulsion.

In applying the method, in my laboratory at the Lima School of Mines, I found that, even after 24 hrs., drops of water adhering to the walls of the burette remained in suspension in the benzol, and, both liquids being colorless and transparent, small drops of water could not be easily detected. In order to avoid this difficulty and to have a sure means of ascertaining the complete separation of benzol and water, I added a coloring substance, soluble in benzol but insoluble in water, and the suspended colorless drops of water appeared clearly within the colored benzol. By light blows against the walls of the burette, helped by gentle heating, the drops could be forced to descend. At the same time, the reading of the volume of water is more distinct.

After a few experiments with different coloring substances, I found that the most suitable one was natural asphalt. A concentrated solution of this substance in benzol is prepared and kept tightly stoppered. One or two cubic centimeters are used for each determination.

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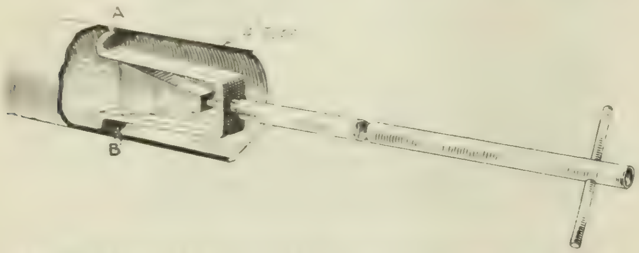
*Lima School of Mines, Lima, Peru.

Practical Suggestions

Home-Made Tube or Flue Scraper

By H. C. Williams*

There are plenty of good tube and flue scrapers on the market, but sometimes it is convenient or necessary to make one. Take an old 18-in. file, cut the tang and draw down each end and bend at right angles. Drill or punch a $\frac{5}{8}$-in. hole through the middle, then bend to the shape shown. Grind the cutting edges *A* and *B* to the angle desired. Provide a wedge for adjusting the size, to make the scraper fit the tube, with the round part threaded for $\frac{5}{8}$-in. nuts and also as a means for attaching the handle, which can easily be made of pipe. When the scraper gets dull, it must be ground and the wedge adjusted again.

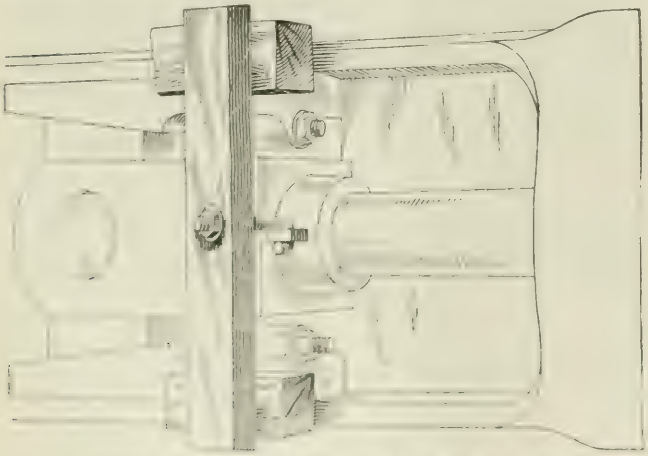


ADJUSTABLE TUBE SCRAPER MADE FROM OLD FILE

Drawing a Tight Key

By Jack L. Ball†

It was found that the key used to fasten the piston rod into the crosshead of an 18 x 32-in. hoisting engine was so tight that it would be difficult to remove it in limited time. A ratchet was secured and a $\frac{7}{8}$-in. hole drilled in the key; a $\frac{3}{4}$-in. bolt was heated, bent and extended through a piece of 2-in. square iron blocked in the position shown in the illustration. After drawing up very tight on the nut, a light tap with a hammer loosened the key.



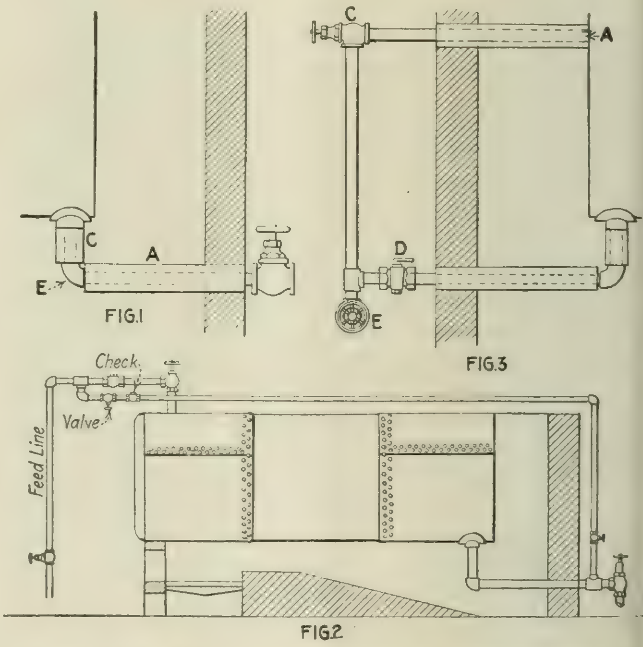
HOOK BOLT PULLING ON A TIGHT KEY

Blowoff Failure and Remedy

By P. E. Merriam*

The blowoff valves on a battery of boilers were originally arranged as shown in Fig. 1, the part of the $2\frac{1}{2}$-in. blowoff pipe in the combustion chamber being protected by a long sleeve *A* extending through the back wall, and the vertical sleeve *C* and the elbow *E* being covered 2 in. thick with magnesia mixed with high-temperature cement.

Although the boilers were worked above rating, no trouble was experienced until underfeed stokers were installed. After the first had been in operation a month, the blowoff pipe was burned and ruptured inside the setting. This was replaced, using extra-heavy pipe and fittings. In a short time after the second stoker was in operation, the blowoff pipe on that boiler failed as had the first. The engineer decided that the intense heat in the combustion chamber evaporated the water in the pipe so fast that none remained to protect the pipe, and accordingly he changed them all by placing a tee in the feed line to each boiler and extending a small pipe to the blowoff, as shown in Fig. 2. This causes a circulation through the blowoff pipe, and in three years no further trouble has developed.



FIGS. 1 TO 3. PROTECTION FOR BLOWOFF PIPE
Fig. 1—Original piping. Fig. 2—Circulating pipe connected. Fig. 3—Another plan.

Fig. 3 shows another way to keep the blowoff pipe clear and gives good results. The pipe *A* is tapped into the back head at the water line and is protected in the combustion chamber by a sleeve and connects with the

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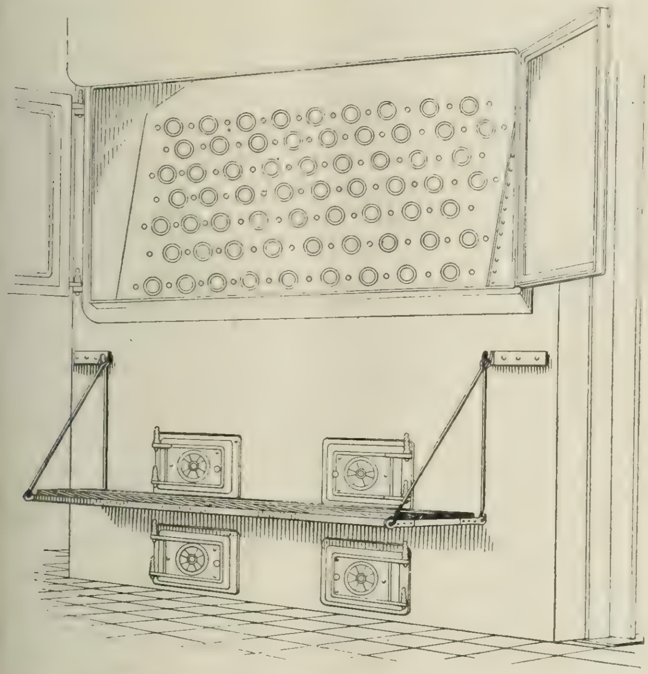
*Claremont, New Hampshire.
†Amsterdam, Ohio.

*Methuen, Massachusetts.

blowoff pipe outside of the setting, as shown. When the boiler is to be blown down, valve *C* is closed and *D* and *E* are opened. When desirable to flush the pipe *A* or use it as a surface blowoff, *D* is closed and *C* and *E* are opened. Under operating conditions valves *C* and *D* are open and *E* is closed.

Portable Boiler-Cleaning Platform

It is common to see a fireman balanced on a box placed in front of a boiler, while washing out and doing other work during the cleaning-out period. The illustration shows a convenient portable platform that can be used with good results and can be made by any one. The sketch shows the platform hung in front of a boiler. It consists of a wooden frame on which lengthwise strips are secured. At each corner is a flat strip of iron, with an eyepiece on one end, and secured in place with small bolts. On the front of the boiler are two flat iron pieces with a hook on the inner end. From these hooks, ⅜-in. rods hang and hook onto the eyepieces of the platform. It requires but a minute to put the platform in place, and it is as easily removed.



CLEANING PLATFORM IN POSITION

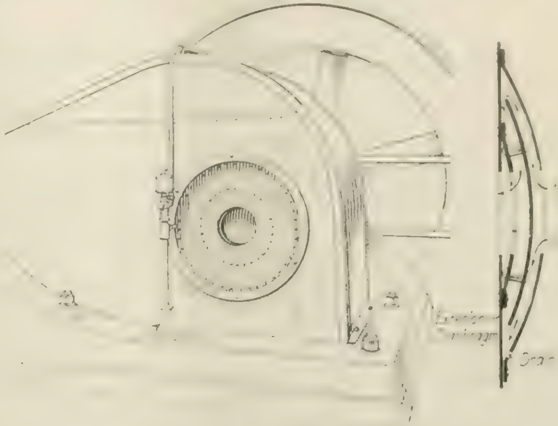
A Satisfactory Oil Guard

By F. L. Johnson*

In a power plant with high-speed engines the cranks of which were inclosed in sheet-iron cases, a 20-in. opening was left opposite the forward crank center to give access to the rod end for keying.

To keep the oil from splashing out on the floor, the engine builders covered the opening with a fine-mesh screen.

As an oil guard it was an unsatisfactory arrangement, as the pulsations of air acting on the screen distorted it, and as it flapped back and forth oil was thrown off, much of which went to the floor. Transverse braces were put on to stiffen it, but with no great success. After some thought a modified form of exhaust head was made of No. 16 sheet iron and put over the opening as an experiment by one of the mechanics in the plant.



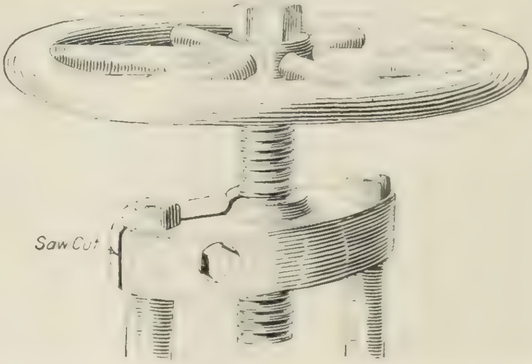
DETAILS OF OIL GUARD

The sketch shows how it was made and attached to the case, and the certainty with which it stopped all throwing of oil and still gave perfect ventilation was highly satisfactory.

Freeing Threads on Valve Stems

By H. C. Williams*

In many plants there are valves that are used only once in a while, and when they are needed their stem threads will sometimes stick or work stiff. I had such a case recently, and in trying to open the valve, I twisted the stem off. To prevent a recurrence, I split one side of the yoke with a hacksaw and drilled it to receive a bolt, as shown in the illustration, putting in a strip of sheet iron to fill the split when tightening up the bolt. The stem can easily be freed by slacking the bolt and striking the yoke a few blows, and the yoke is not weakened, as the bolt takes away any strain there may be. For yokes that will not permit of splitting as shown, it is best to cut a slot in the shape of a keyway on one side of the stem through the threaded part, so as to act as a cleaner for any dirt or grit. I have several valve stems fixed that way, and they work well.



SLOTTED YOKE ON INFREQUENTLY USED VALVES

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*New York City

*Concord, New Hampshire

Events and Economics of the War

German resistance on the Western front is stiffening; nevertheless, the Allies continue to make substantial gains. The French advance now dominates the Oise valley; French forces have captured Ribecourt. Allied patrols have penetrated Albert, and other gains are reported. Cavalry is in action. The Bolsheviki have released Allied diplomats. The Czecho-Slovaks have been recognized as a nation by Great Britain. The American consul at Moscow has severed relations with the Bolsheviki. An American regiment has landed at Vladivostok and joined the Allied troops already there; the Japanese arrived later. Bolsheviki forces have been driven 100 miles from Archangel, and Allied forces landed at Onega Bay. One British force has reached Baku and has seized that oil port on the Caspian Sea, another has penetrated Turkestan and joined forces with the anti-Bolsheviki.

An agreement is in process of conclusion with regard to 80% war-profits tax. One hundred members of the I. W. W. organization were found guilty on numerous charges.

Domestic Crucible Graphite Insufficient

It is estimated that with the increased requirements in manufacture of munitions and in kindred industries, about 25,000 tons of graphite, suitable for manufacture of crucibles, will be needed in 1918, states a U. S. Geological Survey authority. If freight conditions and demand for the product favor the production of domestic graphite, about 8000 tons of flake, exclusive of dust, can be produced in this country. This will mean an increase of about 160% over the production in 1917 and is largely in excess of the amount of domestic material usually required by crucible manufacturers. Unless they should use a larger proportion of the domestic product than formerly, many mills may have difficulty in disposing of their product. If the freight situation should revert to the conditions prevailing in the autumn of 1917, and imported graphite enters the market in as large amounts as during the latter part of 1917 and the first few months of 1918, the demand will be small and the domestic production of No. 1 and No. 2 flake will hardly exceed 2500 tons. If the domestic production could be stimulated to its maximum capacity, reasonable assurance of a steady market given, and encouragement offered for the establishment and operation of new plants, a production as high as 10,000 tons might be reached. In any case it is evident that the country is not yet independent with respect to graphite suitable for manufacture of crucibles, and the deficiency must be supplied from Ceylon and Madagascar.

Although the War Trade Board's restriction has been a factor in reducing imports, there was a lessened demand for Ceylon graphite several months previous to the restriction becoming effective, according to a consular report. The plumbago shipped to the United States from Ceylon during the quarter ended Mar 31, 1918, totaled only 2194 tons, valued at $405,064, according to certified consular invoices, as against 6524 tons, valued at $2,166,957, in the same quarter in 1917.

In 1917 the United States took over 81% of Ceylon's graphite production, as compared with 75% in 1916. Though the best grades of plumbago sold for as high as $500 per ton during 1916 and 1917, half this price is not obtainable at present.

Government Standardizes Price of Silver

The Treasury recently fixed the maximum price of silver at $1.01½ per fine ounce. As the United States supplies most of the metal, this decision amounts to the establishment of a definite world price, additional guarantee being afforded by the fact that one condition attending the sale of silver by the Government is that the purchaser shall not pay more than the standard price of $1.01½ in markets outside the United States.

Within the last three months the Government has melted down about 100,000,000 silver dollars and exported most of the bullion to India, China, and Japan for coinage purposes. As the law under which this was done specifies that the Government shall pay $1 per oz. for silver to replace these melted dollars, the Government found it necessary to sell its own stocks at 1½c. above the purchase price. Recently some purchasers have been bidding as much as $1.02 for silver to be exported, necessitating action to stabilize the price.

Tin Among the Precious Metals

Recent quotations of $1 per lb. for tin in the markets of New York suggest that this metal, for which the United States is dependent upon mines in other countries, may soon rank as a precious metal, says a bulletin of the National City Bank.

Tin mined in the islands of Banca, just off the coast of Java, has been reaching the United States lately across the Pacific, and not through the Mediterranean, as under normal conditions. This is also true of part of the tin from the Malay Peninsula and the small quantity of tin from the mines in China, which are at the present time isolated from the market on account of floods which prevent transportation to the Hongkong smelteries.

The United States is dependent in large part upon the mines on the opposite side of the globe, though considerable quantities are now being drawn from our South American neighbor, Bolivia, which produces nearly one-third of the tin used in the world, but exports it as concentrates, owing to lack of fuel for use in smelting.

All efforts to develop tin production in the United States, which now uses about one-half of the tin mined in the world, have thus far been unsuccessful. The extremely small quantities found in Alaska and other parts of the country have been insufficient to supply even 1% of the steadily increasing quantity required by our industries.

Sheet Mica Production Stimulated By War Demands

The quantity of sheet mica produced and sold in 1917 showed an increase of 41% over that of 1916, being 1,216,816 lb., as compared with 865,863 lb. in 1916 and 553,821 lb. in 1915, according to a bulletin of the U. S. Geological Survey.

The prices paid for mica in 1917 continued, with minor fluctuations, to increase throughout the year. Those for domestic mica in the South in 1917 were from 10 to 20% higher than the prices for similar mica in 1916. The greatest increase was for the smaller sizes, especially for the 1½ by 2, 2 by 2, and 2 by 3 in. The largest sizes showed no increase in price. The average price per lb. of sheet mica produced in 1917 was 58c., a price lower than for either 1916 (61c.) or 1915 (68c.) but higher than for any other preceding year.

Sheet mica has come to be of importance as a war mineral through its use as insulator in electric apparatus, especially in condensers, magnetos, and spark plugs; also as windows in masks worn for defense against asphyxiating gases, and for other uses where a transparent, non-inflammable, non-shattering material is necessary, as in automobile goggles and as coverings for wounds. It is also used in spectacles, sight holes of divers' helmets and smoke helmets, compass cards, automobile shields, and in windows where glass would be broken by heavy shocks or by vibrations, as in the conning towers of warships and of submarines. That ground mica is possibly of value as a chemical source of potash salts has been suggested, especially its direct application to the soil as a fertilizer.

Argentina To Build Merchant Fleet

Reports from Buenos Aires indicate the probability that Argentina will make appreciable additions to her merchant marine as soon as opportunity permits. The Argentine Navigation Co. will begin building soon, for local service; and will subsequently add about 100,000 tons to the present fleet. The new ships will vary in size from 1000 to 4000 tons, and will be used mainly as a result of an anticipated increase in commercial intercourse between Argentina and the United States and Europe after the war. The additional shipping facilities will aid immigration, which is to be encouraged, particularly of European war veterans.

In connection with the policy of expansion, it has been suggested that Argentina should establish a Latin-American Chamber of Commerce in New York to coöperate with a branch in Buenos Aires.

Appeal Made to Patriotism Of Coal Workers

The anthracite industry is thoroughly in accord with a plan which is being put into practice by James B Neale, director of production of the U. S. Fuel Administration. A committee of six men is to be appointed, to be known as the production committee, three of whom will represent the operators and three the mine workers. This committee's duty will be to see that every worker is American in thought, word and deed, and that he will work eight hours daily for six days a week. There will also be a producing manager appointed by the Fuel Administration for each coal-producing district. His duty will be to stimulate patriotism and arrange meetings, at which loyalty will be the keynote. The nation's needs will be discussed, and intensive methods for greater output will be outlined. This plan is designed to combat the German propaganda now being waged in the anthracite region.

Export of Gold Manufactures Limited

Exportation of manufactures of gold, it was announced by the War Trade Board on July 29, would not be permitted under license on and after that date, unless satisfactory evidence were given that the f.o.b. selling price of the articles, which include jewelry, watches, plate, and like products, was not less than three times the value of the fine gold contained. However, if articles of the sort named were actually made for the sole purpose of export before July 29, they may be exported up to Sept. 1, 1918, provided the f.o.b. selling price is not less than twice the value of the fine gold contents. Applications to export manufactures containing platinum, iridium, gold or palladium will be considered only when regulations governing the export of the latter metals have been complied with.

Fabrication of Rivetless Ships

News has been received of the launching of the first steel vessel built without rivets, in Great Britain. Electric welding took the place of riveting, the plates being bolted together temporarily during the process.

Although spot welding has been used extensively as an alternative to riveting light iron and steel, and other processes of welding have been adopted in subsidiary construction work in shipbuilding, this is the first instance of a completed vessel being fabricated entirely by welding. From the data obtained during the construction of the new ship, the admiralty estimates that a saving of 25% may be made in the principal costs of construction.

Bureau of Mines Coöperates With Food Administration

It is seldom realized that flour has hitherto been used extensively in the manufacture of dynamite and other explosives, and coöperation between the Bureau of Mines and the Food Administration has resulted in the conviction that more than 16,000 barrels of flour per annum can be saved as a result of the action of the Bureau in seeing that manufacturers use substitutes wherever possible. Wheat flour is also used in small quantities in assaying; and it is interesting to note that the food conservation campaign in South Africa led to the substitution of mealie flour for this purpose, the alternative reducer proving entirely satisfactory.

The awarding of a War Industries Badge as an insignia of merit to deserving industrial workers has been authorized by Secretary of Labor Wilson, on the recommendation of the War Labor Policies Board and following an agreement between the war production departments of the Government.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Platinum: Its Licensing Here And Production in Colombia

Regulations concerning the licensing of those handling platinum have been drafted by a committee composed of Hennen Jennings, Charles H. Conner, Charles L. Parsons and James H. Hill. The regulations now go to the Secretary of the Interior and to the chairman of the War Industries Board for approval, after which they will be duly promulgated. Rumors continue to reach Washington that considerable quantities of platinum are being withheld from the market in Colombia. To date, however, no evidence in substantiation of the reports has been forthcoming. From present indications it is probable that Colombia will produce 35,000 ounces of crude platinum during the current year. A slight increase in the 1918 domestic (U. S.) production is expected by platinum specialists here.

Output of Chrome To Be Augmented

Concentrating tests are being made of chrome ores at the Seattle station of the Bureau of Mines. Under the direction of Albert Burch, the Bureau is making special efforts to be helpful to the producers of northern California and southern Oregon, who at short notice have been called upon to furnish the chrome needs of the country. Just at this time, special attention is being given to deposits away from the railroads. The Bureau's field men are estimating costs and studying the economic situation of such deposits, with the intention of designating those which offer the best chance to become producers. Experimentation also is in progress with regard to the best method of getting chrome from beach sands.

Suspension of Recruiting for Officers' Training Camps

Volunteering of men in civil life for training as officers is suspended in order to prevent disruption of industry and the general impairment of efficiency which results from the indiscriminate enlistment of men up to the age of 45. The new order will remain in force until pending draft-law legislation is passed and new regulations are decided upon which will determine the most suitable form of selection. It is probable that the final regulations in the matter will leave it to the Government to decide whether men can be spared from certain occupations for military service.

Priorities Board To Encourage Gold Mining

That Washington is aroused thoroughly to the need of stimulating gold production is evidenced by a resolution passed last week by the Priorities Board. The resolution reads: "Be it resolved by the Priorities Board that gold mining is an essential war industry, and the powers of this board will be so exercised as to accord to such industry preferential treatment in the supply not only of tools, machinery and equipment, but in transportation service, fuel supply and labor supply."

Apparently it is the consensus of opinion in Washington that a bonus on gold production, or any other similar panacea, is impracticable. It is believed, however, that numerous minor ways of assisting the industry can be found, which, in the aggregate, will result in stimulating the output.

Zinc Production Stimulated By Increased Demand

Reports to the War Industries Board indicate marked increases in the production of zinc, not only for war needs but for commercial purposes. The board is encouraged by the increased use of zinc in substitution for more needed metals. The enameling of sheet zinc by refrigerator manufacturers apparently is proceeding successfully, as large amounts of zinc are now being used for this purpose. Numerous architects are advising the use of zinc for flashing and spouting in building construction. The New Jersey Zinc Co. is featuring an extended use of zinc in new buildings which it has under construction.

A reduction of 20% in the rates on manganese ore from Western producing fields to Eastern manufacturing centers has been ordered by the Railroad Administration. The Alaskan Steamship Co. and the Pacific Steamship Co. have been given authority to establish rates on ore and concentrates dependent upon their value. The rates, however, are to appl only to such ores and concentrates the value of whic does not exceed $50 per ton.

Consideration is being given by Pope Yeatman, hea of the non-ferrous metals section of the War Industrie Board, to the applications for relief from the coppe consumers who had signed contracts based on the 23½c price. Every effort is being made to find a way to b helpful to those really entitled to relief.

A new system of control in the procurement of all wa materials has been announced by the War Department It provides for a review of every contract by boards o control, the centralizing of purchases, the standardiza tion of contract clauses, a daily fiscal survey and pro visions for public information on War Department need

To meet a request from district and local draft board the Bureau of Mines is hurrying work on its glossar of mining terms. There is also a demand for informa tion from officials engaged in the classification of th personnel of the Army, who need dictionaries of term relating to industrial occupations.

Monthly Copper Production for 1918

This table is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo and Katanga companies, whose copper does not come to the United States.

MONTHLY CRUDE COPPER PRODUCTION, 1918

	April	May	June	July
Alaska shipments	3,579,920	6,069,642	3,980,197	3,994,204
Arizona:				
Arizona Copper	4,200,000	4,130,000	3,700,000	4,000,000
Cons. Ariz. Smelting	2,000,000	2,000,000	1,750,000	1,430,000
Inspiration	9,350,000	10,250,000	10,300,000	9,000,000
Magma	1,050,000	1,169,083	947,128	800,000
Miami	4,913,590	5,100,408	4,692,554	4,793,082
New Cornelia (*a*)	2,806,000	2,880,000	2,822,000	2,300,000
Old Dominion	2,814,000	3,239,000	3,368,000	2,533,000
Ray	7,350,000	8,120,000	7,736,559	7,300,000
Shannon	827,000	802,000	672,000	794,225
Shattuck Arizona	842,790	840,999	805,310	672,024
Other Arizona	25,007,820	27,491,118	25,823,920	24,727,751
California:				
Mammoth	1,530,000	1,328,000	1,196,000	1,330,000
Michigan:				
Calumet & Hecla	11,734,820	12,944,732	11,699,212	11,118,426
Other Lake Superior (*b*)	7,000,000	7,000,000	7,000,000	7,000,000
Montana:				
Anaconda	26,500,000	28,400,000	25,800,000	25,400,000
East Butte	1,811,360	2,208,300	1,999,760	2,076,460
Nevada:				
Mason Valley	1,058,400	1,759,728	1,224,485	1,190,177
Nevada Cons	6,900,000	7,000,000	7,250,000	6,400,090
New Mexico:				
Chino	6,290,513	5,987,340	6,706,474	6,310,396
Utah:				
Utah Copper	16,690,883	18,200,000	18,500,000	16,021,766
Eastern smelters (*b*)	1,750,000	1,750,000	1,750,000	1,750,000
Total reported	146,007,096	158,670,350	149,723,559	
Others, estimated	17,200,000	22,400,000	17,000,000	
Total United States	163,207,096	181,070,350	166,723,559	
Imports, ore and concentrates, etc	12,047,453	10,886,293	11,624,275	
Imports in blister, etc	31,294,232	27,892,478	13,801,332	
Grand total	206,548,781	219,849,121	192,149,166	
British Columbia:				
Granby Cons	3,689,982	3,808,125	3,438,521	2,167,077
Mexico:				
Boleo	1,818,880	1,873,760	1,322,720	
Cananea	4,100,000	4,100,000	4,100,000	5,000,000
Other Foreign:				
Braden	4,722,000	6,758,000	8,292,000	7,036,000
Cerro de Pasco	5,952,000	6,166,000	5,874,000	5,238,000
Chile	7,770,000	7,506,000	9,280,000	
Katanga	4,695,798	5,180,810	3,505,315	....

(*a*) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery, which is included under "Other Arizona." (*b*) Estimated.

The production of the United States by months since the beginning of the year was as follows:

	1918
January	165,431,568
February	160,011,364
March	185,525,168
April	163,207,096
May	181,070,350
June	166,723,559

The item "Alaska shipments" gives the official figure of the U. S. Department of Commerce. Kennecott production for April, May, June and July was 4,794,000, 3,404,000, 4,044,000 and 5,090,000 lb., respectively.

It's a Long Way to Tipperary

Just suppose that your office or home was transferred, for a moment, to alongside a lonely road in France, and that as you looked out of the window you saw a company of the 27th Engineers coming back from the firing line—from the incessant din and danger and eternal vigilance—back for a few hours of well-earned rest. Wouldn't you feel glad of an opportunity to cheer them up? Those half dozen cigars in your pocket—how long would they last if you had the opportunity of handing them over to the men who are doing so much to make the world a decent place to live in?

But France is a long way off, and it is just the distance that makes it more difficult for us to realize what is going on. Picture those men tramping back to their billets—and then send your check to the Comfort Fund, and take your share of credit for that smile of satisfaction—that won't wear off.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$13,664.00
Students of Wisconsin Mining School	50.00
A. M. Plumb	5.00
C. W. Snow	2.50
Charles A. Mitke	5.00
A. A. Hassan	10.00
A. A. Hassan, Jr.	5.00
Emin A. Hassan	5.00
Bernard MacDonald	5.00
C. F. Rand	50.00
Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
Wm. H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
Total	$16,054.61

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Growth of the Mining and Metal Industries in France*

One of the most important questions which at the outset of the war engaged the attention of those who were entrusted with the safety and welfare of France, was the supply of cast iron and steel. When enormous quantities of these metals were needed for the manufacture of war material, France, owing to the German invasion, was deprived of her most important fields of iron ore, as well as the chief foundries for transforming this ore into metal. The North African mines were immediately requisitioned. Iron ore was purchased from Spain, steel from America and England. The foundries which had been closed since August, 1914, were opened again by degrees—even those in the proximity of the front, such as the Neuves-Maisons, Frouard and Pompey. Many glass-works furnaces were adapted for metallurgy; and the great mineral wealth which till then had been turned to little account was exploited. The results of these efforts soon made themselves felt. Before the war, of the 5,000,000 tons of coke required every year, France had to get more than 2,000,000 tons from Germany. At the present time she can supply her own needs, and does not require to apply abroad for any coke. Supposing 100 is taken as representing the output of cast iron in September, 1915, it will be found that the factor rose progressively to 176 (in January, 1916), 250 (July, 1916), and to 280 (in January, 1917). For steel the same progression is noticeable. If the production of Martin and ordinary steel is represented by 100 for January, 1915, it has now reached 155 for Martin and 210 for ordinary steel.

It is in Normandy that the efforts, not only for exploiting mineral wealth but also for giving greater extension to the metallurgic output of France, have been greatest and far reaching; and they promise well for the future. Before the war, France was considered as rich in iron ore. Besides the basins of Lorraine, which produce three milliard tons, she possesses the basin of Normandy, which, in an area of 40,000 sq.km., contains, according to a recent estimate, nearly a milliard tons of a superior quality of ore yielding 50% of iron. In 1914, 21 grants in mining districts, producing 1,152,000 tons a year, already existed in the departments of the Orne, Manche and Calvados, which yielded 648,000 tons, with six grants only under exploitation. About the middle of 1916, a large society, entirely French, the Société Normande de Métallurgie, was founded, with a capital of 40,000,000 fr., by Schneider and Co., the great Creusot manufacturers, the Société des Aciéries de la Marine et Homécourt, and several shareholders belonging to the metallurgic world. This new society leased the foundry previously organized by the Société des Hauts-Fourneaux de Caen, formed in 1892; and in July, 1916, started the works afresh. They are situated at Mondeville-Colombelle near Caen, and cover over 400 hectares (a hectare is about 2½ acres), 200 of which are on the plateau and 200 in the valley of the Orne. About 30 km. distant is the Soumont mine, capable of yielding even now 4000 tons of iron ore a month, and which, in the near future, will have a far larger output.

The establishments of the Société Normande de Métallurgie comprise gas and coke furnaces, large steel works, a rolling mill, smelting works, and blast furnaces. Three stations and a railway line 33 km. long facilitate the transport service. The line was made by a branch society and runs between the foundries and the Soumont mines. There are now four batteries of 42 furnaces each, producing 1000 tons of coke a day. Since January, 1918, two other batteries have been in working order and have brought the output up to 1500 tons a day, or 500,000 tons a year. The coke, collected by an ingenious system of inclined planes and chains, after being sorted out is sent in trucks to government metal works. Gas undergoes a series of processes for the purpose of extracting the byproducts obtained by the distillation of coal, such as tar, phenol, benzine, toluol, naphthalin, sulphate of ammonia, used in the manufacture of explosives and for dyeing purposes, and which, prior to the war, were almost exclusively produced by Germany.

The blast furnaces, the first of which has been recently blown in, are in themselves 29 m. high, but with their basements tower 45 m. above the foundry ground plot. They can produce 400 tons a day, which is the largest individual output obtained in Europe at present. To each is affixed a battery of five metal cylinders, or "Cowpers," 7 in. in diameter, for heating the air. Three of these gigantic blast furnaces will be ready this fall; and the whole installation, when completed, will be capable of an output of 450,000 tons of cast iron a year. The steel works contain four converters of 30 tons' capacity and five Martin furnaces of 30 tons' capacity, capable of producing an output of 275,000 tons of Thomas steel and 125,000 tons of Martin steel annually. The rolling mill can pass 500,000 tons of ingots a year, and is supplied with several reversible trains for production of small samples. The Société already possesses ample stocks of iron ore; also a large water tower, 66 m. high, built in the neighborhood, with two reservoirs and a canal to the Orne, so that 10,000 cu.m. of water could be supplied hourly. A vast hall, 200 m. long, contains the electrical equipment, consisting of two turbo alternating-current generators of 3000 and 5000 kw., six gas alternating-current generators of 6000 hp., and three of 3000 hp. A private harbor has been built on the Orne canal, and it is ready for vessels of 2000 tons, and will soon be open to boats of 8000 tons' burden.

The preceding facts show how the Société Normande has been able to create, in the midst of war, one of the most important metallurgic centers in the whole of France. The mining industry of the entire region has followed its example. At present 30 fresh grants have been made for exploiting deposits in Normandy, Brittany and Anjou. On the other hand, the French government is preparing to work the Littry coal fields, situated between Saint-Lo and Bayeaux. Lastly, owing to many recent improvements, trade with Caen harbor is increasing every day. From 890,000 tons in 1910, it rose to 1,126,000 in 1913. The canal connecting the harbor with the sea will soon be enlarged and made accessible to vessels of 8000 tons. All Western France is participating in this mining and industrial expansion occasioned by the war. It is also purposed to build new blast furnaces in the neighborhood of Rouen.

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*Excerpt from the Fortnightly Information Leaflet issued by the American Chamber of Commerce in Paris.

Editorials

Work or Fight

WE FIND it hard to understand the opposition of Mr. Gompers and the other conservative labor leaders to the "work-or-fight" provision in the pending draft bill. This provides simply that if a man be absent from work without cause for more than a very reasonable—indeed, very lenient—time, he may be withdrawn from a deferred classification and thus rendered liable to draft. The labor leaders protest that this is an attack upon the loyalty of the American workman and a "conscription of labor in a covert way." "Labor has kept faith," says Frank Morrison, secretary of the American Federation of Labor. "If enacted, the amendment would be used by every unfair profiteering employer. We protest against placing an employer in a position to brand his employees as 'slackers.'"

Now, the purpose of the amendment, without any doubt, is to cause all men to work full time, or something that is more nearly so than they do at present. The labor leaders imply that their men are working even now as much as the proposed law requires, and they say specifically that the men are neither "slackers" nor disloyal. If this be so, we cannot see what valid objection they can have to the provision, which would be absolutely inoperative with such a condition. If a man is working six days a week in an essential industry, certainly he is not going to be taken away from it.

But we know that in a great many industries the men are absenting themselves from work too much of the time, and this is a very serious matter. Such men may be technically called "slackers," but they are not necessarily disloyal. On the contrary, they may be perfectly loyal and even enthusiastic for the national cause, but they may not be appreciative of what is meant by every man "doing his bit" and may not understand that work in the shops, fields and mines is just as important as direct military service. With men who cannot be made to understand that, some compulsion is necessary. The idea is not to compel them to work for nothing, to enslave themselves; on the contrary, it is simply to compel them to work for the highest wages that ever befell labor in the history of the world.

The slur upon profiteering employers is unjust. There are many honest people who are convinced that the real profiteers in this war are the artisans, mechanics and manual laborers generally. Not only do they squander their extraordinary earnings, but, also, they waste their time, being satisfied too often with the proceeds of two-thirds of a week's work. This is one of the basic causes of increasing costs, increasing wages, increasing costs again, and so on with the vicious circle. Is it that more days of work would tend to reverse these evil conditions, by checking rising wages in the first place, and that in this idea we are to find the real reason for the labor leaders' opposition to the "work-or-fight" proposition? Such a thought would be unworthy of Mr. Gompers, we should say. But if it be entertained by any of his colleagues, let them be assured that there was never anything more economically unsound and dangerous.

Exit the I. W. W.

THE conviction of Haywood and his sub-leaders in the I. W. W. will inspire courage in every loyal heart. The I. W. W. in the United States and the Bolsheviki in Russia are exactly equivalent in their composition and purposes. We have seen the tragedy that has happened in Russia from the Bolsheviki gaining the upper band and setting up a tyranny of their own. Our I. W. W. would have liked to be the same thing here. Already outrageous of our civilization before the war, they extended their nefarious preachings and practices during our time of trouble so that they became disloyal and seditious, playing purposely into the hands of the enemy, just as did Lenine and Trotzky in Russia. For this they were apprehended and locked up, so that they could do no further harm, unless a jury should decide that they had been charged unjustly. Like other citizens, they had their day in court, which in their case happened to be three months. They were tried by a fair-minded jury, in whose selection they participated, according to our ancient and honorable method. The jury promptly decided that they were guilty, and millions of loyal citizens applauded the verdict. Thank God that this country has not been so debauched and poisoned that it is ready for any I. W. W. or Bolsheviki propaganda!

Mr. McAdoo on Taxation

MR. McADOO talked some good sense to the Committee on Ways and Means on Aug. 14. As is well known, that committee had been framing a tax law on the basis of what Mr. Kitchin is pleased to describe as the "excess profits" of capital, that is, on the theory that capital should substantially be limited to a certain arbitrary return. This not only introduces the insolvable complication of what is capital, or, rather, how it should be defined in a law, but also it courts the danger of extinguishing enterprise and reducing our business to a dead level of mediocrity. Mr. McAdoo put his finger right on the line of cleavage when he said:

> The distinction between a war-profits tax and the excess-profits tax is not a matter of form, but of substance. By a war-profits tax we mean a tax upon profits in excess of those realized before the war. By an excess-profits tax we mean a tax upon profits in excess of a given return upon capital. The theory of a war-profits tax is to tax profits due to the war. The theory of an excess-profits tax is to tax profits over and above a given return on capital. A war-profits tax finds its sanction in the conviction of all patriotic men of whatever economic or political school, that no one should profit largely by the war. The excess-profits tax must rest upon the wholly indefensible notion that it is a function of taxation to bring all profits down

> to one level with relation to the amount of capital invested, and to deprive industry, foresight and sagacity of their fruits. The excess-profits tax exempts capital and burdens brains, ability and energy. The excess-profits tax falls less heavily on big business than on small business, because big business is generally over-capitalized and small businesses are often under-capitalized.
>
> The war-profits tax would tax all war profits at one high rate; the excess-profits tax does, and for safety must, tax all excess profits at lower and graduated rates. Any graduated tax upon corporations is indefensible in theory, for corporations are only aggregations of individuals, and by such a tax the numerous small stockholders of a great corporation may be taxed at a higher rate than the very wealthy large stockholders of a relatively smaller corporation. The object of a graduated tax should be to make taxes fall upon the rich, who are best able to pay them. The graduated excess-profits tax disregards this, and often produces the reverse result.

Mr. McAdoo unfortunately offset to some extent his own sensible expression by advocating a retention of the present excess-profits tax; not that he does not think it cannot be improved, but he is simply opposed to increasing it. Therefore, after having pronounced the system a bad one, for reasons so succinctly and emphatically stated, he proposes, nevertheless, to keep it. In his letter of June 5 he said:

> The Government departments, under great pressure, as they are, to get necessary war materials and supplies with the utmost expedition, cannot in the nature of things fix their prices nor guard their contracts in such a way as to avoid the possibility of profiteering. The one sure way is to tax away the excessive profits when they have been realized. I do not say this in a spirit of criticism of the corporations or business men of the country, who have for the most part loyally supported the Government. In entering into war contracts they take grave risks. They are called upon to make vast expenditures of capital for purposes which may prove unproductive after the war. They are not to be blamed in these circumstances for asking for prices and terms which cover those risks. On the other hand, when the risk has been liquidated by proper allowances, and the contract has proved profitable, the Government should take back in taxes all profits above a reasonable reward.

This also is good sense. It may be pointed out, however, that, between the arrangements of fixed prices and the levying of a confiscatory excess tax on capital, nobody can enter upon expenditures of capital for purposes that may prove unproductive after the war. The combination of these restrictive conditions affords no chance for liquidation. There is not enough taxation of the abhorrent *war profits* and there is too much taxation of incomes, not attributable in any way to the war, simply because they are large. There is too much taxation of the bees and not enough on the honey.

Publicity in South American Mining Matters

THE vicissitudes of the average Latin-American mining corporation are illustrated by a short account of the Caylloma mine, published in the present issue. The intrinsic value of the mine may be gaged from the fact that, as recently as 1914, 12,000 oz. of silver per month was being shipped in rich ore, which frequently assayed 300 or 400 oz. per ton.

Company formation, to judge from the information available, seems to have begun in earnest about 1886, after about 250 years of intermittent production. From 1889 to 1900 an equivalent to about half a million American dollars was spent on plant and equipment, but the only successful metallurgical operation in practice at the latter date seems to have been the sorting of high-grade ore for shipment. Further reconstructions for the purpose of raising capital for plant occurred in 1905 and 1913.

In 1907 a new 60-ton concentrating plant was purchased. Six years later there was another company organization, and money was raised for a new mill. This time separate sand and slime cyanide treatment of concentrating-table tailings was arranged for. A satisfactory extraction of silver by leaching of sand had been proved impracticable in Mexico several years previously, so that, assuming that the ore was not abnormal in character, the new installation was not likely to be a success. The new mill was started up in 1916, and a flotation plant was added in 1917 in an effort to improve results. Flotation of silver ores has not met with the unqualified success predicted in some quarters, so that it is yet early to anticipate that the new combination of methods will prove entirely satisfactory. The present year has already seen the forming of a new directorate and the raising of still more capital.

The checkered careers of so many locally controlled Latin-American mines are in no small measure due to their isolation from modern centers of technical progress. A description of practice often adopted under such conditions—away from the searchlight of publicity—may reasonably be discounted as incredible by the engineer in a progressive mining community, and will be viewed with amazement by the visitor. We have before us an account of the operations of a gold mine which failed to pay expenses on a $\frac{2}{3}$ oz. gold ore, and was shut down. In the operation of the plant all the cyanide solution, after passage through the zinc boxes, appears to have been run to waste.

Cuba has already taken the initiative in a campaign to insist on the need for men of high standing and specialized ability in mining engineering work. In a recent issue of the *Boletin de Minas* attention is drawn to the failure to distinguish between the details of mining and other branches of engineering. Examples are cited where, for the most part, negative results have been achieved, and where only by dint of obtaining abnormally favorable prices for the products has it been possible to develop the industry to any appreciable extent, and so to compensate for the enormous sums invested in badly directed undertakings. The Cuban mining authorities are convinced that success is unattainable without the employment of technical advisers whose professional standing is on a par with that of men who have reached high positions elsewhere; and an appeal is made to all interested in Cuban mining to see that confidence in technical advice is placed only in those whose records afford guarantees of capacity and ability.

Cuba's experience has been shared by other Latin American countries. Sometimes a visitor who boldly claims the title of mining engineer in such places is looked upon as a charlatan and a sharper—a distinction conferred as a result of the misguided efforts of many so-called experts and specialists who have discredited the industry by shady financial dealings, by a lamentable deficiency in their knowledge of approved methods of operation, and by an absolute ignorance of details of practice. Nothing will help so much to place the industry on a sound basis, and in a position where it may be respected, as greater publicity.

The Public Is Not To Be Damned

THE public in its relations to public services is very apt to receive scurvy treatment. The public is always more or less helpless. It must travel, and usually can travel only by one way. Similarly, is it restricted in its use of the telegraph and telephone, in its relations with the express service, and so on. A famous financier of railways of a generation ago enunciated the principle of "the public be damned," and the idea trickled down naturally from the fountain head of authority to the meanest baggage smasher. The public had rather an uncomfortable time.

But with the broadening of ideas and visions, the thought occurred to some genius that if measures were taken to make the public happy there would be more use of the service to be sold, which would be beneficial to the vendor of the service. In other words, the idea was that the possession of a monopoly did not limit commercial possibilities. Mr. Vail, of the telephone company, was perhaps the first fully to grasp this big idea. He made the telephone service the most satisfactory of all public services. When he reached into the telegraph service he introduced the same benevolent inspiration into it. Among the express companies nobody ever got the idea. When they fell upon evil days, following the establishment of the parcel post, the public felt that they simply got what they deserved. They remained benighted to the end, with never an idea above the notion that it was good business to collect payment at each end.

The railway companies got the idea in different degrees. There were some administrators, like James J. Hill, who really had it; also the Pennsylvania people. There were others who did not really get it, but who were induced by competition to be very good to the public. Every one remembers how polite and agreeable used to be the staffs of the competing lines from Chicago to the Northwest and from Chicago to Denver, from the man who sold tickets and made reservations in the city offices to the rear-end flagman of the train, who did not disdain to answer inquiries. On other roads there was a variety of service. Some was fairly good, without, however, exemplifying the big idea, which really never permeated thoroughly among the railways; some was indifferent, and some continued downright bad; but, on the whole, the public had come during recent years to receive vastly better treatment than in the days when William H. Vanderbilt declared that it simply was to be damned.

However, since the Government has taken over the railways there has been apparently a change. There is no longer any competition, and therefore no inducement to any employee to be good to people beyond what his own good nature may exude. Nor is there any reason to create business. On the contrary, there is a declared desire to discourage it. But the thought of the administration was to discourage it by advanced rates, not by surly treatment on the part of ticket sellers, freight agents, and trainmen. That those folk have been assuming such an attitude is evidenced by Mr. McAdoo's recent order that they must be good.

Certainly the public has every right to expect that they be polite and decent. Heaven knows that railway service is deteriorating enough to make people unhappy without their having to suffer indignities from indifferent and insolent employees. The public has borne, without murmuring, a staggering increase in rates, which were raised chiefly for the purpose of paying more wages to these aforesaid employees. Theoretically this ought to make them grateful and obliging, though we admit the effect on human nature is apt to be otherwise. However, we hope that Mr. McAdoo's order No. 40 will be beneficial.

The Russian Empire

THE increasing interest in the immediate future of Russia and the keen realization of the critical importance of any move that is made by the Czecho-Slovaks, and by the Entente in coöperation with them, are apparent to all who are making a study of Russia in her relation to the war. In view of the general interest in the Russian question we republish a map of Siberia on page 342 in this issue.

BY THE WAY

Peter O'Riley, one of the discoverers of the Comstock Lode, held his interest in the Ophir mine longer than any of the original locators, and realized nearly $50,000. A little later he and his assistants speculated, until one day poor old Pete found himself with pick, shovel, and pan, and going forth to prospect, wrote Dan De Quille in "The Big Bonanza."

Being a spiritualist, and always having the latest advices from the ghosts of the departed in regard to mines and all else worth knowing about, O'Riley did not consider it necessary to wander far. The spirits pointed out a place in the foothills of the Sierra Nevada Mountains, where they said was stored up far more gold and silver than in the whole Comstock Lode.

The place to which O'Riley was "led" was nothing more than a bed of rotten granite. Here he toiled along, running a tunnel, working for two or three years under all manner of difficulties. As he worked alone in the dark, far under the mountain, month after month, the spirits began to grow more and more familiar. They swarmed about him, advising him and directing the work. And as he wielded pick and sledge their voices came to him out of the darkness which walled in the light of his solitary candle, cheering him on.

News at length came that O'Riley had been caved on and was badly hurt. Then that the physicians had pronounced him insane. When he recovered, he was anxious to return to his tunnel—the spirits under the mountain were calling to him—but he was sent to a private asylum for the insane, and in a year or two died there, the spirits lingering about him to the last, and heaping on him reproaches for having left the golden mountains and silver caverns they had pointed out to him.

Personals

Have You Contributed to the Association of the 27th Engineers?

C. P. Bernard has returned to New York from Africa.

M. S. Davys has returned to Nelson, B. C., from a trip to Cooks' Inlet, Alaska.

E. E. Calkins is back at Miami, Ariz., after having examined mining properties in New Mexico.

M. R. Hull has accepted an appointment with the Nevada Consolidated Copper Co., McGill, Nevada.

Kirby Thomas is in Quebec, making an examination of asbestos properties in the East Broughton district.

Charles A. Randall is now assistant manager for the Dome Lake Mining and Milling Co., Ontario, Canada.

C. M. Clark is making an examination of the Lulea mine, near Hay Lake, in the Rice Lake district of Manitoba.

Howland Bancroft has returned to Denver, after having spent seven weeks in Washington on war work.

Richard G. Place has been appointed chief chemist at the Vermont Copper Co.'s plant at South Strafford, Vermont.

Robert Dye has been appointed manager for the Teck-Hughes Gold Mine Co., Ltd., Kirkland Lake, Ontario, Canada.

Ralph Weston has resigned from the position of metal mine inspector, State of Utah, and has gone to California.

J. B. Landfield, formerly mining engineer in an advisory capacity to the Russian government, is now in Washington.

H. P. Nagel has been appointed mine superintendent for the Sunnyside Mining and Milling Co., Eureka, California.

L. D. Cooper, chief engineer for the E. T. Longyear Co., of Minneapolis, was in New York last week en route to Vermont.

J. Cleveland Haas, of Spokane, Wash., has been visiting mining properties in the Boundary district of British Columbia.

T. J. Harwood, late manager of the Schumacher gold mine, in the Porcupine district of Ontario, has gone to Los Angeles, California.

A. R. Globe has resigned from the position of assistant manager for the Hollinger Consolidated Gold Mines, Ltd., Ontario, Canada.

Albert Burch is now associated with the Bureau of Mines, and will be concerned with the encouragement of chrome-ore production.

C. E. Drayer has been elected secretary of the American Association of Engineers, with headquarters at 29 South La Salle St., Chicago.

A. T. Thompson, assistant to the president of the Phelps Dodge Corporation, is at Los Angeles, recovering from an operation for appendicitis.

N. A. Stockett, previously with the St. Joseph Lead Co., has been commissioned to a second lieutenancy in the engineers' corps U. S. A.

Seldon S. Rogers is in charge of the crushing and flotation departments at the Anaconda Copper Mining Co.'s plant at Anaconda, Montana.

M. W. Bacon, of Spokane, Wash., formerly manager of the Stewart Mining Co., operating near Kellogg, Idaho, was at Phoenix, Ariz., on August 12.

Norman Dye, of Rochester, N. Y., has been made manager of Clevinger Prophet Silver Mines, Ltd., on the Mann ridge, Gowganda district, Ontario.

C. P. Tomlinson, of Hartford, Conn., has been appointed consulting engineer for the Southern Minerals Corporation, of Boston, of which he is also a director.

E. H. Wells, of the New Mexico State School of Mines at Socorro, is investigating manganese deposits in Grant County on behalf of the U. S. Geological Survey.

Albert L. Waters left Phoenix, Ariz., on Aug. 11 for San Francisco en route to Hongkong, China, where he will take charge of a smelting enterprise for American capitalists.

George B. Louderback, professor of geology at the University of California, is to be in charge of the Bureau of Mines' campaign for increased manganese production in the Pacific Coast states.

John D. Ryan, director-general of aircraft production and president of the Anaconda Copper Mining Co., has returned to Washington after a visit to the spruce camps in the West.

C. M. Eye, superintendent for the Benguet Consolidated Mining Co., who has been spending a summer vacation in North China, will be back in Baguio, P. I., on August 1.

H. O. Robinson has returned to New York from Venezuela, where he had been for several months in charge of the development and equipment of a magnesite property on the island of Margarita.

M. M. Summerhayes, formerly manager of the Porcupine Crown Gold Mining Co.'s property at Timmins, Ontario, Canada, has been appointed manager for the Bluestone Mining and Smelting Co. of Nevada.

W. A. Carlyle is now general manager and vice-president of the British American Nickel Corporation, Ltd., Sudbury, Ontario, Canada, having taken over the duties previously assigned to E. P. Mathewson.

D. B. Dowling, of the Canadian Geological Survey, has been commissioned to supervise the work of testing the gases of the Alberta gas fields to ascertain their gasoline content. He will begin in the Calgary field.

A. H. Burroughs, Jr., formerly engineer for the Conrey Placer Mining Co., Ruby, Mont., has gone to Washington and entered the Bureau of Ordnance, Navy Department, as a technicist, with the rank of ensign.

O. B. Smith, superintendent of the mines of the Granby Consolidated Mining, Smelting and Power Co., of British Columbia, has returned to the mines from Vancouver, where he recently underwent an operation.

B. H. Dunshee, until recently assistant general manager of the mining department of the Anaconda Copper Mining Co., when he resigned on account of ill health, has gone to California, where he will make his home.

G. H. Cox, of the firm of Cox & Radcliffe, consulting engineers of Tulsa, Okla., and head of the department of geology of the Missouri School of Mines and Metallurgy, has been appointed assistant director of that school.

W. G. Swart has been elected the first president of the newly organized Duluth Engineers' Club, whose members will include representatives of the mining, mechanical, electrical and civil engineering professions.

C. S. Blair, geologist for the Tennessee Coal, Iron and Railroad Co., is making a tour of the Southwest inspecting possible sources of manganese supply. His headquarters will be at Tucson, Ariz., until this work is completed.

Joseph Inch has resigned from the position of chief engineer with the Cia. de Minas de Cobre de Gatico and has been appointed manager for the Soc. de las Minas de Cobre de San Bartolo, San Pedro de Atacama, Antofagasta, Chile.

A. A. Hassan left on Aug. 24 for New Brunswick, Canada, to examine manganese and pyrrhotite deposits. He will then proceed to Halifax, N. S., to examine the Montague gold deposits and to Tangier, N. S., to examine the Bradford gold mine.

E. Tsutsjima, Buhei Sakane and **Fashimatsu Kawamoto,** three Japanese business men appointed by their government as a commission to purchase nickel and zinc in America for war requirements, have arrived in Toronto on their way to visit the nickel and zinc fields of Canada.

Eugene Poitevin, of the staff of the Canada Department of Mines, Ottawa, has been investigating conditions in relation to the occurrence of platinum at Olivine Mountain, Tulameen district, B. C., in company with **P. B. Freeland,** district engineer for the Provincial Department of Mines.

A. P. Rouillard, of the Durban-Roodeport Deep, Transvaal, South Africa, has resigned to enter war service. The direction of the property passes under the contol of **Charles Glyn,** manager of the City and Suburban Gold Mining Co., who is succeeded by **H. C. Hilton** of the Village Main Reef.

Addison H. MacKay, formerly in charge of the Harriman oil interests in the Tampico district, has returned to the United States, after several months in Venezuela, where he obtained important concessions, covering oil, copper and chrome. His address is the New York Club, New York.

R. N. Kotzé, Government Mining Engineer of the Transvaal since 1908, has been made a Knight Bachelor. Mr Kotzé was educated at Capetown and took his diplomas in mining and metallurgy at the Royal School of Mines, Clausthal, Germany. In 1896 he was appointed assistant engineer, and later consulting engineer, to the Transvaal Goldfields, and relinquished that position for his present one in 1907.

O. M. Bilharz, of Pittsburg, Kan., has lately acquired interests in the Batesville manganese field, in Arkansas. Among others who are reported to have become interested in properties in this field are **C. H. Plumb,** of Joplin, Mo., and **Otto Ruhl,** also of Joplin, the latter of whom is spending considerable time in the district supervising operations. **L. F. Hirschler,** formerly in charge of the Edith zinc mine at Rush, Ark., **J. Reed**, a mining engineer of Memphis, Tenn., and **P. R. Coldren,** editor of the mining department of the "Joplin Globe" have been recent visitors in the Batesville district.

Obituary

A Memorial Service, in appreciation of the personality and life work of the late Dr. James Douglas, will be held during the Colorado meeting of the American Institute of Mining Engineers at 12 noon on Tuesday, Sept. 3, at a place to be announced later.

George E. Price, formerly manager of the Rudeshill mine, died at Charlotte, N. C., on July 24. Mr. Price had carried out professional work in many parts of the world, including Western Australia, West Africa, Canada, and Bolivia, as well as gaining a wide experience in the United States. He was born at Dayton, Ohio, on Jan. 1, 1858.

J. V. Kelly died at San Antonio, Tex., on Aug. 3, He was a graduate of Harvard University and had been actively engaged in mining engineering work for the last 12 years in the United States, Cuba, Mexico and Central America. Mr. Kelly recently resigned his position as general mine superintendent of the La Blanca y Anexas Mining Co., of Pachuca, Mexico, to report for duty with the Engineers Reserve Corps, in which he had been commissioned a captain.

Prof. Auguste J. G. Ledoux, of the Ontario Bureau of Mines, died suddenly at Sudbury, Ont., recently. He was professor of mineralogy and geology at Brussels University at the outbreak of the war, and enlisted in the Belgian artillery, in which service he was severely wounded. On his discharge from the army three years ago, Professor Ledoux came to Canada, and last year was appointed by the Ontario Bureau of Mines to investigate the sand and gravel deposits of the province. He leaves a widow.

William Haymond Powers, pioneer o Inyo County, Calif., died at Bishop o July 23. He was born in Henry County Indiana, in 1848, and, with his parents crossed the plains to Nevada in 1863, traveling by ox team. The family settled i Carson Valley, but later, in 1866, William and his elder brother Jacob went to Bishop Calif. William Powers and Miss Alinza Burdick, whom he married in 1870, made with others, the first American flag seen in Inyo County, from red and blue woolen blankets and white flour sacks.

Adolph Faber du Faur died at Newark N. J., on the 18th inst., in his 92d. year He was born in Württemberg, Germany, a ancestor being one of those who escape from Paris at the time of the massacre o St. Bartholomew's night, his mother being direct descendant of Martin Luther. H came to America in 1850, served in th Civil War and was commissioned a cap tain, afterward being engaged in engineer ing work in connection with the extensio of the Capitol at Washington. Although a inventor and engineer of wide and varie ability, Captain Faber du Faur's name primarily associated with the furnace h invented, which has survived as a detail o standard equipment in the metallurgy o lead and, in a slightly modified form, has been used extensively for the smelting o gold and silver precipitates from the cy anide process. This apparatus was the firs type of tilting furnace used, where th crucible remained in the furnace during th pouring of the bullion.

Societies

The Engineers' Club of Northern Minne sota will make a trip through the Cuyun range on August 24.

The National Safety Council will hold i annual meeting and congress from Sep 16 to 20, inclusive, at the Statler Hot St. Louis, Mo. A small safety education exhibit will be shown in the hotel, earli plans of arranging for elaborate displa at the Coliseum having been abandon

The Lehigh University three-year course in ship construction and marine transportation, to be started in September, will be under the direction of Professor F. P. McKibben, head of the department of civil engineering. The new course will be a combination of engineering and economics to prepare students for ship construction during the war and, in addition, foreign commerce afterward. Lehigh now has a full quota of student representatives at the Government camp at Plattsburg, N. Y., where they are receiving training that will equip them to assist army officers at the university next year in the War Department instruction in military drill and science.

The American Ceramic Society announces the inauguration of a monthly journal to take the place of the annual volume of transactions previously published. The society belongs to the older family of scientific societies in the United States. The first meeting, which was in reality a gathering of a small group of ceramic enthusiasts, was held in Columbus, Ohio, in February, 1899, and from that meeting grew the present organization. The term "ceramic" is synonymous with "silicate industries," and the interests and activities of the society include all branches of the clayware, glass, and cement industries, as well as enameled wares of all kinds, and, in addition, other closely allied products are included, chief among which are abrasives, gypsum and lime. Few realize the gigantic proportions of these industries. The products of the three major divisions alone (clayware, glass, and cement) aggregate a value of over $400,000,000 per annum. In the earlier days the society consisted of one main organization only. With increased activities and with enlargement in its scope of usefulness it became necessary to organize 10 local sections and 4 student branches. The publication work of the society has, up to the present time, been confined to the issuing of the annual volume of transactions. The growth of the society has made it essential that periodical publication of the researches and other activities of the members be undertaken; and the monthly "Journal of the American Ceramic Society" is the logical result. The contents of the first number include the following original papers and discussions: "Kaolin in Quebec," Keele: "Special Pots for the Melting of Optical Glass," Bleininger; "The Effect of Gravitation Upon the Drying of Ceramic Ware," Washburn; "Test of a Producer Gas-Fired Periodic Kiln," Harrop; "Notes on the Hydration of Anhydrite and Dead-Burned Gypsum," Gill. The present officers of the Society are: President, Homer F. Staley; vice president, A. F. Greaves-Walker; treasurer, R. K. Hursh; secretary, Charles F. Binns; trustees, A. F. Hottinger, E. T. Montgomery, and R. D. Landrum.

Institute of Metals division of the American Institute of Mining Engineers, with the iron and steel members of the latter and the American Foundrymen's Association, will hold a meeting at Milwaukee, Wis., to open on Oct. 8. The papers to be presented by the Institute of Metals division are given below: those under the auspices of the committee on iron and steel, Joseph W. Richards, chairman, will deal with iron ores, iron and steel metallurgy, and related subjects. Programs for the meetings, as provisionally arranged, are as follows: Tuesday morning, Oct. 8: "The Metallography of Tungsten," by Zay Jeffries. (See A.I.M.E. Bull. No. 138, p. 1037.) "The Constitution of the Tin Bronzes," by S. L. Hoyt. A paper will also be read by C. H. Mathewson. Wednesday morning, Oct. 9: Symposium on the conservation of tin. Among those taking part will be G. W. Thompson, of the National Lead Co.; G. H. Clamer, of the Ajax Metal Co.; C. M. Waring, of the Pennsylvania Railroad Co.; M. L. Lissberger, of Mark Lissberger & Son, Inc.; D. M. Buck, of the American Sheet and Tin Plate Co.; W. M. Sorse, and M. L. Dizer, of War Industries Board. Wednesday afternoon, Oct. 9: "The Volatility of the Constituents of Brass," by John Johnston. (See "Journal," Am. Inst. Metals, March, 1918, p. 15.) "Notes on the Metallography of Aluminum," by P. D. Merica and J. R. Freeman, Jr. "The Effect of Impurities on the Hardness of Cast Zinc or Spelter," by G. C. Stone. (See "Journal," Am. Inst. Metals, March, 1918, p. 11.) "Dental Alloys," by Dr. Arthur W. Gray. Thursday morning, Oct. 10: "Notes on Non-metallic Inclusions in Bronzes and Brasses," by G. F. Comstock. (See "Journal," Am. Inst. Metals, March, 1918, p. 5.) "Nichrome Castings," by Arlington Benzol, of the Driver-Harris Wire Co. "Fusible Plug Manufacture," by G. K. Burgess and J. J. Gurevich. "Application of the Spectroscope to the Chemical Determination of Lead in Copper," by Messrs. Hill and Lucke. Also a paper, by P. D. McKinney. The sessions on iron and steel will be held during the morning and afternoon of Wednesday, Oct. 9. In addition to a number of papers on iron ore, ferroalloys and other allied subjects, interesting lectures, to be illustrated by moving pictures, will probably be given, on the manufacture of steel, and on the training and employment of cripples in industry.

Industrial News

E. J. Albert has resigned from the management of the mining and power department of the Canadian Allis-Chalmers, Ltd., and has been appointed sales manager for the Thwing Instrument Co., Philadelphia.

The Truck Owners' Conference, Inc., will hold 19 two-day conferences, in as many cities, during the next ten months. The purpose throughout is to secure greater efficiency in truck operation. The opening conference will be held in Detroit, Sept. 19 and 20, at the Board of Commerce building.

The Hardinge Conical Mill Co. has published under the title "What Really Happened—The True Story of a 'Test' (?)," a reprint of E. H. Kennard's contribution to the discussion of C. T. Van Winkle's paper on ball-mill performance which was published in the April, 1918, bulletin of the American Institute of Mining Engineers.

Traylor Engineering and Manufacturing Co., manufacturers of mining, milling and smelting equipment, of Allentown, Penn., announce the opening of a district office at 612 and 614 Mohawk Block, Spokane, Wash., in charge of **W. H. Agens,** district manager, and another at 900 Citizens' Bank Building, Los Angeles, Calif., in charge of **Harry V. Croll.**

E. P. Dillon, manager of the power division of the New York office of the Westinghouse Electric and Manufacturing Co., has resigned to become general manager of the Research Corporation, of New York. Mr. Dillon came to the Westinghouse company in 1909, having been previously connected with various mining and electrical companies in Colorado.

The Radium Ore Sampling Co. announces the completion of a rare-ore custom sampler at Montrose, Colo., where all kinds of rare and precious ores and concentrates may be sampled. Particular attention has been given to the matter of making accurate moisture determinations, and to the collecting, saving, and sampling of the valuable dust of carnotite and other rare oxide ores. Ore can be ground as fine as 20 mesh and all the product carefully screened if desired. Adequate precaution is furnished in the nature of protection from theft and fire. Prices will be furnished upon request, covering kind and quantity of material involved and size of fineness desired. Thirty days' free storage is allowed on all shipments from time of arrival, and, when desired, orders from producers or shippers will be accepted for any or all stages of transportation charges to the sampler, subject, of course, to the value of the ore covering such accounts after payment of charges.

Trade Catalogs

The Blaster's Handbook, a pocket textbook, has been issued by E. I. du Pont de Nemours & Co., of Wilmington, Del., which tells, in detail, how to blow soot from big chimneys, how to break up old boilers and heavy machinery, and how to use explosives for every purpose where their employment is practicable. It gives information regarding the proper explosive to use, the quantity, the method of loading and firing. The book is illustrated and contains charts and diagrams that make it a valuable addition to any technical library.

Westinghouse Instruments and Relays is the title of catalog 3-B, of which a revised edition has just been issued. Among apparatus listed for the first time are type AW and type FW duplex instruments, type EH and PH ammeters, which are hot-wire instruments suitable for operation on either d.c. or a.c. circuits of any frequency; type OA watt hour meters for switchboard service, which are similar to the well-known standard house-service type OA watt hour meters, except that they are designed for switchboard service; the motor-operated type M graphic instruments; type CV voltage relays, which can be furnished to operate either on under-voltage or over-voltage, as ordered; the type CP reverse-phase relays to provide against phase reversals; type BT transfer relays, which operate with the excess current relays, such as the Westinghouse type CO and type CR, to directly energize the operating coil of the circuit-breaker from the current transformer, no separate operating circuit being required; and type CT temperature relays, which depend for their operation upon the temperature of the apparatus on the circuit as well as the amount of the overload. 8½ x 11 in.; pp. 101, illustrated.

"Potentiometer System of Pyrometry and Temperature Control." Leeds and Northrup Co., Philadelphia, describes a system of pyrometry and temperature control in which the potentiometer method is employed for measuring the electromotive force of thermocouples. A known electromotive force is included in the circuit with the thermocouple and, by varying this, the current can be also varied until a galvanometer, in the circuit, indicates that no current is flowing. When this has been done the thermocouple electromotive force is, of course, equal to the known electromotive force. Due to the fact that no current flows at the moment of measurement, changes in the resistances of lead wires, thermocouples, galvanometers, etc., are eliminated and do not affect the result. By making the lead wires of the same material as the thermocouple, the "cold junction" of the latter is brought back to the instrument, where its effects can be compensated automatically. The variable electromotive force is obtained by a moving contact along a slide wire through which a standardized current is flowing. This may be done by hand, as in potentiometer indicators, or by mechanical power as in the Leeds & Northrup Recording Potentiometers. In these instruments the galvanometer acts merely as a trigger or pilot. When deflected, the boom is forced by reciprocating parts against other parts which mechanically adjust the slide wire contact, the amount of adjustment depending upon the amount of deflection. When no current is flowing the boom stands at the neutral position and there is no adjustment. It is thus possible for a delicate and sensitive galvanometer to control the expenditure of a considerable amount of power. This fact has been taken advantage of to construct curve-drawing and multiple-circuit printing recorders, and also to operate signal lamps and indicators at the furnaces. The recorder thus takes the place of an attendant, who would otherwise be required to read the pyrometer and to signal its indications. The potentiometer is also applied to a special apparatus for the location of the thermal transformation or recalescence and decalescence points of metals. The Leeds & Northrup Co. has developed an apparatus by which temperatures are plotted as ordinates, and temperature differences between the sample and a non-recalescing body on a magnified scale as abscissæ. This shows the transformation points graphically, as the temperature of the sample remains nearly constant for a time at such points, although the non-recalescing body continues to change. Pp. 60; 8 x 10½ in.; illustrated.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Ore Separator—Robert E. Nelson, Keystone, S. D. (U. S. No. 1,272,301; July 9, 1918.)

Nitrogen, Production from the Air.—Carlo Andreucci, Rome, Iitaly. (U. S. No. 1,272,181; July 9, 1918.)

Air-Washer—Donald T. Hastings, Detroit, Mich., assignor to Holly Bros. Co., Detroit, Mich., (U. S. No. 1,272,434; July 16, 1918)

Belt-Tightener—Antone J. Adamek, Orient, S. D. (U. S. No. 1,272,350; July 16 1918)

Cable Grip—Thomas J. Craven and Daniel J. Crilly, Detroit, Mich. (U. S. No. 1,272,392; July 16, 1918)

Centrifugal Pump—James D. Bell, Seattle, Wash. (U. S. No. 1,272,606; July 9, 1918)

Converter Lining—Frank E. Hinners, Milwaukee, Wis. (U. S. No. 1,272,442; July 16, 1918)

Drier—Charles H. Klein, Chaska, Minn. (U. S. No. 1,272,676; July 16, 1918)

Drier—Frederick K. Fish, Jr., New York, N. Y., assignor to Lumber Tie and Timber Vulcanizing Co., New York. (U. S. No. 1,272,649; July 9, 1918)

Editorial Correspondence

WARREN, ARIZ.—Aug. 12

Announcement of a New Housing Plan has been made by the Phelps Dodge Corporation and the Calumet & Arizona Mining Co. The plan provides that the companies will build homes and sell them to the employees on terms of rent, with interest on deferred payments at only 6%. The new proposal will give a considerable relief to the congested housing conditions of the Bisbee district. Over 80 applications have already been made by employees of the Copper Queen, and the plan is certain to bring relief to the district.

JEROME, ARIZ.—Aug. 12

The Building Program of United Verde Copper Co. consists of the following: Emergency hospital at Clarkdale; apartment building at Jerome of 33 three-and four-room apartments; eight patio groups of six three-room houses at Clarkdale; 20 five-room houses at Clarkdale; completion of old hospital building at Jerome to provide housing for single men; 20 four-room houses at Jerome, four 16-room concrete bunkhouses at the steam-shovel camp, and a clubhouse at Clarkdale.

BUTTE, MONT.—Aug. 13

No Movement Toward a Strike has been made here, although the matter of calling one was left in the hands of the executive committee of the Metal Mine Workers' union, affiliated with the I. W. W. City and county authorities were called recently into a conference with the officer in command of the Federal troops here. The chief of police and the sheriff were directed to place under arrest every man who is not working and who refuses to go to work. It is estimated that there are in Butte at least 1000 idlers and men not engaged in useful occupation. They are being arrested, and those who promise to go to work are given a card and allowed 24 hours in which to get into the hay fields or the mines. Consequently, every I. W. W. man who is here will either walk out of the city or go to work.

JOPLIN, MO.—Aug. 14

A Site for an Ore Warehouse at Picher, Okla., to be used in conjunction with the operation of an Oklahoma Mining Exchange, has been secured, and it is stated that a building will be erected at once. Many operators and mine owners in the field have given their support to the plan for the mining exchange and warehouse, which was proposed a few weeks ago at Miami, but other operators and mine owners are holding aloof and prefer to wait before going into the proposition. Other such schemes in this field have fallen through, and older operators are doubtful in this case. They admit, however, it would likely be a good thing if it could be properly worked out and if all mining men in the district would give their assistance.

No New Machinery for Mill Building in this district is the slogan of one of the [illegible] concerns in Joplin, and the idea is expected to be endorsed by all machinery dealers in the district. Rumors of the plan led to other rumors to the effect that the Government had issued orders that no more new mills be built in this field. The latter rumor is not correct, but the machinery [illegible] in question has decided that it would be unpatriotic to ask for new steel to use in mill building when there is an abundance of second-hand machinery in the field. This company does not deal in second-hand machinery, so its [illegible] is free from question on the score that it is trying to better its own interests. It will undoubtedly lose considerable business by its stand. The supply of second-hand machinery in this field, which was decidedly short two years ago, has suddenly become plentiful. At this time there is little opportunity for the sale of new mining machinery, unless it is of some new pattern or design that has not been used here generally. Numerous mills that were "[illegible]" [illegible] early are now on the market.

Organization of a Local Branch of the American Zinc Institute was decided upon by about 50 mine owners and operators who met in Joplin on Aug. 10. Victor Rakowsky, who was instrumental in the formation of the National American Zinc Institute, called the local meeting and presided as chairman. It was decided by the operators present, who represented more than 80% of the zinc production from this field, that it would be well to form an organization to include representatives from the mercantile and banking interests of the district, as well as from the mining industry. A committee of three, P. B. Butler and F. C. Wallower, of Joplin, and R. D. Tuthill, of Miami, all representing mining interests, was named by Mr. Rakowsky and empowered to select four more men from the mining industry, the seven to form the first board of directors for the new organization for the coming year. One of the duties of this committee, besides the completion of the organization plans, will be the selection of a committee of 51 members, 17 of whom are to come from the mining, 17 from the mercantile and 17 from the banking interests of the district. This committee will be entrusted with the task of raising at once a fund of $50,000, to be used in defraying the expenses accrued and accruing for the betterment of the industry during 1918 and thereafter. It will be known as the Missouri-Kansas-Oklahoma War Chest Fund. It is not certain that the new body, which is to be known as the Missouri-Kansas-Oklahoma Zinc Institute, can become a part of the American Zinc Institute, recently formed at St. Louis, under the plan of organization as outlined at the meeting here, but at least application for entrance will be made. A resolution adopted provided that the plan of organization should be drawn up along lines to conform with those of the American Zinc Institute.

MOUNTAIN HOME, ARK.—Aug. 13

Development in the Batesville Manganese Field is progressing rapidly. Activity is marked in the transfers of land and leases, and the influx of new operators is heavy. Owing to the fact that the ore occurs in clay, and in most instances is determined by outcrops, little development work is necessary before production can be made, and production is picking up rapidly, many properties having been brought to a producing stage since activity started early in the year. Shaft and drift methods of mining are being used in some instances, when the orebody is penetrated from the top, and the overlying Boone chert is too thick to strip, but most of the work is by open-pit methods. Prospecting is general over the entire field, and is broadening the ore-producing area. A number of washing plants are in operation, several are under construction and will be completed within the next sixty days, and many more are planned or contemplated. If present conditions hold, there will be at least 25 in operation by the first of 1919, with capacities of from 100 to 300 tons per day. Hand jigs are also being pressed into service and are in use all over the field. They are of the same type used in cleaning and concentrating zinc ores. Regular Joplin-type jigs are a part of the equipment in most of the new plants under construction. They will be used in the final cleaning and concentrating process, the finer product going into them after passing through the log washer which does the preliminary work. A few of the plants that are in operation and some under construction are straight jig plants, the log washer not being used at all. Instead of trams to carry the crude ore from the pits or mines to the washer, some of the operators are installing flumes, which are feasible, owing to the fact that all the ore occurs in clay. A pipe line follows the flume, the crude ore is dumped directly into it and carried by water and gravity to the plant. This process removes a large part of the clay before the crude gets to the plant. Cushman, the hub of the manganese industry, in this section, for years has been a sleepy little mountain village but is now taking on all the general characteristics of a live Western camp. The heaviest flow of new operators is coming from southwest Missouri and the North Arkansas zinc fields. Most of the operators are experienced mining men. This is giving the field a stability that promises its maximum development. The price set on ore in May is also having the effect of stimulating development.

GOLD HILL, ORE.—Aug. 15

Recent Uncovering of Large Chrome Deposits on the extensive serpentine dike extending through the north end of Jackson County may make the Gold Hill district a chrome producer which will equal the output of the Waldo district, in Josephine County. The new find adjoins the famous hydraulic placer mines on Pleasant Creek. The ore runs 45%, will be mined by open cuts, and is situated on a good county road 14 miles to the shipping point at Rogue River, nine miles west of Gold Hill.

Interest in Gold Mining has increased in the Gold Hill district since gold mining has been listed as an essential industry by the War Industries Board. In 1914, the Ashland, Braden, Bill Nye, Opp, Lucky Bart, and many other well-equipped gold mines in the district suspended, and operators took up the mining of quicksilver, manganese, chrome and other war metals. In view of the rich strikes in the 400 and 600 levels of the Ray & Haff mine three miles north of Gold Hill, the reopening of the Red Oak group, and negotiation for the reopening of the Braden and several other old producers in spite of the rising expense of mining, a general revival appears assured.

SPOKANE, WASH.—Aug. 16

The Northwest Mining Association is making plans for the gold convention to be held in Spokane, on Sept. 5, and is having a splendid response from several districts, indicating a large attendance. R. F. Green, member of Parliament from West Kootenai, B. C., will attend, and it is also expected that J. F. Gallbreath, secretary of the American Mining Congress, will be present. Invitations have been sent to all districts of Washington, Oregon, Idaho and Montana. The producers of each district will be asked to form local bodies and crystallize sentiment on the means for alleviating the hardships of operators at the standard price for the metal. They will be asked to send a delegate with the sentiment of the local in concrete form, that the organization may act promptly and simultaneously with other sectional organizations throughout the West.

TORONTO—Aug. 17

The Price of Platinum in Canada, according to an arrangement affected by Hon. Martin Burrell, Canadian Minister of Mines, with the Imperial government, has been fixed at $105 per oz., in uniformity with the price in the United States.

Prospectors and Owners of Mining Claims in Northern Ontario find increasing difficulty in securing men to do assessment work, the great demand for labor for harvesting having reduced the number of men available. Unless the stringency of the regulations regarding assessment work is relaxed, many are likely to lose their claims through being unable to complete the work within the time limit. It is expected that in cases where an effort has been made to comply with the law, the government will not insist on its rigid enforcement.

Boundaries of the Temiskaming Mining Division of Northern Ontario have been arranged so as to include the Doherty silver area, with recording office in Haileybury. The division now embraces the townships of Strathy, Strathcona, Law, Olive, Milne, Askin, Riddell, Cassel and that part of the Temagami forest reserve lying east of the Temiskaming & Northern Ontario Ry. The rearrangement is welcomed by mining men and prospectors interested in the Doherty district, who have been put to some inconvenience owing to the records for that section being kept in Toronto.

Scheelite Deposits Near Falcon Lake, Manitoba, are to be thoroughly tested. A force has been sent from Winnipeg, in charge of E. E. Kain, to operate the Empress claims, in the Star Lake area, and take out a car of ore, which will be shipped to Ottawa. Arrangements have been made with the Imperial Munitions Board to have the first shipment treated gratis, and should the product prove of commercial value the Munitions Board will fix a price for the treatment of further consignments that will just cover the cost. A small concentrating mill will then be built and a steamer put on the Falcon River.

RIO DE JANEIRO—June 12

Ouro Preto Gold-Mining Co. in its report for 1917 states that during the year 82,500 tons of ore was mined, which produced 28,840 oz. gold. The working cost per ton over that of 1916 was 41 farthings, the total profit having been £4832, as compared with £7240 for the preceding year. The superintendent of the mine reports the discovery of good deposits of manganese at shallow depths on the Morro de Sant' Anna property belonging to the company, and that the exploitation of this mineral here, as well as at other places in Minas Geraes, offers good profits were it not for the heavy export taxes and the prohibitive freights on the railway.

CAIRNS, QUEENSLAND—July 6

Copper, Tin and Rare Metal Production of Queensland may suffer unless the I. W. W. element is stamped out. The labor government of the state is not active in this direction. However, a measure has been proposed which intends purchasing the Chillagoe mines, smelteries and railways and placing their operation under the state government. The mines and plants have been closed since 1914

The Kitchener Molybdenite Mine, situated 120 miles west of here, has a good showing on several levels where the mineral occurs in a white quartz fissure vein. Treatment consists of stamping and flotation, which secure a high and clean recovery. Present reserves are estimated as being valued at $1,000,000 and the property will doubtless become an important producer. Present capacity of stamps is a ton of metal per week. Another concern operating in North Queensland is the Thermo Electric Ore Reduction Corporation, Ltd. This company has mines situated at Wolfram and Mount Carbine, both 80 miles west of Cairns. Bismuth, tungsten and molybdenite are mined. However, owing to a strike, the mines and stamp mill are not now being worked. Dissatisfaction is expressed over the present prices paid for Australian molybdenite and tungsten by the Imperial government. In the case of molybdenite, £5 per unit is paid and for tungsten or scheelite, 52s. per unit. By selling to United States markets, Canada can realize nearly double this price

The Mining News

ARIZONA

Cochise County

SHATTUCK, ARIZONA (Bisbee)—July production was: Copper, 672,024 lb.; silver, 12,292 oz., and gold, 103 oz. Production for seven months of 1918 was: Copper, 5,878,198 lb.; lead, 444,937 lb., silver, 86,271 oz., and gold, 706.60 ounces.

Greenlee County

CORONADO (Clifton)—Accumulated gas from fire caused explosion, and subsequent cave-in resulted in the death of a shift boss and two miners.

Mohave County

CAMP BIRD (Kingman)—Shaft down 118 ft. Crosscutting vein on 100 level.

GOLDEN CROSS (Kingman)—Resumed work on Jack Pot claim. To sink vertical shaft to cut the vein at 150 level.

RICO EXPLORATION (Kingman)—Sinking below permanent water level. To crosscut vein at 200 level and drift through orebody.

RURAL (Kingman)—To be equipped with hoist and other machinery. Shaft is being unwatered.

Pima County

CHAMPARADO (Tucson)—Hoist to be installed.

Pinal County

ARIZONA HERCULES (Ray)—Has moved the dismissal of several suits, involving spur tracks, ore bins, mill and electrical service, against Ray Consolidated Company.

Santa Cruz County

FLUX (Patagonia)—Operating 200-ton mill and handling sand-carbonate carrying lead and silver.

Yavapai County

BIG LEDGE (Huron)—Sump on 450 level of Henrietta mine completed.

GRAND ISLAND (Jerome)—Completed enlargement of 208-ft. shaft to three-compartment and will sink soon.

GREEN MONSTER (Jerome) — Shaft down 795 ft. and in diorite.

JEROME VERDE (Jerome)—Raise to connect Maintop orebody with 1100 level to be completed soon.

UNITED VERDE EXTENSION — (Jerome)—Have ceased shipping ore to custom smelteries, and entire mine product is being sent to smeltery at Verde.

VERDE COMBINATION (Jerome)—Installation of pipe connecting pump on 1080 level to outlet in Mescal tunnel has retarded development work.

YABA COPPER (Jerome)—To operate group of claims near the United Verde.

ARKANSAS

Independence County

DENNISON-BARKSDALE (Batesville) —Have purchased 160 acres of manganese land on Lafferty Creek, and will install the first hydraulic washer in the manganese field. Equipment will consist of 1200-gal. pump, 2500 ft. 10-in pipe, 100-hp. engine at river, 150-hp. engine at foot of hill for pressure and a 700-gal. 1½-in. stationary ball and socket nozzle. Final process of cleaning will be done with regular Joplin type jigs.

RUHL (Batesville)—Sixty-acre tract under operation by Otto Ruhl, of Joplin. Development under way.

PAGE (Cushman)—Under operation by Stanley Hanford and Walter Denison. Five shafts in high-grade manganese ore.

CALIFORNIA

Butte County

CHROME DEPOSITS discovered by J. A. Clark near Intake, on the Western Pacific, are being operated under lease.

EMMA (Nimshew)—Operated by Aubrey H. Rugh under lease.

Calaveras County

UTICA (Angels Camp)—New ore recently cut in Cross shaft said to be of sufficient amount to warrant resumption of Stickles mill.

Glenn County

CERESE GOLD (Willows)—Have discontinued operations.

Humbolt County

CHROME MINES at Pecwan Creek and Red Mountain operated by Englebright and Marsh are producing steadily and shipping from Requa by water to Eureka for reshipment by Northwestern Pacific Railway.

Nevada County

UNION HILL (Grass Valley)—Shaft at 1250 level, new station completed at 1200 and pumps and compressors installed. Active development in progress. Tungsten is associated with gold ores and is concentrated on the ground. Concentrates are treated for gold extraction at the Pioneer Reduction works in Grass Valley. Report that the Union was to be abandoned is false. Union is controlled by the Gold Point Consolidated Mines Co., which also controls the Gold Point. South Idaho and Idaho Development Co. mines. Erroll MacBoyle is manager.

San Luis Obispo County

GOODWILL COPPER (San Luis Obispo)—New 200-ft. shaft has cut good ore. Will be developed by 500-ft. tunnel.

Shasta County

SHASTA COUNTY MINERAL PRODUCTION in 1917 amounted to $9,218,396, chiefly copper.

AFTERTHOUGHT (Ingot)—Part of the flotation plant being dismantled and the milling plant to be remodeled.

Siskiyou County

SISKIYOU SYNDICATE (Callahan)—Have ceased to operate gold mines in the Sawyer Bar district and are developing and shipping chrome ore near Callahan.

CHALCO COPPER (Hornbrook)—Have taken over Houstan mine, and Chalco group near Hornbrook. Double-compartment shaft to be sunk 200 ft., with drifts and crosscuts on the Chalco. Also purposes to erect 50-ton mill.

Trinity County

NEELY (Castella)—Three motor trucks used to haul chrome ore to Castella, for shipment by Southern Pacific.

GLOBE (Dedrick)—Recently reported permanently closed down, and plant being dismantled. H. M. Hall, of San Francisco, principal owner, says the mine will not be abandoned, but new development is to begin immediately. Property is equipped with 20-stamp mill, tube mill and cyanide plant and a two-mile aërial tramway.

COLORADO

Boulder County

UTICA (Boulder)—Plans to construct flotation mill when men and supplies are available. C. H. Fry is general manager.

Gilpin County

GILPIN-EUREKA (Central City)—Plans underground development and modernization of mill with flotation unit.

San Miguel County

SHIPMENTS FROM TELLURIDE during July were: Smuggler Union and Black Bear mines, 14 cars to Durango and 51 cars to Pueblo; Tomboy, 25 cars to Durango and 16 to Pueblo; Total, 106 cars, all concentrates. Shipments for same month last year were 127 cars.

CARBONERO (Ophir)—Development in progress in ground operated by the Ruttila-Brown Leasing Co. and payable ore has been opened.

CARRIBEAU (Ophir)—Mine production sufficient to keep mill in operation. Tailings from old dump being treated at flotation plant with satisfactory results. Bunk house, boarding house, and assay office were recently destroyed by fire caused by defective gasoline heating arrangement in assay office.

BLACK BEAR (Telluride)—Shaft sunk to 100 level, station cut and drifting each way on vein.

Teller County

ACACIA (Cripple Creek)—Developing on 1400 and 1700 levels. Kenneth Mackenzie is general manager.

IDAHO

Boundary County

IDAHO-CONTINENTAL (Porthill)—Eleven automobile trucks and 10 wagons used to transport ore from mill to Porthill. Tramway connects mine and mill.

Shoshone County

NABOB CONSOLIDATED (Kellogg)—Cut parallel orebody in raising to Denver tunnel level. William H. Beaudry is manager.

FEDERAL MINING AND SMELTING (Mullan)—Miners at Morning mine and at Gold Hunter property have returned to work.

SARINA (Wallace)—To extend No. 4 tunnel to cut vein disclosed in No. 2 tunnel.

SUCCESS (Wallace)—Have resumed operations after shut-down since last April.

KANSAS

Joplin District

RODERS (Harrison)—Moving and remodeling Jersey 200-ton mill. Will purchase tables, belts, drills, ore cars and track.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Copper production in July was 11,118,426 lb. Producers were: Ahmeek, 1,885,705 lb.; Allouez, 590,449; C. & H., 5,284,105; Centennial 193,006; Isle Royale, 1,279,579; La Salle, 140,706; Osceola, 1,398,216; Superior, 130,666 and White Pine, 215,994 pounds.

HOUGHTON COPPER (Houghton) — Drift on third new vein of Superior lode in good copper rock.

NEVADA

Clark County

MANGANESE ASSOCIATION (Las Vegas)—Low silica manganese ore opened in sedimentary formation 16 miles southeast of town. Ore occurs in flat shoots up to 20 ft. thick. Mining by churn drilling and blasting with black powder. Ore hauled to railroad by truck. Mine owned by Thomas Thorkildsen, of Sterling Bora Company.

Esmeralda County

GRANDMA CONSOLIDATED (Goldfield) —Shaft completed and station being cut at 865 level.

Humboldt County

ROCHESTER MINES (Rochester) — Driving north on 10 and 11 levels in milling grade ore.

Lyon County

MALACHITE COPPER (Mason)—Lessees operating on Malachite and Natchez workings. Shipping good-grade carbonate and sulphide copper ore.

WESTERN NEVADA (Mason)—Making regular shipments of copper sulphide ore. Ore loaded at McConnell spur.

BLUESTONE (Yerrington)—New electric pumping plant completed. New cottages being built for employees.

Mineral County

AURORA CONSOLIDATED (Aurora)—Property closed down, as it cannot be operated at a profit under present conditions. Mill may be dismantled.

WALL STREET (Luning)—Only high-grade copper ore being shipped. Ore packed by burro, wagon haul and then railroad freight.

Nye County

TONOPAH DISTRICT ore production for the week ended Aug. 10 totaled 9183 tons, of an estimated gross milling value of $156,111. Producers were: Tonopah Belmont, 1899 tons; Tonopah Mining, 3250; Tonopah Extension, 2053; Jim Butler, 343; West End, 974; Halifax, 66; Montana, 234; MacNamara, 315; Monarch Pittsburg, 23, and miscellaneous, 26 tons.

BIG PINE (Manhattan)—Milling of over-size mill dump resumed. Work delayed by slow delivery of tube-mill liners. About 200 tons per day being treated.

MANHATTAN CONSOLIDATED (Manhattan)—New vein cut in crosscut on fifth level.

UNION AMALGAMATED (Manhattan) Opening Earl orebody on 700 level.

WHITE CAPS (Manhattan)—Contract let to sink shaft an additional 150 ft below fifth level.

TONOPAH BELMONT (Tonopah)—New [illegible] mill of Belmont-Wagner Development Co., a subsidiary company at Telluride, Colo.; formerly the Alta mine, completed and ready for operation.

TONOPAH DIVIDE (Tonopah)—Crosscut on [illegible] level recently opened gold-silver ore. Drift extended [illegible] ft to southeast in ore, full width of drift in ore and one wall not exposed. To crosscut [illegible] ft to expose full width of orebody.

TONOPAH MINING (Tonopah)—Examination of property in Nye County is under way. If taken will be incorporated in name of Nevada [illegible] Mining Co., a subsidiary company.

OKLAHOMA

Joplin District

QUEBEC (Douthat)—Mill completed and plant to be started soon. E. R. McClelland, Kansas City, is owner.

BIG TEN (Lincolnville)—Sinking shaft and probably will build mill.

LEAD BOY (Miami)—To remodel and enlarge concentrator to 250 tons. Expect to purchase tables, crusher and compressors. R. H. Elkins is superintendent.

LUCKY JOE (Miami)—Changed from steam to gas power and started mill.

WAXAHACHIA (Miami) — New mill ready for operation, but, there is a scarcity of water. Attempt to be made to get sufficient water from drill hole on property.

ACME (Picher)—Operating after shutdown of several weeks due to broken compressor.

CORTEZ (Picher)—To build 250-ton mill and expect to purchase tables, crushers, compressors, conveyors and gas engine. W. T. Landrum is superintendent.

EAGLE - PICHER (Picher) — Moved boarding house to allow sinking of third shaft for Crawfish mill.

HIDDEN TREASURE (Picher)—Planning erection 350-ton mill. Colin S. Campbell, of Oklahoma City, is president. John Grifford, of Baxter, is manager.

MANHATTAN (Picher)—Leased to John Skinner and associates, who will operate.

ROYAL (Picher)—Operating after being down several weeks for overhauling.

ALAMO LEAD AND ZINC (Quapaw)—To build 200-ton mill and expect to purchase tables, engine, compressors, crushers and ore cars. Joe T. Burger, Dallas, Tex., is superintendent.

CHARLOTTE (Quapaw)—Purchased mill at Granby and will move it to lease near old Red Eagle mine, at Lincolnville.

DORRIS (Quapaw)—New 250-ton mill in operation.

SAMBO (Quapaw)—Purchased by Chas. H. and William S. East, of Lima, Ohio, and Walter Peltier, of Miami. Mill being overhauled.

HUTTIG LEAD AND ZINC (St. Louis)—To build 200-ton mill and will purchase compressors, crushers, tables, engine and boilers. R. M. Simrall is superintendent.

HEALDTON (Tar River)—Sinking shaft and expect to build mill.

OREGON

Douglas County

E. B. CRANE (Cottage Grove)—Taken over the Buena Vista group of quicksilver mines, situated near the Douglas-Jackson county line, and owned by W. S. Webb, of Gold Hill.

Jackson County

LITTLE JEAN (Gold Hill)—Lease on cinnabar mine taken by Toney Ross. Property equipped with 12-pipe mercury furnace and has been a producer since 1878.

Josephine County

AMERICAN EXPLORATION & DEVELOPMENT (Grants Pass)—Unwatering old Tyson chrome mine on Chrome hill, near Smith River. This is the oldest chrome mine on the continent and was worked in the early 70's, but abandoned in 1875.

UTAH

Juab County

VICTORIA (Eureka)—Portion of the mine to be operated by lessees.

Salt Lake County

SELLS (Alta)—Expect to place tramway in operation September 1.

Tooele County

GOLD HILL (Gold Hill)—Making regular shipments of lead-silver ore. Shaft retimbered and will be sunk to 500 level.

SOUTHERN CONFEDERATE (Gold Hill)—To install hoist at shaft and resume sinking. W. C. Davis is superintendent.

WESTERN UTAH EXTENSION (Gold Hill)—Mining on 200 and 300 levels of Mogul shaft. Winze in Helmet tunnel to be sunk 100 ft. in vein.

YELLOWHAMMER (Gold Hill) — Improvements completed and mining resumed.

WASHINGTON

Stevens County

NORTHWEST MAGNESITE (Chewelah) —Produced 4000 tons of calcined magnesite during July. Four kilns are in service and two more are to be added.

SPOKANE COPPER (Loon Lake)—To resume operations. To crosscut from bottom of 110-ft. shaft.

CANADA

British Columbia

SILVERSMITH (Sandon)—Opened large orebody. Will increase force if possible.

Ontario

APEX (Porcupine)—Mining plant has been sold.

SANDY FALLS (Porcupine) — Power plant on Mattagami river has been closed Decreased calls for power in Porcupine can be met by the Waweatin plant.

THOMPSON KRIST (Porcupine) — Has not been able to make arrangements with Vipond to continue work from 400 level of latter company's property.

COBALT SHIPMENTS for the week ended Aug. 10 were: McKinley-Darragh, 144,348 lb.; Nipissing, 81,250 Dominion Red, 78,000; Trethewey, 77,165 and Coniagas, 58,318 lb. The shipments aggregated less than 220 tons.

COCHRANE (Cobalt)—Has been leased by the Temiskaming, which will develop.

KERR LAKE (Cobalt)—July production was 231,000 ounces. For year ended July 31 production was 2,359,229 ounces.

MINING CORPORATION (Cobalt)—Has dropped option on group of claims at Fort Matachewan and has sold plant and supplies to the Nipissing, which will develop property adjoining the Otisse.

NIPISSING (Cobalt) — High-grade mill has been closed, as company finds it can treat high-grade and concentrates in the low-grade mill and effect a considerable saving.

PETERSON LAKE SILVER COBALT (Cobalt)—Has completed 100-ton mill. J. W. Hosking is superintendent.

PROVINCIAL (Cobalt)—Has been closed down, but is expected to reopen in the fall.

WALDMAN (Cobalt) — Operations on property, which is under option to the Mining Corporation of Canada, have been discontinued.

KEELEY (South Lorraine)—To resume operations in charge of Malcolm Black. West of Wettlaufer mine and developed by several shafts.

PITTSBURGH LORRAINE (South Lorraine)—Has leased Wettlaufer mill and mine and is carrying on exploration work. R. T. Strong is manager.

LAKE SHORE (Kirkland Lake)—Treated 1761 tons of ore, averaging $24.61 and received $43,353 in June. Most of the ore came from development.

ONTARIO-COLORADO (Matachewan)—Diamond drilling of this property, formerly the Otisse, is meeting with favorable results.

OTISSE (Fort Matachewan)—Four diamond drill holes have been put down and drilling is being continued.

SULLIVAN (Matachewan) — Surface samples show high grade gold content.

McIVOR CLAIMS (Beatrice Lake)—Small mining plant has been installed.

MILLER INDEPENDENCE (Boston Creek)—Sinking has been resumed. To sink shaft to 200 level and drift east and west.

RENAUD CLAIMS (Boston Creek)—Has been taken over by Robert Norrington, representing Detroit interests.

CORDOVA (Cordova Mines)—Electri plant to produce ferrochrome. Crude or obtained from Quebec. P. Kirkegaard is i charge.

HOWIE-COCHENER (Lightning River —Installed plant and will resume shaf sinking.

PERU

Junin

CERRO DE PASCO (Cerro de Pasco)-July production was 2619 tons of blist copper.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsa —July cleanings, $111,000. June tonna milled aggregated 25,289 tons.

The Market Report

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver		Aug.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
15	4.7600	99⅝	48$\frac{13}{16}$	19	4.7550	101⅛	48$\frac{13}{16}$
16	4.7600	99⅝	48$\frac{13}{16}$	20	4.7550	101⅛	48$\frac{13}{16}$
17	4.7600	99⅝	48$\frac{13}{16}$	21	4.7550	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
15	*26	†	8.05	7.75	8½ @8¾
16	*26	†	8.05	7.75	8.70 @8.80
17	*26	†	8.05	7.75	8.70 @8.80
19	*26	†	8.05	7.75	8.75 @8.85
20	*26	†	8.05	7.75	8⅞ @9
21	*26	†	8.05	7.75	9 @9⅛

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Aug.	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
15	122	122	137	385½	385½	29½	28½	54
16	122	122	137	385½	385½	29½	28½	54
17	...	...	...	...	...	...	...	...
19	122	122	137	381½	381½	29½	28½	54
20	122	122	137	377½	377½	29½	28½	54
21	122	122	137	375½	375½	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Aug. 21, 1918

The main features of interest in the metal markets this week were the advances in the prices of zinc and silver, the continuation of the easiness in tin, and more acuteness in the stringency in lead.

Copper—There was nothing of special interest to report.

The copper selling contract between the Granby Consolidated Mining, Smelting and Power Co. and the American Metal Co. will soon expire and will not be renewed.

The United Verde Copper Co. has taken over the sale of its own copper, which heretofore has been sold by L. Vogelstein & Company.

Copper Sheets—Situation unchanged; prices not quoted. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper. Unchanged

Tin—The recent large arrivals of tin, together with reluctance on the part of buyers, have produced a decidedly easier situation in this metal. Even some lots of Straits tin have turned up in the market, one or two sales at 90c. being reported. However, this kind of tin is earmarked for Governmental purposes and is subject to allocation; wherefore there is no general market in it. Banka tin and 99% grades have sold at 88c. However, shipments of Banka cannot be contracted in Batavia for less than $1. The East is very firm, and local dealers look for higher prices again in this market.

Singapore quoted £381½, c.i.f., London, on the 15th; £383½ on the 16th; £379½ on the 19th; £377½ on the 20th; and £375½ on the 21st.

Lead—The situation remains unchanged. August lead is no longer to be had, and practically the same can be said of September supply. Anyhow, the latter is very scarce indeed. The production of domestic lead in the first semester of 1918 was 266,874 tons, not including antimonial. This figure is to be compared with 563,000 for the whole of 1917, and 570,000 tons in 1916; wherefore it is evident that there has been a serious decline in production, which is the root of the present trouble. The present effort is to reduce non-essential consumption still further.

Under date of Aug. 20, the following notice was sent out by Clinton H. Crane, chairman of the Lead Producers' Committee: "The demand for pig lead for use on vital war work is now so acute that all possible conservation of the existing supply has become imperative. The Lead Producers' Committee for War Service earnestly requests the coöperation to this end of every manufacturer and dealer. All are asked to endeavor to eliminate non-essential uses of lead in order that there may be more available for direct and indirect United States Government orders and for other work of national importance. It is necessary that all consumers and jobbers refrain from accumulating any stocks except such as will allow a reasonable working margin. No pig lead whatsoever will be sold by producers for re-sale in carload lots. Re-melted or scrap lead is not to be sold at higher prices than the current market for virgin lead. Retail dealers may be supplied solely on the basis of their agreement to re-sell only to customers whose requirements appear to be essential, and also to limit the price charged to ½c. per lb. in excess of the ruling wholesale price."

By a typographical error the quotation for 3 months lead in London on Aug. 12 was given at £29½ instead of £28½, the latter being the correct figure.

Zinc—This market advanced rather rapidly on only a moderate volume of business. The reasons for the advance are rather mysterious. The weekly statistics that are now being published have been favorable, and without reflecting any fundamental change they have undoubtedly created a more optimistic sentiment. Some recent buying for export to Japan has probably had an effect also. We are inclined to think, however, that some domestic manufacturers who have failed to cover their requirements for the remainder of this year have overstayed their market too long. On the 19th spelter sold at 8.75c. in the early part of the day, while in the latter part, 8.85c. was realized for a round lot, with buyers over. On the 20th 9c. was realized, and on the 21st there were sales in the morning at 9c., and in the afternoon, at 9⅛c., with buyers over.

The sheet zinc producers met the War Industries Board on Aug. 21 and discussed price, with the result of an agreement to maintain the existing prices. The producers proved substantial increases in cost of production, but made no request for higher prices. The producers of high-grade and refined zinc are to meet the War Industries Board on Aug. 22. In their case an awkward situation develops, for with common spelter at 9c., high-grade will have to be higher than 12c., else refining by redistillation will cease, a margin of 3½c. being reckoned necessary for that purpose.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4. Unchanged.

Aluminum—Price fixed at 33c. per lb. for lots of 50 tons or more, ingot, 98-99% grade. Sheets are 42c. per lb. for 18 gage and heavier. Price established June 1 and continues to Sept. 1. Unchanged.

Antimony—Strength in this market continued. There were some Governmental inquiries here, and Japan was reported again to be a buyer in China. The course of the market in the near future will depend a good deal upon the situation as to the stock. It is the common opinion that the latter has been much reduced. We quote spot at 14¼@14½c. We quote futures at 13¼@13½c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted $1.50@1.75 per pound. Unchanged.

Nickel—Market quotation: Ingot, 40c.; shot 43c.; electrolytic 45c. per lb. Unchanged.

Quicksilver—Unchanged at $125. San Francisco reports by telegraph, $117.50, steady.

Gold, Silver and Platinum

Gold and Silver Shipments—According to a report from the United States Sub-Treasury, gold coin amounting to $205,000 has been withdrawn for shipment to Mexico. In addition, it was announced that $1,000,000 in silver had been withdrawn from the assay office for shipment to India. This is presumably a part of the silver melted from silver dollars by the Treasury Department, 100,000,000 of these coins having been melted within the last three months to provide silver for shipment to China, Japan and India.

Silver—The Treasury Department issued a ruling on Aug. 15, 1918, defining the future policy of the Government with respect to silver exportations, and the order was published in the press throughout the country as follows:

"Under the authority of the act of Congress approved Apr. 23, 1918, silver has been sold by the Secretary of the Treasury at a price which will permit the Treasury, from new purchases of a corresponding amount of silver at the price of $1 per fine oz., to recoin the silver purchased into silver dollars without loss. In order to provide for the various items of expense involved, it was found necessary to fix the price for which silver was sold at $1.01½ per fine oz., and it was made a condition of sale that the purchaser should not pay a higher price for silver in other markets than in those of the United States. Up to the present time the Federal Reserve Board has freely granted licenses for the export of silver. In order, however, to conserve the use of silver, export licenses for silver will hereafter be granted only for civil or military purposes of importance in connection with the prosecution of the war, and only in cases where the exporter certifies that the silver to be exported has been purchased at a price which does not directly or indirectly exceed $1.01½ per oz. 1000 fine, at the point where silver is refined in the case of silver refined in the United States or at the point of importation in the case of imported silver. Applications for licenses to export silver should also state from whom the silver was purchased, the point at which silver was delivered to purchaser, for whose account and by whose order and for what purpose the silver is to be exported."

This ruling in effect establishes a maximum price of $1.01½ per oz. 1000 fine, and the silver price will hold at this figure so long as the demand for export exceeds the supply. Our Government will consequently be unable to purchase silver at $1 per fine oz. until this law of supply and demand operates to bring the price of silver in the open market down to that figure.

The British Treasury has raised its maximum price to 49½d. to conform to maximum price in the United States. The New York official price has been fixed at $1.01½ per oz. 999 fine.

Mexican dollars at New York: Aug. 15, 77; Aug. 16, 77; Aug. 17, 77; Aug. 19, 78; Aug. 20, 78; Aug. 21, 78.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 17—Blende, per ton, high, $77.20; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $52.50@50; calamine, basis 40% zinc, $37.50@30. Average selling prices: blende, $55.10; calamine, $36.83; all zinc ores, $54.65.

Lead, high, $102.70; basis 80% lead, $100; average selling price, all grades of lead ore, $100.26 per ton.

Shipments the week: Blende, 10,835; calamine, 278; lead, 1522 tons. Value, all ores the week, $760,650.

The closing strength of last week was manifested in a $5 advance on purchases this week, and this week closes even firmer, with all buyers in the market with larger orders to fill, and sellers today declining to sell until next week's market. For awhile yesterday there was a lull, then heavier orders came to the buyers and the sellers stiffened and then declined to sell.

Platteville, Wis., Aug. 17—Blende, basis 60% zinc, $75 for premium grade. Highest settlement price reported was $74 per ton. High-lead blende, base $47.50. Lead ore, basis 80% lead, $93 to $95 per ton. Shipments reported for the week were 2614 tons blende, 303 tons galena and 598 tons sulphur ore. For the year to date, the totals are 82,281 tons blende, 4809 tons galena and 31,817 tons sulphur ore. During the week 2325 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Offerings from the West are more liberal, especially of the lower grades, and prices are a shade easier.

Manganese Ore—Unchanged.

Molybdenum Ore—Unchanged, with buyers conspicuous by their absence.

Tungsten—The market continues very active in high-grade ores, and high-grade scheelite is difficult to obtain at the prices quoted, $25.50 per unit. The highest grade wolframite realized $24.50; lower grade wolframite, high in tungstic-acid content, sold for $24; wolframite with a slight percentage of impurities sold for $23. Impure scheelites are hard to market; impure wolframites are quoted at $18 to $20 per unit.

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight; but no sulphur imports are being received. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines f.o.b. mines. Unchanged.

Iron Trade Review

PITTSBURGH—Aug. 20

The weather has been favorable in the past few days from the production standpoint, and furnaces and mills are beginning to look for record-breaking outputs within a few weeks. Curtailment in output from weather conditions this season has been unprecedentedly small. On account of various troubles from time to time, chiefly coke shortage, output has at no time been at rated capacity since late in 1916. Record rates of actual production may be reached without capacity operation being attained, because there has been much increase in capacity. Causes of output being at less than capacity are being carefully studied. There is now relatively little actual shortage of coke, but considerable complaint regarding its quality. Because of poor [illegible] per ton of pig iron [illegible] and there is [illegible] in the actual output. In [illegible] too many [illegible] and [illegible] than pig iron, and that the authorities are likely to order [illegible] furnaces back to pig iron, [illegible] than the manganese alloys. As to steel mill outputs, the greater restrictive influence is shortage of scrap, particularly shortage of the better grades, and this, of course, cannot be remedied.

The testimony of department representatives before Congressional committees in connection with the draft law, that the war can be won in 1919, gave the steel industry no new view, as that idea has been entertained for several weeks at least, and is no doubt based upon the magnitude of the preparations, with which the trade is familiar, though there has always been a ban upon the giving out of details. As to steel consumption, additional information is made available through the official announcement within the week that the warehouses built and being built in the United States by the Construction Division of the Army total $218,000,000 in cost and involve 33,800,000 sq. ft., and are made almost entirely of concrete, brick and steel.

With only moderately favorable conditions, the production of finished rolled steel in the present half year should be about 18,000,000 net tons, taking account of the summer curtailment, and a rate of 40,000,000 net tons a year is distinctly possible for the future, and some new construction is under consideration.

Pig Iron—The shortage of pig iron has grown more pronounced and is variously ascribed to a combination of causes, poor quality of coke, shortage of coke, indifference of labor at some furnaces, too much blast-furnace capacity on ferromanganese and spiegeleisen—19 furnaces at last count—shortage of scrap, requiring openhearth furnaces to use more pig iron than normal, and the heavy demands of Great Britain, France and Italy. Selling for first half 1919 has practically stopped, partly because furnaces are not certain that they will be able to deliver after direct orders and allocations are met and partly because the War Industries Board does not seem to favor operation. Allocations for early deliveries continue heavy. Some steel mills that have always got their pig iron from the same source under long-term contracts have had to depend largely upon allocations, as the iron they usually get is still more useful in some other connection. There are practically no open-market transactions. Allocations represent forced orders at the set prices, which remain: Bessemer, $35.20; basic, $32; foundry, $33; malleable, $33.50; forge, $32; f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less.

Steel—Substantially all the soft steel in unfinished form is already moving in approved channels, leaving nothing new to be sold in the market or to be allocated. Prices remain: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57. Only occasional small lots of shell-discard steel come out, and any that can possibly be graded as forging is sold under that category.

Ferroalloys—Ferromanganese was recently in poorer supply, but there is no difficulty at present, and, as noted above, some observers think too much is being produced and that some furnace capacity should be diverted to pig iron, which is more urgently needed. On the whole, domestic ores have not proved as good as expected, being too lean, and more Brazilian ore will have to be imported than was counted upon, but the authorities will take care of this. The recent recommendation that large consumers cover for the first half of 1919 is interpreted to mean that the price, although not formally fixed, as in pig-iron and steel products, will continue, and that ore will be provided at a fair cost. The market is only moderately active, despite the recommendation as to buying for first half of 1919. Some large consumers are already covered, though others have not yet begun to buy. The market remains at $250, delivered, for 70% ferromanganese, with $4 a unit for higher manganese content, and at $75, furnace, for 16% spiegeleisen.

Coke—As byproduct-coke production increased during the second quarter of the year, through the completion of more capacity, the beehive production seemed in a fair way to continue, but in the last few weeks beehive production has decreased almost as much as byproduct has increased, the coal for the new byproduct ovens having to be taken from beehive ovens to large extent. Generally speaking, the country's output is now running at a trifle above 600,000 net tons a week beehive and a trifle above 525,000 net tons byproduct, with prospects that byproduct will pass beehive in from two to four months. It was in the first week in July that byproduct production first crossed the 500,000-ton mark.

STOCK QUOTATIONS

N. Y. EXCH.†	Aug. 20
Alaska Gold M.	3¼
Alaska Juneau	2
Am.Sm.& Ref.,com	78½
Am. Sm. & Ref., pf.	104
Am. Sm. Sec., pf., A	90½
Am. Zinc	18
Am. Zinc, pf	‡49½
Anaconda	65⅞
Batopilas Min	1⅛
Bethlehem Steel	83
Butte & Superior	25⅝
Butte Cop. & Zinc	11⅜
Cerro de Pasco	35
Chile Cop	16⅛
Chino	38⅞
Colo. Fuel & Iron	47
Crucible Steel	68⅛
Crucible Steel, pf.	90
Dome Mines	8¼
Federal M. & S.	12
Federal M. & S., pf	35
Great Nor., ore ctf.	31¾
Greene Cananea	44⅞
Gulf States Steel	83½
Homestake	72
Inspiration Con.	51⅜
InternationalNickel	29⅞
Kennecott	33⅜
Lackawanna Steel	83
Mexican Petrol	101
Miami Copper	27¾
Nat'l Lead, com	59⅛
National Lead, pf.	103½
Nev. Consol	20
Ontario Min	9¾
Ray Con	24
RepublicI.&S.,com	91
Republic I. & S., pf.	101
Sloss-Sheffield	59⅞
Tennessee C. & C.	19⅛
U. S. Steel, com	111½
U. S. Steel, pf.	110½
Utah Copper	80⅝
Va. Iron C. & C.	.73

BOSTON CURB*	Aug. 19
Alaska Mines Corp.	.12
Boston Ely	.60
Boston & Mont.	.51
Butte & Lon'n Dev.	.15
Calaveras	1
Chief Con	2⅛
Contact	.15
Corbin	10
Cortez	.07½
Crown Reserve	.18
Crystal Cop.	.38
Eagle & Blue Bell	2$\frac{5}{16}$
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	19½
Mexican Metals	.45
Mines of America	1
Mojave Tungsten	.09
Nat. Zinc & Lead	.16
Nevada-Douglas	.52
New Baltic	.90
New Cornelia	18
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.07
Yukon Gold	1

SAN FRAN.*	Aug. 20
Alta	.03
Andes	.05
Best & Belcher	.02
Caledonia	.04
Challenge Con	.03
Confidence	.06
Con. Virginia	.22
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.07
Mexican	.17
Occidental	‡.51
Ophir	.05
Overman	.02
Savage	.03
Sierra Nevada	.03
Union Con	.40
Utah Con	.01
Belmont	2.50
Jim Butler	.55
MacNamara	.31
Midway	.04
Mont.-Tonopah	.09
North Star	.06
Rescue Eula	.12
West End Con.	1.05
Atlanta	.03
Booth	.04
Comb. Frac	‡.02
Florence	.11
Jumbo Extension	.10
Kewanas	.03
Nevada Hills	.03
Nevada Packard	.27
Round Mountain	.18
Silver Pick	.05
White Caps	.24
Big Jim	‡.75
United Eastern	3.25

COLO. SPRINGS*	Aug. 20
Cresson Con.	4.81¼
Doctor Jack Pot	.03¼
Elkton Con.	.04½
El Paso	10
Gold Sovereign	‡.02
Golden Cycle	1.69½
Granite	.17
Isabella	.04½
Mary McKinney	.07½
Portland	.80
United Gold M.	.13
Vindicator	.40

BOSTON EXCH.*	Aug. 20
Adventure	.60
Ahmeek	75½
Algomah	‡.15
Allouez	49
Ariz. Com., ctfs.	15
Arnold	.20
Bingham Mines	9¾
Bonanza	.16
Butte-Balaklava	.25
Calumet & Ariz.	67¾
Calumet & Hecla	460
Centennial	12
Copper Range	48
Daly West	2¾
Davis-Daly	5¼
East Butte	9¾
Franklin	3¼
Granby	79
Hancock	6
Hedley	‡12
Helvetia	.15
Indiana	.50
Isle Royale	25½
Keweenaw	.87
Lake	5
La Salle	2½
Mason Valley	3½
Mass	4¾
Mayflower	2½
Michigan	2½
Mohawk	55
New Arcadian	1½
New Idria	13
North Butte	14¼
North Lake	.60
Ojibway	.65
Old Dominion	39½
Osceola	50½
Quincy	69½
St. Mary's M. L.	50
Santa Fe	.60
Seneca	11
Shannon	3¾
Shattuck-Ariz	15½
So. Lake	1
So. Utah	.16
Superior	4¾
Superior & Bost.	1¾
Trinity	3
Tuolumne	1¾
U. S. Smelting	41¼
U. S. Smelt'g, pf.	42½
Utah Apex	1¼
Utah Con	9¾
Utah Metal	2$\frac{1}{16}$
Victoria	2
Winona	1¼
Wolverine	22
Wyandot	.50

N. Y. CURB†	Aug. 20
Big Ledge	$\frac{11}{16}$
Butte & N. Y.	‡.75
Butte Detroit	.15
Caledonia	.46
Calumet & Jerome	$\frac{11}{16}$
Can. Cop. Corpn.	1$\frac{11}{16}$
Carlisle	‡2
Cashboy	.05
Con. Ariz. Sm.	1½
Con. Coppermines	5
Con. Nev.-Utah	‡$\frac{5}{16}$
Emma Con	‡.10
First Nat. Cop.	1$\frac{11}{16}$
Goldfield Con.	.22
Goldfield Merger	‡.03
Greenmonster	‡$\frac{7}{16}$
Hecla Min	5$\frac{1}{16}$
Howe Sound	4⅛
Jerome Verde	.50
Louisiana	$\frac{5}{16}$
Magma	30
Majestic	.18
Marsh	‡.04
McKinley-Dar-Sa.	.43
Milford	‡.75
Mother Lode	.35
Nixon Nevada	.48
Ohio Cop	‡1$\frac{1}{16}$
Rawley	‡2½
Ray Hercules	4⅛
Richmond	‡.56
Rochester Mines	.35
St. Joseph Lead	14¼
Standard S. L.	‡1
Stewart	.13
Success	‡.12
Tonopah	2⅝
Tonopah Ex.	1$\frac{11}{16}$
Tribullion	‡$\frac{7}{16}$
Troy Arizona	.12
United Cop.	‡$\frac{5}{16}$
United Verde Ext.	37
United Zinc	‡1¼
Utica Mines	‡.08

TORONTO*	Aug. 1
Adanac	‡.06
Bailey	.02
Beaver Con	.20
Chambers Ferland	.12
Coniagas	2.50
Hargraves	.04
Kerr Lake	5.62
La Rose	.25
Min. Corp. of Can.	2.00
Nipissing	8.37
Peterson Lake	.08
Temiskaming	.28
Wettlaufer-Lor	.03
Davidson	‡.2
Dome Exten	.12
Dome Lake	.10
Hollinger	4.25
McIntyre	1.2
Newray	.56
Porcu. Crown	.1
Teck-Hughes	.14
Vipond	.1
West Dome	.0

* Bid prices. † Closing prices. ‡ Last Quotations.

Engineering and Mining Journal

August 31, 1918

Volume 106 *Number* 9

RECEPTION ROOM, AMERICAN INSTITUTE OF MINING ENGINEERS, ENGINEERING SOCIETIES' BUILDING

American Institute of Mining Engineers And the War

BY BRADLEY STOUGHTON

OF THE seven thousand present members of the Institute, 612 are known to be in the army of the United States or its Allies, 24 are in the navy, 59 in the air service, two are enrolled in the Red Cross, and 101 are engaged in other branches of Government work. Already, 13 are known to have died in service, making a total of 811 of which the Institute has definite records at this time. These records are doubtless incomplete, as there are many members whose addresses are lacking and who have given instructions to hold all mail and publications, presumably because they have left for the front.

It is proper that record should be made here of the names of those who have made the supreme sacrifice, notwithstanding that we know the list to be still incomplete.

At the Colorado meeting, memorial services will be held, at which the professional and military records of each of these men will be presented so far as they can be obtained. Later, this information will be published in the A. I. M. E. *Bulletin*, together with photographs.

In all justice to the patriotism of many scores of other members between the ages of 18 and 45, it should be recorded that, at the sacrifice of personal desire, they are continuing their engineering work in providing munitions and resources for carrying on the war, through the conviction that in this way they are rendering their most valuable, if not the most spectacular, service to the cause for which others are risking their lives. Finally, there are many members of the Institute who are giving a share of their time to professional work, without remuneration, at the request of the Government. These services include examinations of ore deposits or districts in which the Government is interested; professional visits, some of them outside of the country, searching for "war minerals" of which there is a scarcity; researches on the properties of metals and processes of production; and part-time occupation as consulting engineers or metallurgists to the Ordnance, Navy, and other Government departments.

Probably no group of men is more actively engaged in professional life than are mining engineers and metallurgists in producing materials necessary for carrying on the war, including steel, of which cannon, rifles, projectiles, ships, and machinery are made; copper for electric conductors, projectile bands and so forth; zinc for cartridge brass; lead for bullets, etc.; platinum, mercury and other metals necessary for, or accessory to, the manufacture of arms and explosives. Then there are many minerals essential for the manufacture of war materials, of which a scarcity has been brought about by the difficulties of ocean transportation. Members of the Institute have responded most generously in assisting in the discovery and stimulating the production of these minerals at home; some by giving up their professional work entirely and going into the Government service, and others by professional work, reconnaissance, mine examinations, and like activities. The net result has been the addition to the resources of our own country of valuable, and in some cases enormous, deposits of sulphur, and of chromite, manganese, and other steel-alloying elements.

In its official capacity the Institute has assisted in the recruiting of the 11th Railway Engineers; in active participation in the work of the Naval Consulting Board, and the War Committee of Technical Societies; in the financial and other support of the National Research Council and of the War Minerals Committee. It rendered active service in stimulating the production of manganese and pyrite, and has been effective in supplying a great many engineers for Government work through a central body maintained for the purpose of acting as a medium in this respect between all Government departments and the technical societies.

At the request of several departments of the Government, the Institute is furnishing them free copies of its *Bulletin*, and at the request of the American Library Association it is sending its *Bulletin* to a great many of the military cantonments, especially where engineers are being trained. Lack of space forbids recording the many services, official and semi-official, that are being rendered, but mention should be made here of the generosity of Dr. Gardner F. Williams, who has donated a great many copies of his book "The Diamond Mines of South Africa," which is advertised and sold by the Institute, the entire proceeds

DIED IN SERVICE

LEWIS NEWTON BAILEY
Died of pneumonia, Apr. 30, 1918.

LOUIS BAIRD
Died on battlefield in 1915.

WILLIAM MORLEY COBELDICK
Died from gas poisoning, Oct. 7, 1915.

RALPH DOUGALL
Killed in action.

ALFRED WINTER EVANS
Killed in action, Oct. 12, 1917.

WILLIAM HAGUE
Died in active service, Jan. 1, 1918.

WILLIAM T. HALL
Killed in action in France, May 19, 1917.

JOHN D. IRVING
Died in active service in France, July 26, 1918.

EDWARD H. PERRY
Killed in action, Mar. 30, 1918.

FRANK REMINGTON PRETYMAN
Killed in action, June 17, 1916.

FRED B. REECE
Killed in action.

SOREN RINGLUND
Died July 24, 1918.

GEORGE ROPER, JR.
Killed in aëro accident in England, May 25, 1918.

being turned over to the American Red Cross. Several hundred dollars has been contributed in this way, neither Dr. Williams nor the Institute receiving any share of the proceeds, nor any return of the expense of sale and distribution.

The A. I. M. E. in Colorado

There are 243 members of the Institute in Colorado. Of these, 114 reside in Denver, making that city one of the large and representative centers of the society. The intensive mineral development in the state and the successful exploitation of many mines in widely separated localities have made Colorado an attractive field for mining engineers and metallurgists.

From a technical standpoint Colorado engineers must be credited with many notable contributions to the advancement of the industry. Among the more important are development of sampling companies and principles of ore sampling; concentrating, sampling, cyanide and chlorination mill design, construction and operation; treatment of the telluride gold ores of Cripple Creek; development of silver-lead smelting, and gold and silver refinery practice; Bartlett process for the treatment of lead-zinc sulphide ores; chemical treatment of uranium, vanadium and tungsten ores; production of ferroalloys; design of bag-houses, dust-filtration, and smelting-works flue systems; construction of improved crushing rolls, concentrating tables, ball mills, and other ore-dressing appliances; design and construction of silver-lead and pyritic blast furnaces; application of wire-rope tramways to a difficult topography and their extensive use for mining transportation; use of long mine adits for development and drainage purposes, and the development of methods for their construction; invention and introduction of the Waugh stoping drill, the water Leyner drill, and the Leyner air compressor.

The most noteworthy plant in the state is that of the Colorado Fuel and Iron Co. at Pueblo. Despite many difficulties, this company has established an important iron- and steel-making industry. Steel and iron are not only turned out in pig and billet form, but as wire, nails, spikes, bolts, nuts, reinforcing bars, blacksmith iron, wire fencing, steel rails and structural steel, and cast-iron pipe.

The more important Colorado corporations include the Portland Gold Mining Co., which paid dividends until the beginning of 1918 amounting to $10,957,080. The Victor Mill, at Victor, is a notable installation in many respects; and the Independence mill, in the same locality, which is of more recent design and construction. The Victor and Independence mills have a combined rated capacity of 60,000 tons monthly. The Golden Cycle plant, at Colorado Springs, is a special installation designed for handling high-grade ores of an uncommon type. The American Smelting and Refining Co. operates important plants at Denver, Pueblo, Durango and Leadville; and the Ohio & Colorado Smelting and Refining Co. has a large custom smeltery at Salida.

Among the important mining-machinery firms in the state are the Colorado Iron Works Co., the Denver Engineering Works Co., the Hendrie & Bolthoff Manufacturing and Supply Co., the Mine & Smelter Supply Co., the Dorr Co., the Stearn-Roger Manufacturing Co., the Morse Bros. Machinery and Supply Co., and the Denver Fire Clay Co. The Colorado Iron Works Co. did pioneer work in the development of silver-lead and pyritic blast furnaces. Its special equipment enables it to carry on an extensive business in smelting appliances and ore-dressing equipment. Important though unsuccessful efforts were at one time made to develop an oil-burning blast furnace. The Denver Engineering Works Co. has made important modifications in crushing-roll design, and introduced the Richards pulsating jigs and classifiers. The recent absorption by Hardinge interests promises to result in a strong combination that will specialize in mill design and the manufacture of ore-dressing appliances. Few Western mining men are unacquainted with the Hendrie and Bolthoff Manufacturing and Supply Co. and the Mine and Smelter Supply Co. Both of these companies carry varied stocks of mining machinery supplies; they are the selling agents for manufacturers of compressors, rock drills and miscellaneous mine and mill equipment, and have shown great enterprise in introducing concentrating tables and milling appliances. The Dorr Co., manufacturers of the well-known classifier, thickener, and other hydro-metallurgical appliances, has its laboratories and principal offices in Denver. The Stearns-Roger Manufacturing Co., deals in mill and factory supplies; the Edwards roasting furnace and the Wetherill magnetic separator were introduced by this firm. The Denver Fire Clay Co. is a well-known manufacturer of oil-burning muffle furnaces, crucibles, fire brick, and fine balances, as well as an important supply house for chemicals and chemical apparatus.

The Ainsworth assay balance, put upon the market by Wm. Ainsworth & Sons, marked a beginning in the construction of precision balances. There is scarcely a Western assayer who is not familiar with this balance. Smith and Thompson, employed by Ainsworth, opened a factory of their own, and thus Denver became the center for the manufacture of fine balances. The Denver Rock Drill Co. has been successful in creating a market for the Waugh drill and is now one of the leading manufacturers of rock drills.

J. George Leyner established at Littleton a machine shop and began the construction of mining machinery. The "water Leyner" drill made use of the "hammer principle," hollow steel and a water jet discharged at the drill bit. It was eminently successful and speedily established itself in the esteem of mining men. The Leyner air compressor was an excellent machine and was introduced into a number of Colorado mines. The Leyner drill sharpener was another successful appliance. The J. George Leyner Co. was absorbed by the Ingersoll-Rand Co., and its products are now sold by the latter named company.

Part of the membership of the A. I. M. E. is scattered among the above-named companies and many are in others in the state—as superintendents, managers, mining engineers, metallurgists, assayers, surveyors and chemists and in other technical capacities. The local section of the A. I. M. E., under the leadership of Charles M. MacNeill, chairman, George M. Taylor, vice chairman, Fred Carroll, Secretary, W. W. Case and H. E. Collbran, has held many interesting meetings. It is doing effective work, as may be judged by the number, variety and importance of the papers presented at the Colorado session by Colorado members.

The Board of Directors, A. I. M. E.

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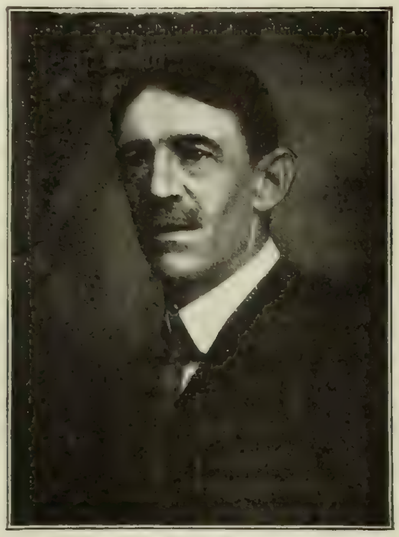

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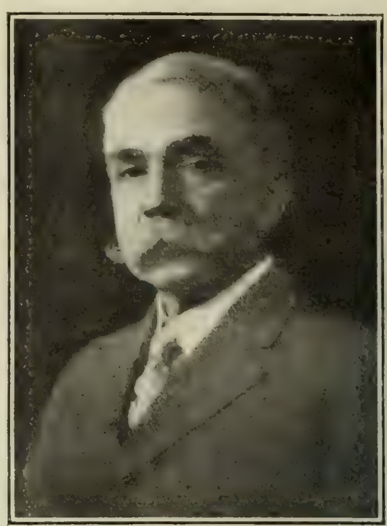

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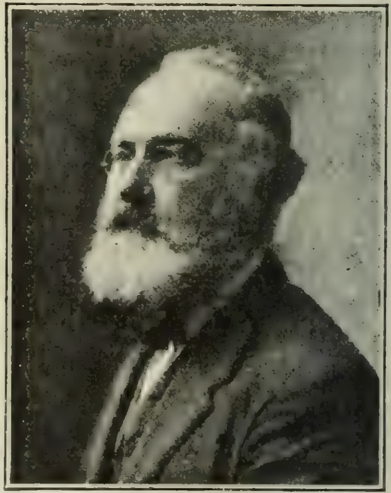

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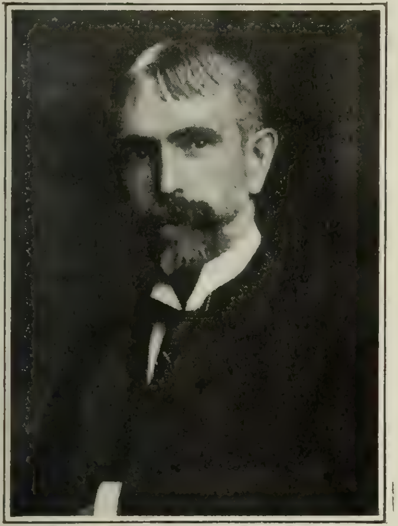

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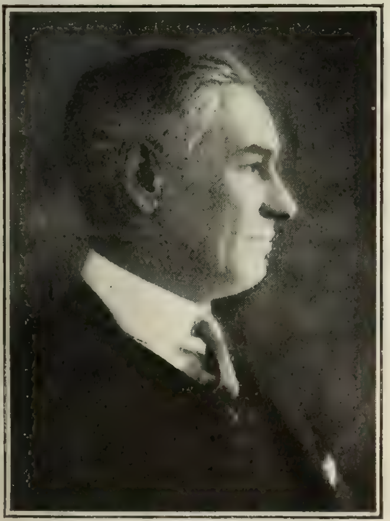

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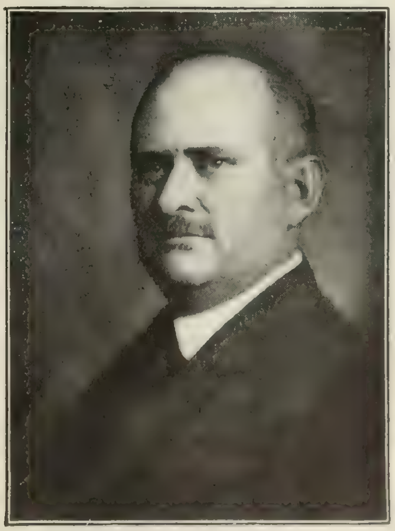

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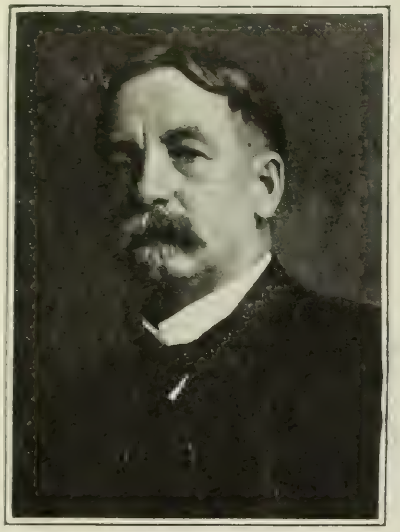

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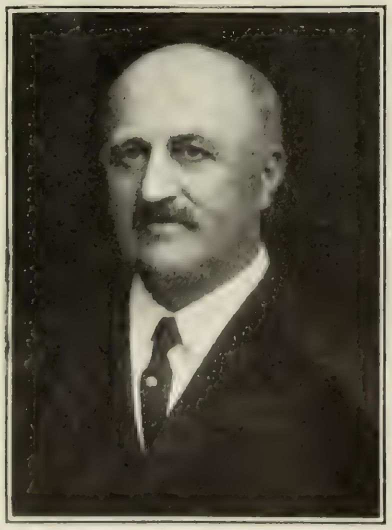

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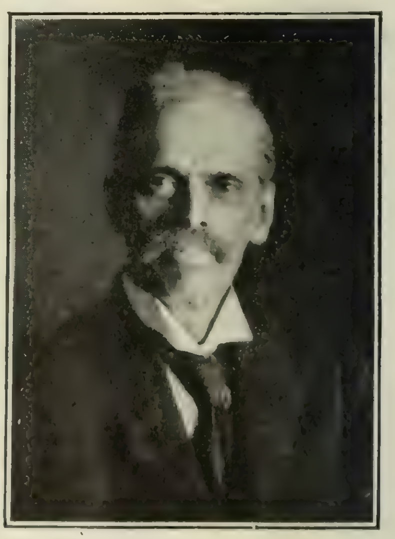

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Colorado Mining in 1918

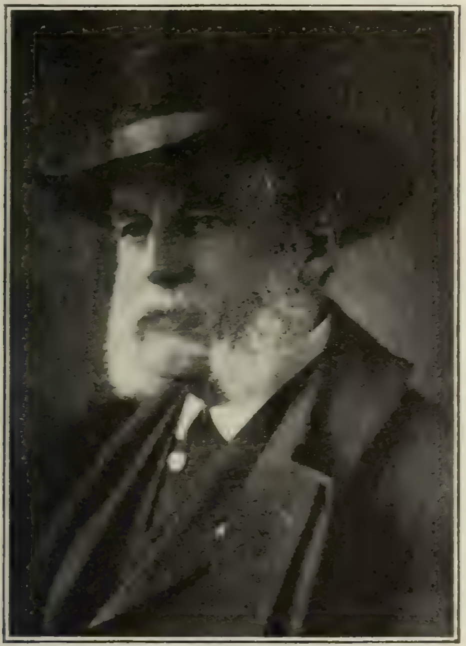
Colorado mines are now passing through a period of adjustment, the final results of which will not be apparent for two or three months. For many operators the situation is critical, and others are apprehensive of the future, for the prices of labor and material are mounting, and the margin of profit of some mines has for many years been slight. Many small properties have closed; others have continued with diminished forces. The shipments in May and June, which should have been greater than those of the winter months, were materially less.

According to Charles W. Henderson, of the U. S. Geological Survey, the production for the first six months of 1918 shows a considerable decrease for gold and an appreciable decrease for silver. Copper has never been an important mineral in Colorado, and in 1918 so far it shows an appreciable decrease as compared with 1916 and 1917. The output of lead has remained practically stationary during 1918. The market for the low-grade zinc ores of Colorado is not encouraging, and the production has already fallen off considerably. There are no truly high-grade zinc ores in Colorado comparable to those of the Miami, Okla., field.

The production of gold from Cripple Creek for the first six months of 1918, as compared with the same period in 1917, shows a decrease of approximately $800,000, which, if continued, means, for the year a decrease of $1,600,000 to $2,000,000. The Golden Cycle cyanidation mill at Colorado Springs has been operated steadily in 1918, but the Colorado Springs mill of the Portland Co. was closed in April. The company has offset in part the loss occasioned by this closing by sending the ore from its mines to its 1000-ton Independence mill at Victor, where the Portland and Victor 500-ton mill for low-grade ores is also situated. The small cyanidation mills in the Cripple Creek district have been idle.

Leadville already shows a decrease in the output of gold, silver, copper and zinc, but an appreciable increase in the output of lead. The output of manganese iron ores from Leadville for use at steel plants has been steady. The reopening of the Ute and Ulay mines at Lake City, Hinsdale County, and the development work at Creede promise to add to the lead output of Colorado. San Juan County has not quite maintained the output it made in 1917, but the San Miguel County (Telluride) mills have produced at a greater rate. The development adit of the Camp Bird mine has reached the vein, but the rest of the year will be spent on development work, so that probably no production can be counted on from that mine, which, up to 1916, was a large contributor to the output of gold, as well as lead, silver, and copper.

Decreased supplies of ore have caused the closing of the sampling works at Black Hawk, Gilpin County, and at Georgetown, Clear Creek County, both old establishments. The sampling works at Idaho Springs has continued its operations. The number of active mines in Boulder County has become small. The dredges in Summit County have so far not yielded their usual output, but the production during the first three months of the year is generally low at Breckenridge; the dredging begins to be productive in June. The sampling works at Breckenridge has been closed. The Derry Ranch dredge, near Malta, Lake County, resumed operations in May. Mines at Bonanza, Saguache County, have continued in operation, with promise of a considerably increased production when the Rawley Co. completes its tramway from Bonanza to its mill now building at Shirley.



ROSSITER W. RAYMOND,
Secretary Emeritus

BRADLEY STOUGHTON,
Secretary

THE SECRETARIES OF THE AMERICAN INSTITUTE OF MINING ENGINEERS

Remember the Comfort Fund of the 27th Engineers.

War Minerals of Colorado

Lead, Zinc, Gold, Silver, Tungsten and Copper Ores—Uranium, Vanadium and Radium Produced From Carnotite, Vanadinite and Pitchblende Ores

BY A. H. HUBBELL

NO STATE in the Union is better able than Colorado to respond to the urgent demand for war minerals. Abundantly endowed with deposits of gold, silver, lead and zinc, it is also the foremost producer of tungsten, vanadium, uranium and radium. Of less importance as a source of copper than other parts of the West, its output of that metal in 1917 nevertheless secured for it the eleventh place in the list of states. Colorado, moreover, was one of the seven states producing the bulk of manganese ore mined in the country last year. Molybdenum, fluorspar, iron and other minerals in lesser quantities are among those contributing to the wealth of the American Switzerland. It therefore remains for the powers that be, in Washington and elsewhere, to see to it that the maximum good shall accrue to the American people as a whole, as well as to the citizens of Colorado, through the proper exploitation of this treasure house. At a time when the economic strength of the nation is being carefully measured by extensive surveys, and the need of proper distribution of raw materials is becoming of great importance, anything tending to cripple a vital industry, such as gold mining, for example, should be remedied without delay.

Earlier in the war, the high prices paid for base metals, as well as the prevailing high costs, caused greater attention to be given in Colorado to producing these metals than was devoted to gold and silver. However, the improved silver situation, culminating in the signing of the Silver bill on Apr. 23 by the President and, on the other hand, the alarming conditions facing the gold-mine operators, have again thrown the precious metals into the limelight.

DECLINING GOLD OUTPUT

The output of gold in Colorado in 1917 was 15% less than the year before, declining from 19,009,100 oz. in 1916 to 15,955,100 oz. in 1917. Even at that, the 1917 production was almost a fifth of that of the entire country, and put the state in second place, following California. The general occurrence of gold as well as silver in Colorado's ores is reflected in the fact that an average analysis of the ores smelted at the five big lead-silver plants of the state, situated at Denver, Pueblo, Leadville, Durango and Salida, during the five-year period from 1912 to 1916, showed an average content of over ½ oz. of gold and 12 oz. of silver per ton. The labor shortage, general throughout the state, affected the gold-mine operators more seriously than others, because of their inability to bid as liberally in securing men, by reason of the standard value of their output. Many mines have been forced to shut down owing to this fact and to other causes.

Silver mines, on the other hand, fared better, and many properties have been reopened. Of the total 1917 silver output of the United States, 74,244,500 oz., Colorado produced 8,163,600 oz., ranking as sixth highest.

Lead in Colorado is derived almost entirely from lead-silver ores. The five smelteries already mentioned, four of which belong to the American Smelting and Refining Co., the remaining one being the plant of the Ohio & Colorado Smelting Co. at Salida, have, in all, 32 furnaces, with a combined capacity of 1,955,000 tons of charge per year. Strange though it may seem, it is necessary to import rich lead ores into the state to bring the average tenor of the furnace charge up to 10% lead (or, better, 12%). Colorado ores smelted during the five-year period from 1912 to 1916 carried only 6.76% wet lead, which is insufficient to smelt them. The additional lead necessary for the reduction process must be shipped, refined and marketed. This condition entails a heavy extra charge on the production of lead from Colorado ores. In testifying before the Smelter and Ore Sales Investigation Committee of the State of Colorado, the general manager of the Ohio & Colorado company's plant stated that about 70% of the total lead smelted at Salida came from ores produced outside of the state, which were laid down at heavy loss at Salida in order to make operations possible there. The mining of lead-silver ores has, of course, been greatly stimulated by the better prices obtained for the product.

COPPER

Though the production of copper in Colorado is overshadowed by that of the other major metals, the 12,028,000 lb. derived from ores of the state last year secured to it the position of eleventh in rank. Copper ore is mined in various parts of the state, including the Anaconda property, at Iola, and the Akron at White Pine. Ironton and Red Mountain ore is shipped via Silverton. Other plants produce copper concentrates, but the greater part of the metal is derived indirectly from the lead-silver ore. Such ores as were smelted at the five lead-silver plants from 1912 to 1916 contained 0.61% copper on an average. The state boasts only one copper smeltery, that of the Wanakah Mining Co., at Ouray, which has two blast furnaces, with an annual capacity of 105,000 tons of charge, not including fuel.

TUNGSTEN ORES

It is in tungsten that Colorado shines most brightly as a producer of war minerals. Its output of tungsten minerals is about equal to that of California, the two states producing well over 80% of the total quantity mined in the United States, which is estimated for last year at somewhat less than 5000 tons of products equivalent, on an average, to 60% WO concentrates. Before the war, the entire country failed to produce enough tungsten to meet the domestic demand, which has now become three times as great as before. The importance of this industry in Colorado can therefore hardly be overestimated. Moreover, the tungsten produced in the state, being free from tin, is superior to the imported.

The deposits of tungsten in Colorado, as elsewhere in the United States, are extremely small. There are no large bodies of 1% ore in the state. Ninety per cent. of the output comes from ferberite deposits in Boulder County and the northern part of Gilpin County. The producing district lies about 25 miles northwest of Denver and is about 12 miles long by 7 miles wide, the principal centers being Nederland, Lakewood and Stevens Camp. The deposits are worked largely by lessees, and the ore is hauled for treatment to centrally situated mills, about 10 of which are in the district.

The oldest and largest tungsten company in the district in Boulder County is the Primos Chemical Co. Other operators are the Wolf Tongue Mining and Milling Co., the Vasco Mining Co., the two together operating about 24 mines; the Boulder Tungsten Production Co., and the Tungsten Metals Corporation, as well as several other producing companies. Some of these companies are making tungstic acid or ferrotungsten, or both, on the spot. In particular, the Tungsten Products Co. and the Black Metal Reduction Co. are making tungstic acid, the latter company also making ferrotungsten in an electric furnace. The Rare Metals Ore Co. is operating at Rollinsville, Gilpin County. Elsewhere in the state, hübnerite is mined in San Juan County near Silverton; hübnerite and scheelite both are produced at Leadville in the Garbutt and Ibex properties; and hübnerite occurs at Alma, in Park County. Other discoveries have been made in Eagle and Chaffee counties.

Remarkable advance has been made in the dressing of tungsten ores, particularly in Boulder County, where the milling of ores without metallic impurities is said to have reached the highest stage of development attained anywhere.

WESTERN TUNGSTEN PRODUCERS AND THE TARIFF COMMISSION

On June 28, Western tungsten producers appeared before Commissioner William S. Culbertson, of the U. S. Tariff Commission, and Guy C. Riddell, metallurgical expert of the commission, at a hearing in San Francisco, following one held at Denver on June 17. In the course of the testimony, it was brought out that the cost of producing tungsten ores in Colorado ranged from $15 to $33 per unit, compared with much lower costs in California. The witness said, however, that such costs were extremely difficult to determine, as the deposits were uncertain and the reserves limited. Another witness said that the life of tungsten properties was so short that depreciation was figured at 50%, though there was no set rule. Among the difficulties said to be confronting the small tungsten producer were mentioned the following: Abnormally high operating costs; fluctuations in the ore market; inability of small producers to ship in car lots; lack of stabilized price for local ores; and last, but not least, the middleman.

PRODUCTION OF FERROTUNGSTEN

It is interesting to note that a center in which final products such as tungstic acid and ferrotungsten are being made is growing up in the vicinity of Denver. New companies have also entered this field. A new 300-kw. furnace for making ferrotungsten has recently been established near Denver. Metallic tungsten is obtained from its ores only as a black powder, which is sold to steel makers, and contains usually about 98% W, 0.5% Fe, 0.5% Si, 0.1 to 0.2% C, and practically no sulphur or phosphorus. Ferrotungsten, the alloy of iron and tungsten, as produced in the electric furnace, contains from 50 to 85% W and 0.5 to 4% C.

Tungsten producers have had the same troubles as to labor scarcity and rising costs that have confronted those in other industries. The opinion has been expressed, however, that in Colorado output can be doubled if an adequate and stable price for ores and products be established by the Government and if protection be given from cheaply produced imports.

VANADIUM AND URANIUM AND RADIUM

The vanadium, uranium and radium industries are closely linked, and equally intimate is their association with the name of Colorado. The main source of the three important elements is the carnotite ores of the state, though the Primos Chemical Co. is also producing vanadium from Colorado roscoelite ore. Colorado's output of vanadium ores, however large compared with that of other states, is a small per cent. of the amount of Peruvian patronite ore imported, which is the origin of most of the vanadium used in this country.

The chief producers of vanadium and uranium, with the latter of which radium is associated, are the Primos Chemical Co. and the Standard Chemical Co. Practically all the uranium entering into steel manufacture now comes from Colorado, being derived, along with vanadium, from carnotite, though there is a deposit of pitchblende in Gilpin County that has so far yielded a small part of the output. Engaged in the production of radium are the National Radium Institute, the Pittsburgh Radium Co., the Standard Chemical Co., the Schlesinger Radium Co. and the Chemical Products Co. Radium was formerly in demand for experimental and medicinal purposes, but a new use for it has sprung up in the manufacture of luminous paint, to which the war has added impetus. Such paint is employed on watch dials, compass faces, gun sights and for like uses, to make the objects treated visible at night. However important and valuable these elements are, they are produced in comparatively small amounts, that of radium, of course, being minute.

MANGANESE ORE PRODUCTION

Colorado ranked seventh in 1917 among the seven states producing the bulk of that year's domestic output of manganese ore, the demand for which has been so greatly increased through the cutting off of Brazilian imports, owing to the scarcity of ocean tonnage. Much of the state's output comes from the manganese-silver ores of the Leadville district. Metallurgical or 40% manganese ore is rare in Leadville, though 30% ore exists in large quantities. The U. S. Geological Survey has recently estimated that 13 deposits in the district named contain about 700,000 tons and possibly 1,500,000 tons of ore averaging 20 to 25% Mn, 24 to 30% Fe, and 10 to 15% SiO_2. Similarly at Red Cliff, Colo., two deposits are estimated to have probably 750,000 tons and possibly 1,000,000 tons of ore analyzing 14% Mn, 38% Fe and 1 to 2% SiO_2, all these ores being low in phosphorus.

Tests are being made at the Golden station of the U. S. Bureau of Mines on manganese-silver ores with the Caron process, which recovers the silver by leaching and precipitation and the manganese as a byproduct. This work is under the supervision of George H. Clevenger, and is being done for the Bureau of Mines, the Netherlands government and the Research Corporation of New York. The Golden station was selected because of the large bodies of the manganese-silver ores occurring in Colorado.

In a list of shippers of manganese ores recently published in the *Journal*, the only one named in Colorado outside of the Leadville district was J. D. Batie, of Pueblo, though Boyer and Frankenberry, of Salida, and the Colorado Manganese Mining and Smelting Co., of Denver, were named as prospective shippers.

Molybdenum and Fluorspar

Molybdenum and fluorspar also occur in Colorado, but at present assume less important parts in the mining industry of the state. The Primos Chemical Co. has developed an extensive molybdenite property in Clear Creek County, near Empire, and also has established two plants for treating large deposits of disseminated molybdenite at Climax, north of Leadville. The Climax company, according to H. L. Brown and M. W. Hayward in the *Journal* of May 18, 1918, has developed over 6,000,000 tons of 1% MoS ore, and it is estimated that double this tonnage exists. This ore contains no obnoxious ingredients and no other mineral except a little pyrite. As stated before, it is fine grained instead of coarse and flaky.

Fluorspar was regularly shipped during 1917 from Wagon Wheel Gap, near Creede, and from the Barstow mine, near Ouray, as well as from the vicinity of Jamestown, in Boulder County. No tonnage figures are at present available, but undoubtedly they would be small. The total production in the United States in 1916 was only approximately 155,000 tons, about three states producing, including Colorado.

As for potash, it is said that the phonolite ores of the Portland, Vindicator, Golden Cycle and other mines of Cripple Creek contain 6% of recoverable potash. It is similarly stated that the dumps of the two mills at Colorado Springs contain 6,000,000 tons running 6 to 10% in potash. The establishment of a plant to work these dumps and to handle current tails is talked of. However, until the potash industry has secured a firmer footing in this country, even on a war basis, it is unsafe to commit one's self to predictions as to its future.

Pyrite Deposits of Leadville, Colorado*

By Howard S. Lee†

The ore-bearing formation of the Leadville district consists of two beds of limestone separated by a layer of quartzite. The upper carbonaceous limestone, known locally as the blue limestone, varies in thickness from 50 to 300 ft. The lower or Silurian limestone is about the same thickness as the upper bed. Underlying the Silurian limestone is a layer of Cambrian quartzite from 100 to 250 ft. thick resting on Archean granite, which forms the limit of ore deposition. Usually, there is a sheet of white porphyry above the upper limestone; a sheet of gray porphyry is associated with the blue limestone, either in or below it, but the porphyries are not as regular as the quartzites and limestones and are not always found in expected positions.

An elaborate system of faults and intrusive porphyry dikes has an important bearing on ore deposits throughout the district, and it may be said that most orebodies are directly traceable to one or both of these causes.

The distribution of pyrite in the Leadville district is general. The chief pyritic orebodies extend in a zone approximately 6000 ft. long and several hundred feet wide, from the Yak and Moyer, on the south; through the Louisville, Greenback, Mahala, Adams, and Wolftone mines, on Carbonate Hill; across Yankee Hill, and into the Quadrilateral, Denver City, and Tip Top, on Fryer Hill.

The orebodies occur as replacement deposits in the limestone along a minor fracture, or contact metamorphic deposits along a porphyry dike or fault. Replacement deposits closely related to intrusive gray porphyry dikes are the most important and most prevalent. Deposits of manganiferous siderite which inclose iron orebodies, particularly in the carbonaceous limestone, are closely associated with iron sulphide orebodies and often indicate the presence of ore when approached from the outside, and mark the limits of ore when approached from the inside. The fact that the pyrite is surrounded by siderite would indicate that the pyrite had been deposited first.

After the pyrite was deposited, there were at least two periods of further action in which other minerals were introduced. Two periods are apparent at the Yak mine, where pyrite was deposited along a fracture system having a general northeast direction. At a later period, there was movement resulting in fracturing along a N 15° W course, and it is along these fractures that secondary zinc enrichment is encountered. Still later there was movement along the original northeast system where secondary silver enrichment took place. At the Denver City mine, only secondary enrichment of silver has occurred, and the ore contains n zinc or lead. The enrichment here is similar to conditions at the Louisville mine, in that lines of weakness developed along small dikes of porphyry. The mechanical action in both cases would be the same, the onl difference being that the precipitating action of th porphyry and pyrite together would be greater, an higher assay values would be found along the smal dikes.

The ore is a compact, fine-grained, fairly hard pyrite Along enrichment zones, the ore is fractured and granular, whereas the barren pyrite is much harder. Thi would naturally form ribs of harder material betwee oreshoots, which in many cases have been left in lie of timbers.

The method of mining has consisted of driving exploratory drifts to determine the zones of enrichmen and the walls, and, when the preliminary informatio was obtained, using the ordinary square-set metho with selective mining. If it was found too expensiv to hold the more or less barren pyrite in place, it wa taken out and sold to the smelters for what little gol or silver it might contain, as well as for the iron. I two or three cases, notably at the Yak and Leadvill unit, it was found more profitable to mine the enti orebody, as the zones of enrichment were small but frequent, and the mass was heavy. In this way unit costs were reduced, the tonnage was increased, and the total profit was greater than if the richer parts had been gouged out and the larger part allowed to remain in place.

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*Abstract of a paper by Howard S. Lee to be read at the Colorado meeting of the A. I. M. E., September, 1918.

†Leadville, Colorado.

Because of the small amount of sulphuric acid manufactured and consumed in Colorado, and the high freight rates to the eastern part of the country, which precludes competition with Eastern and Spanish pyrites, little Leadville pyrite has been used in the manufacture of acid, although small shipments have been made. Occasional trial lots have been shipped East, which have roasted satisfactorily.

There are large deposits of pyrite in Leadville, containing a minimum of 43% sulphur, suitable for the manufacture of sulphuric acid. In these deposits, enrichment zones contain gold, silver and zinc, but the system of mining in use will permit selective methods whereby the part more valuable for other metals may be stoped separately and shipped to the smelteries, the pyrite being kept clean for acid use. The only material available now is run-of-mine ore suitable for crushing and roasting in "fines" burners. The problem of lump ore, both as to suitability and preparation, will be worked out only when there is sufficient demand to warrant experiments.

Development of the Coke Industry In Colorado, Utah, and New Mexico*

The history of Western coke has been closely related to the development of the metallurgy of iron and steel and the precious metals in Colorado. The first smeltery was established in 1877, at Malta, by A. R. Meyer, but it was not successful and was succeeded by the Harrison Reduction Works, in 1878. The La Plata began with one furnace in June, 1878, and in 1879 was operating four furnaces. These used charcoal for fuel, but, because of hot tops, suffered a tremendous loss in lead and silver, which was overcome by the erection of 50 single-bank 10-ft. bee-hive ovens at Crested Butte in 1880. The slack coal sent to these ovens was pure, and yielded a coke carrying as little as 4.5% ash.

The first smeltery, erected in Pueblo by Mather and Geist, grew into the immense Pueblo Smelting and Refining Co., now a part of the American Smelting and Refining Co. Coke for these small furnaces was made from unwashed Engleville coal, in 186 single-bank 12-ft. ovens at El Moro, in the Trinidad district, and it was not uncommon for the percentage of ash to exceed the percentage of fixed carbon in the coke. On Jan. 23, 1880, the Colorado Improvement Co. consolidated with other companies to form the Colorado Coal and Iron Co. In 1881, this company erected a small iron and steel works at Bessemer, which has grown into the present Minnequa plant of the Colorado Fuel and Iron Co. The reorganization of the Colorado Coal and Iron Co. in August, 1896, to the present Colorado Fuel and Iron Co., resulted in active progress toward the improvement of its coke. Washeries at that time consisted chiefly in costly experiments. Sopris was the first coke plant to have a fairly efficient washery. In 1899, the Colorado Fuel and Iron Co. purchased the patent right to the Forrester plunger jig, which became the standard unit for all of the washeries built during the years 1900 to 1902. During this period, many standard batteries of double-bank 13-ft. ovens were constructed by the Colorado Fuel and Iron Co. and by coal companies operating in New Mexico and Utah. Previous to 1898, there were approximately 1600 coke ovens operating in Colorado, Utah, and New Mexico, without a single coal washery. At the end of 1902 there were 5900 coke ovens in operation, with 12 coal washeries.

The Utah Fuel Co. erected ovens at Castle Gate, in 1888, to handle Montana trade, but it was found that the coking property of the coal was deteriorating as the mine developed. An exhaustive examination of the entire property resulted in the discovery of a coking coal at Sunnyside which does not possess uniform coking qualities, and it is necessary to disintegrate the slack to a fineness of ⅛ in. before the best results can be obtained. In 1900, the Dawson Fuel Co., operated by the Phelps-Dodge interests at Dawson, N. M., erected 95 double-bank 13-ft. ovens and a washery, which gave inefficient results. After experimentation with various jigs and other coal-washing appliances, the company constructed an all-steel washery and assembled units of double-compartment jigs, concentrating tables, centrifugal driers, and appliances which make this washery second to none in the United States. In 1905, the Dawson company erected 480 under-flue ovens, the construction of which shows a great saving in boiler fuel, and the coke has a structure suitable for copper smelting. The Colorado Fuel and Iron Co. experimented with a stack oven which was of the bee-hive type, but the gases passed through flues under the floor and then up through a stack. The object was to coke the charge from the bottom up and from the top down in one operation, and reduce the time of coking from 48 to 24 hours. Finally the system was abandoned because there was not sufficient heat under the floor to make a dense coke.

The Colorado Fuel and Iron Co. in 1908 began an active development of oven construction. Coke machines were installed at Segundo and Tabasco, and experiments were made on oven building. Previously oven retaining walls had been built of stone, laid with a batter of 2 or 3 in. The results of experiments show conclusively that reinforced concrete walls, without batter, are superior to stone. The reinforced concrete retaining walls of the ovens of the Carbon and Coke Co., operated by the American Smelting and Refining Co., have been operating about 10 years with practically no repairs. The Covington coke extractor was introduced to offset the rapid decrease in available oven labor.

The H. Koppers Co., has erected at Minnequa, Colo., 120 ovens which are divided into two batteries and have a coking capacity of 46,000 tons per month, each oven being 40 ft. long, 10 ft. high and 19 in. wide. It is presumed that the coking period will be between 16 and 18 hours. Provision has been made at this time for use of the excess gas, recovery of ammonium sulphate, recovery of tar and oils, and a special plant for benzol recovery. An approximate cost of $5,000,000 will cover the ovens, coal washery, benzol plant, coke-screening plant and various appliances.

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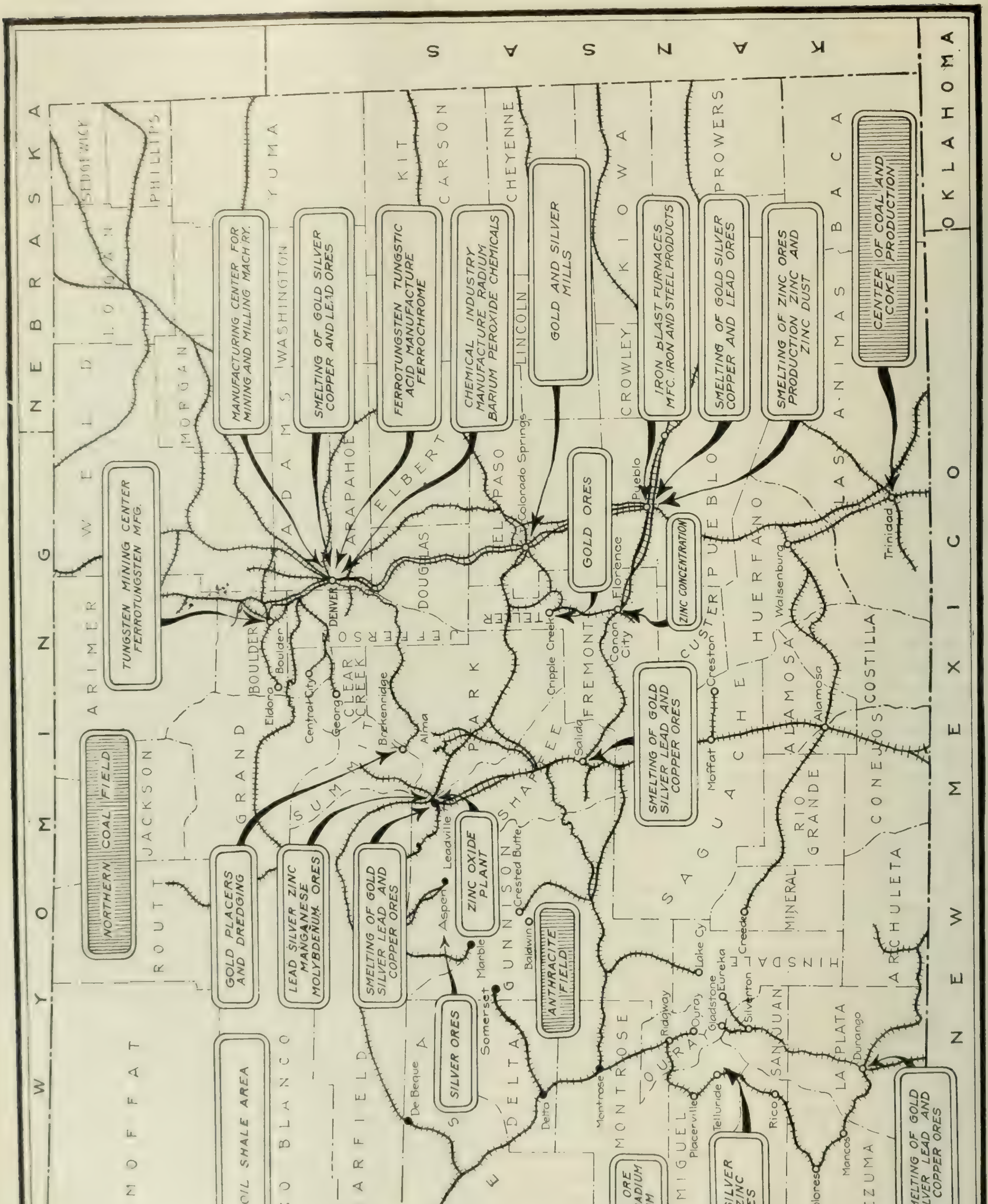
*Abstract of a paper by F. C. Miller to be presented at the Colorado meeting of the A.I.M.E. September, 1918.



INDUSTRIAL MAP OF COLORADO

Ore Treatment in Colorado

A Unique Position Has Been Maintained by Colorado in the Milling and Metallurgical Field—In Concentration, Smelting and Refining, Many Fundamental Improvements Are Due to Colorado Engineers

COLORADO has been prominent in the development of methods of ore treatment. The great variety of its minerals, the diverse conditions of locality, and its distance from manufacturing centers necessitated the development of methods that would result in finished or, as far as possible, nearly finished, metallic products that could be transported at a minimum of expense to the distant market centers. This progress, accelerated as new ores were discovered, stimulated the mining-machinery business. As a result, Denver became an equipment center of considerable importance. Metallurgists, chemists and millmen also developed under the stimulus of the important problems that they were compelled to solve. Innovation in the application of chemical principles and the development of mechanical appliances have long been features of the professional metallurgical practice that has made Denver a center for technical men. As a supply point, Denver has been for years and will continue to be important.

AMALGAMATION AND CONCENTRATION

The first gold vein discovered in Colorado was the Gregory, at Black Hawk, Gilpin County, on May 6, 1859. Other discoveries followed, and soon Gilpin County was an important gold-producing area. The slow-speed, high-discharge stamp mill was developed in response to the early discovery of the fact that fine division and intimate contact with mercury were necessary for a substantial recovery of the gold.

Concentration by means of the Gilpin County bumping table opened the way to a new principle. The rapid development of lead smelteries afforded an outlet for the concentrates produced. Gilpin and Clear Creek counties became a Mecca for millmen, and the practice there established became the inspiration and example for other mining camps.

Concentration became the accepted method to apply to gold ores after amalgamation, and there are a number of plants wherein this combination method is still used. The accompanying list has been compiled to indicate the present position of the method. Better concentration appliances have taken the place of the old bumping table—the vanner, and tables of the Card, Wilfley, Overstrom and Deister types.

CONCENTRATION

Gilpin County practice was adopted, in some of its features, when lead, zinc and silver sulphide ores were discovered. Such ores were more complicated than the simple sulphide gold ores, and required a more thorough development of concentration appliances. The vanner was borrowed from California practice and served a useful end. In 1896, Arthur R. Wilfley invented the Wilfley table and greatly extended the possibilities for the treatment of the mixed sulphide ores that were so characteristic of the mining districts of Colorado. Classification and fine crushing were developed, and finally complete mill systems were worked out. Magnetic concentration for separating iron and zinc concentrates was applied. Electrostatic separation also was tried. Dry concentration methods were experimented with. Nothing that might give a more marketable product was ignored. Millmen tried and succeeded fairly well in sending clean concentrates of zinc, lead, and iron to the smelting plants. Flotation was welcomed as a method of insuring better recoveries and became important as a treatment to supplement the more common methods of wet concentration. The introduction of flotation was rapid, and the peculiar problems that were encountered necessitated a large amount of patient experimentation. The following list of plants indicates the present importance of concentration and flotation practice:

COLORADO AMALGAMATION-CONCENTRATION PLANTS

	Capacity
A. K. R. Gold Mining and Milling Co., Rollinsville	(a)
American Gold Mining Co., Ouray	(a)
Capital Mining and Tunnel Co., Georgetown	250-ton
Carr Mines, Central City	50-ton
Carter Mining Co., Ohio	20-stamp
Colorado Metals Co., Silverton	20-stamp
Continental Mines, Power and Reduction Co., Idaho Springs	100-ton
Dorit Mining, Milling and Tunnel Transportation Co., Idaho Springs	50-ton
Dumont Mining and Milling Co., Dumont	75-ton
Gilpin-Eureka Mines Co., Central City	10-stamp
Gold Anchor, Alice	10-stamp
Golden Age Mining and Reduction Co., Jamestown	50-ton
Golden Empire Mining Co., Empire	10-stamp
Intersection Leasing Co., Animas Forks	10-stamp
Jurich Mining and Leasing Co., Ames	30-stamp
Little Mattie Mining, Milling and Power Co., Idaho Springs	40-stamp
London Mining and Reduction Co., Alma	20-stamp
Meteor Mine, Alice	5-stamp
Miller Gold Mining, Milling and Tunnel Co., Leadville	15-stamp
Mount Champion Mining Co., Leadville	100-ton
Ophir Loop Mines Co., Ames	50-stamp
Pennsylvania-Colorado Mining, Tunnel and Milling Co., Central City	50-ton
Perigo Mines, Gilpin	30-stamp
Pioneer Consolidated Mines Co., Breckenridge	20-stamp
Raymond Cons. Mining Co., Ohio	20-stamp
Sunnyside M. and M. Co., Eureka	200-ton
V. P. R. Leasing Co., Central City	45-stamp

(a) Unknown.

CONCENTRATION PLANTS OF COLORADO

	Capacity, Tons
Ackron Mines, White Pine	(a)
American Rare Metals Co., Cedar	10
Bard Creek Mining Co., Georgetown	50
Big Five Mining Co., Idaho Springs	50
Blue Flag Gold Mining Co., Laurium Mine, Breckenridge	75
Bolivar Mining and Tunnel Transportation Co., Montezuma	50
Denver Mining and Milling Co., Wortman	50
East Willow Mining Co., Creede	50
El Monte Mining and Milling Co., Jaspar	50
Canon City Mill, Empire Zinc Co., Canon City	200
Eagle Group, Empire Zinc Co., Gilman	150
Golden Sun Tunnel and Mining Co., Tolland	50
Granite Tunnel Co., Granite	50
Grimm Mill, Boulder	40
Hahn's Peak Gold Mining and Milling Co., Columbine	50
Highland Mary Mines Co., Animas Fork	(b) 20
Jessie Consolidated Mines Co., Breckenridge	100
Joe Reynolds M., M., Drainage Tunnel and Transportation Co., Idaho Springs	50
Keystone Mining and Reduction Co., Magnolia	50
Long Chance Mining Co., Nederland	30
Midland Chief Mines Co., Georgetown	50
Mineral County M. and M. Co., Creede	300
Orient Mine, Villa Grove	50
Philadelphia Mines Leasing Co., Montezuma	100
Pittsburgh Con. Mining, Milling and Tunnel Co., Idaho Springs	50
Rawley Mining Co., Bonanza	100
Rico-Wellington Mining Co., Rico	75
St. John Mines, Ltd., Revenue Mine, Ouray	250
Santiago Consolidated M., M. and Tunnel Co., Georgetown	50
Silver King Mines, Dumont	25
Smuggler Leasing Co., Aspen	400
Standard Gold-Copper M. and M. Co., Salida	(b) 10
United Imperial Mining Co., Georgetown	50
Wagner Development Mining Co., Telluride	100
Wasatch-Colorado Mining Co., Silver Plume	50 & 75
Wellington Mines Co., Breckenridge	150
Western Chemical Manufacturing Co., Denver	100
Western Gold Mining Co., Alma	25
Yellow Jacket Mines Co., Ouray	150

(a) Unknown.
(b) Stamps.

COLORADO FLOTATION AND CONCENTRATION PLANTS

	Capacity, Tons
Allgrove M. and M. Co., Cardinal	75
American Metal Co., Ltd., Climax	250
American Metal Producing Co., Black Hawk	50
Argo Reduction & Ore Purchasing Co., Idaho Springs	100
Aspen mine, Silverton	150
Atlas Mining and Milling Co., Sneffles	150
Barstow Lease, Ironton	200
Big Giant Lease, Silverton	50
Broderick M. & M. Co., Idaho, Springs	50
Carribeau Mining Co., Ophir	50
Colorado Superior Mining Co., Telluride	200
Colorado-Utah Operating Co., Lake City	100
Contention Mining Co., Silverton	50
Evergreen Mines Co., Apex	100
Excelsior Mining, Milling and Electric Co., Excelsior Mine, Frisco	100
Genesee Mines, Ironton	50
Gold Crown Mining and Reduction Co., Ouray	100
Gold Hill Concentrating Co., Gold Hill	150
Gold King Leasing Co., Silverton	(a) 80
Hamlet Mining and Milling Co., Howardsville	100
Hudson Milling Co., Idaho Springs	125
Idaho Mining and Leasing Co., Hesperus	50
Idaho Mining, Reduction and Transportation Tunnel Co., Idaho Springs	50
Iowa-Tiger Mining Co., Silverton, (100-ton concentration; 50-ton flotation)	
Kittimac Mine and Mill Co., Silverton	125
Little Giant Gold Mining and Milling, Lawson	56
Mary Murphy Gold Mining Co., Romley	175
Mears and Wiltley, Silverton	500
Mineral Farm Mine, Ouray	50
Mountain-Top Mining Co., Sneffles Milling Co., Idaho Springs	50
Oneida-Stag Mining Co., Idaho Springs	(a) 10
Paramount Reduction Co., St. Elmo	100
Pine Marten Mining Co., Red Cliff	100
Pingrey Mines and Ore Reduction Co., Leadville	200
Pride of the West Mining Co., Howardsville	100
Progress Mining and Milling Co., Frawley	250
Puzzle Leasing Co., Breckenridge	50
S. D. and G. Leasing Co., Silverton	250
St. John Mines, Ltd., Denver (Comstock)	100
Silver Ledge Mine, Silverton	100
Silver Lake Mines, Silverton	300
Sunnyside M. & M. Co., Eureka	600
Vernon Mining Co., Ironton	50
Vindicator Gold Mining Co., Independence	350

(a) Stamps.

CHLORINATION

The Plattner process for the treatment of gold ores was invented in 1848. Colorado metallurgists developed it and erected plants and treated ores on a scale that attracted the attention of their brother workers in all parts of the world. Mechanical roasting furnaces, the Holthoff-Wethey, the Pearce turret, the Ropp, the Brown, the Jackling and the Argall, were designed and used on a large scale. Roasting practice became systematized.

Barrel chlorination was rapidly advanced to complete development and became standard practice in the chlorination mills treating ores in the Cripple Creek district and at Colorado City. In 1900, the popularity of chlorination began to wane, and its active competitor, the cyanide process, slowly pushed it out of the field. In 1897, Philip Argall was operating the Metallic Extraction Co.'s plant, nearer Florence. In 1901 the Dorcas cyanide plant was in operation. By 1910 there were only two chlorination plants in operation on Cripple Creek ores. The magnificent installations at Colorado City finally shut down, the last one in 1912, leaving the field to the smelteries and cyanide plants.

CYANIDATION

Philip Argall became interested in the application of the cyanide process to gold ores in the Cripple Creek district, and his efforts led to such success that the new process entirely displaced chlorination. Wherever gold ores were encountered in Colorado, the cyanide process established itself. The Portland cyanide plant at Victor was especially designed to treat the low-grade dump rock that had accumulated for many years. It was a success and has attracted the attention of metallurgists in other localities. For the treatment of higher-grade ores, the Golden Cycle plant at Colorado Springs is a typical example. The importance of the method is indicated by the number of plants that have been constructed.

CYANIDE PLANTS OF COLORADO

	Capacity, Tons
Blue Flag Mine (Blue Flag Gold Mining Co.), Cripple Creek	100
Camp Bird Mine (inactive)	250
Commonwealth Mining Co., Alma	40
Dante Gold Mining Co., Cripple Creek	100
Golden Cycle M. and Reduction Co., Colorado Springs (roast cyanide)	1300
Isabella Mines Co., Victor	75
Jerry Johnson Gold Mining Co., Cripple Creek	100
Joe Dandy Mining Co., Cripple Creek	100
Liberty Bell Gold Mining Co., Telluride	500
London Badger Gold Mining and Milling Co., Ophir	(a)
Portland Gold Mining Co., Victor, (600-ton concentrating mill and cyanide plant; 1400-ton concentrating and cyanide plant; 400-ton cyanide plant)	
Queen Gold Mining Co., Cripple Creek	200
Rex Mining and Milling Co., Victor	100
Smuggler Union Mining Co., Telluride	600
Tomboy Gold Mining Co., Ltd., Telluride	500
United Gold Mines Co., Cripple Creek	50
United States Gold Corporation, Sugar Loaf	150
Wano Mining and Milling Co., Jamestown	50

LEAD-SILVER SMELTING

Colorado early became a lead-silver smelting center, and the practice developed there was in advance of that of any other district. From the earliest days of Leadville there was steady progress. Each smelting plant that was erected was an improvement, mechanically and metallurgically, over its forerunners. Ore tonnages offered to the smelters were never large and probably seldom exceeded 600,000 tons per annum, and much ore from neighboring states was necessary to smelt the Colorado ores. The principal factor in developing the custom-smelting industry can be traced to the necessity of bringing other ores to the furnaces for fluxing and for maintaining the proper proportion of lead in the charges.

Lead-silver smelting has had its ups and downs in Colorado, and new ore discoveries may be expected to maintain the industry. The present smelting capacity is confined to five plants, of which four are operated by the American Smelting and Refining Co. A brief description of the plants follows:

Globe Smelter, Denver: 7 blast furnaces; total annual smelting capacity, 510,000 tons.

Pueblo Smelting and Refining Co., Pueblo: 7 blast furnaces; total annual smelting capacity, 380,000 tons.

Durango plant, Durango: 4 blast furnaces; annual capacity, 210,000 tons.

Arkansas Valley Smelter Co., Leadville: 10 blast furnaces; annual capacity, 510,000 tons.

Ohio & Colorado Smelting Co., Salida: 4 blast furnaces; annual capacity, 345,000 tons.

MATTE SMELTING

The smelting of copper ores with gold and silver ores, collecting the gold, silver and copper in a matte, was begun in 1878 by Richard Pearce at the Argo works, a smaller smelting plant having been operated at Black Hawk before this time. A highly successful practice was established. Small reverberatories, 9.75 x 15 ft., were first used, and these were increased in size until in 1894 they were 16 x 35 ft. A unique system of refining the copper matte for its gold content was put in successful operation, and remained a metallurgical secret until the Argo plant was closed down, when the details of the method were disclosed.

Pyritic smelting was introduced into Colorado early in 1892 at Leadville and at Kokomo. F. R. Carpenter established plants at Golden and at Florence. Similar smelteries were built at Leadville, Ouray and at Vulcan. Most smelters were successful to a moderate extent, although they did not establish the pyritic method of smelting as firmly as was the case of the silver-lead smelters with their method.

As the copper ores of the state, never very great in quantity, diminished, both pyritic and matte smelters had to secure ores from outside the state. Confronted with the added difficulty of finding a market for their matte, they finally succumbed.

ZINC SMELTING

The presence of a large proportion of zinc sulphide in many of the ores of Colorado made such ores objectionable to the lead smelters, and caused them to impose severe penalties upon high-zinc ores. To lose not only the value of the zinc but also to receive less for his lead was not particularly attractive to the miner. The result was to stimulate metallurgists to discover methods for the separation of the lead and zinc compounds.

Bartlett, at Canyon City, introduced a method of volatilizing and burning the zinc to an oxide by means of a special furnace. The zinc oxide mixed with some lead sulphate was marketed to paint manufacturers, and the residues were worked up for gold, silver, copper and the remaining lead. A successful business was established and continued for a number of years.

Other metallurgists attacked the problem by mechanical separation. Electro-magnetic separation was eventually established, and certain ores responded to treatment by this method. The U. S. Zinc Co., the Western Chemical Co. and the Empire Zinc Co. have magnetic separators in their mills. Electrostatic separation was early tried out and has not been particularly successful. Until recently there was a plant in operation in Denver, and three others in the state. Differential flotation has also been tried and is no doubt successful in a number of mills. What has been demonstrated is that no one method is equally applicable to all ores, but is, rather, applicable only to ores of a certain type. The zinc-lead sulphide problem has not been completely solved, but satisfactory results are being obtained in a number of instances. Low-zinc lead concentrate and low-lead zinc concentrate are now being marketed where formerly an almost unmarketable product was shipped.

At Leadville a zinc-oxide plant is treating zinc carbonate ores. The River Smelting and Refining Co.'s plant treats zinc-lead-copper sulphide ores from several counties in Colorado, a part of its product being forwarded to this company's electrolytic zinc plant at Keokuk, Iowa. The U. S. Zinc Company's plant at Pueblo is operating 2320 zinc retorts and producing zinc from ores from Colorado and other districts.

RADIUM, URANIUM AND VANADIUM

Colorado has produced some unusual ores, chief of which are carnotite and pitchblende. The successful treatment of these by scientists of the U. S. Bureau of Mines is so recent that it is unnecessary to go into detail here. Radium, sodium uranate, and iron vanadate have been produced in quantity by methods that were devised in a Denver plant. In another part of this issue an abstract of Dr. R. B. Moore's paper on the methods of treatment of carnotite ores is presented.

The war demand for tungsten stimulated the mining of tungsten ores. The Boulder district is the most important producer. The dressing practice for the special treatment of these ores has progressed until results have been greatly improved. Ferrotungsten, ferrochrome and ferromanganese are being produced by Colorado plants. In another part of this issue Robert M. Keeney describes the smelting methods in use. The activity in the production of tungsten and rare metals is shown by the list of operating companies that follows:

TUNGSTEN, CARNOTITE AND RARE-METAL COMPANIES OF COLORADO

(Figures in parentheses denote capacity)

American Rare Metals Co., Cedar
Black Metal Reduction Co., Boulder (Tungsten concentrate and slime refinery)
Black Prince Mines, Ferberite (15-ton)
Boulder Tungsten Production Co., Boulder (50-ton)
Tungsten Ref. and Ext. Plant, electric furnace (25-ton), Manufacturers ferrotungsten tungstic acid
Carnotite Reduction Co., Nucla
Colorado-Gilpin Gold and Radium M. Co., Central City
Eagle Rock Tungsten Production Co., Boulder (75-ton)
Ferro Alloys Co., Denver (manufacturers of ferrotungsten)
Rare Metals Ore Co., Denver and Rollingsville
Intermountain Tungsten Milling Co., Saline (50-ton)
Iron Mountain Alloy Co., Denver
Long Chance Mining Co., Nederland (30-ton)
McKenzie Mines, Nederland (20-ton)
Colorado Metal M. and Red. Co., Georgetown, (20 stamps)
Mohave Boulder Tungsten Co., Sugar Loaf (50-ton)
National Tungsten Mining Co., Rowena (25-ton)
Overall Mines Co., Egnar (carnotite)
Pittsburgh Radium Co., Denver
Primos Chemical Co., Vanadium
Primos Exploration Co., Crescent (35-ton)
Primos Mining and Milling Co., Lakewood (60-ton)
Radium Ores Co., Naturita
Rare Metals Ores Co., Rollinsville (75-ton)
Schlesinger Radium Co., Paradox (10-ton)
Standard Chemical Co. (50-ton)
Sugarloaf Tungsten, M., M. and Dev. Co.
Tungsten Metals Corporation, Boulder (25-ton)
Tungsten Mountain Mines Co., Tungsten
Vasco Mining Co., Boulder (two 50-ton)
Wolf Tongue Mining Co., Nederland (50-ton)

Technical Uses of Radium*

The chief technical use for radium is in connection with permanently luminous paint. If radium salts are mixed with phosphorescent zinc sulphide, a product is obtained which is permanently luminous in the dark without previous exposure to light. The zinc sulphide must be specially prepared and usually contains traces of impurities, such as copper, manganese, or other mineral. Just what relation exists between these impurities and the peculiar properties of the zinc sulphide is not known, although experimental work is now being done to determine it. The luminous paint usually carries from 0.1 to 0.25 mg. of radium element to 1 gram of zinc sulphide, depending upon the particular use to which the paint is put.

This material is now being used largely on the faces of watches and clocks; to coat electric light push-buttons and the chains attached to electric globes; and for various other purposes. It is unfortunate that the domestic supply of radium is being disseminated in this manner. But as the physicians and surgeons of the country are not purchasing enough radium to made the industry a financial success, it is natural that the manufacturers should take other means of creating a demand. The day is probably not far distant when the people of the United States will greatly regret that so much radium has been utilized in this way.

Radium has a most decided usefulness at present; nine instruments used on airplanes have dials made luminous with radium paint, and it is employed in the same manner for compasses and gunsights. The efficiency of night firing, with both machine guns and artillery, has been greatly increased by the use of luminous sights. Other uses cannot be specified, at the present time, in a public paper.

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*An excerpt from a paper presented at the Colorado Meeting of the A. I. M. E. by Richard B. Moore, of the U. S. Bureau of Mines.

Headquarters of the A. I. M. E.

DR. R. W. RAYMOND'S OFFICE

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Radium Ore Deposits*

Carnotite Occurrences of Colorado and Utah Are of Great Importance in the Pro duction of Radium Compounds—Scattered Deposits in Dolores, San Miguel and Montrose Counties

BY RICHARD B. MOORE

THE principal commercial ores of radium are pitchblende and carnotite. The former mineral has no definite composition, consisting of uranium oxides (UO_3, UO_2) with oxides of lead, calcium, iron, bismuth, manganese, copper, silicon, aluminum, and rare earths. Carnotite has a more definite composition, being a potassium uranyl vanadate containing small quantities of barium and calcium. The formula $K_2O.2UO_3.V_2O_5.3H_2O$ expresses its composition fairly well, although not exactly. Of lesser importance are autunite, a hydrated calcium uranium phosphate $Ca(UO_2)_2(PO_4)_2.8H_2O$, and torbernite, a hydrated copper uranium phosphate $Cu(UO_2)_2.P_2O_8.8H_2O$.

The pitchblende deposit at St. Joachimsthal, Austria, is in mica schist interbedded with lime schist and crystalline limestone. Toward the east and northeast the formation is gneiss. The gneiss was intruded by quartz porphyry subsequent to the deposition of the vein material. In the mica schist are fissures filled with volcanic material which cut the mineralized zone at various points and depths. The veins are usually 6 in. to 2 ft. wide, in rare cases widening out to 3 ft. The mode of mineralization varies greatly, the ores occurring in both stringers and pockets. They contain silver, metallic and as argentite; polybasite, tetrahedrite, etc.; nickel, as nickelin, chloanthite, etc.; cobalt, as smaltite, bismutosmaltite, etc.; bismuth, as metallic bismuth, bismite, etc.; arsenic, as metallic arsenic and arsenopyrite; and uranium, as pitchblende and other alteration products. Galenite, zinc blende, pyrite, marcasite, and copper occur in minor quantities. The veins show that deposition occurred in three periods; the cobalt and nickel were deposited first, then the uranium, and lastly the silver. Dolomite spar is always present, and generally has a white or yellowish-white color, but changes to a brownish-red hue where pitchblende begins to appear, and is a dirty gray where it is actually in contact with the ore. Deep-blue fluorspar is always present. The mines at Joachimsthal have been worked since 1517. In 1545 the production of silver ores declined considerably, but since then the deposits have been mined for bismuth and cobalt. During the last 25 years the mines have been worked for uranium.

SAXONY SILVER-COBALT ORES

In the vicinity of Annaberg, on the Saxony side of the Erzgebirge, the silver-cobalt veins resemble those at Joachimsthal. At Johanngeorgenstadt, the veins contain tin and silver-cobalt ores. Where dolomite spar is found, the silver-cobalt ores contain pitchblende, as at Annaberg. In the Gottessegen mine the pitchblende occurs in the spar in pieces 2 to 3 in. in diameter. These mines are worked principally for bismuth ocher, but also for cobalt and nickel. In the cobalt-bismuth mines of Schneeberg are found bismutite and various minera of nickel, silver, and arsenic. There is also some pitc blende, uranochalcite, uranospinite, galenite, and zi blende.

THE CORNWALL PITCHBLENDE

Pitchblende has also been found in Cornwall, Englan in the tin region. At Joachimsthal and Johanngeo genstadt, the mineral is found associated with nicke cobalt veins, though only part of the veins are high argentiferous. Even though these veins are close connected with the tin veins, they apparently are n of the same age as the latter, but belong to the sar general period of mineralization.

PITCHBLENDE IN THE UNITED STATES

Pitchblende has been found in the following localiti in the United States: Feldspar quarry, at Middletow Conn., in large octahedrons; in Hall's quarry, Glastonbury, Branchville, Conn., in a pegmatite ve and usually embedded in albite; at Marietta, S. C.; the Baringer Hill district, Llano County, Tex.; in t Bald Mountain district, Black Hills, S. D.; in Mitch County, N. C.; and in Gilpin County, Colo. The latt district is the only one of commercial importance.

All of the Gilpin County mines, with one exceptic are found on or near Quartz Hill, a few miles fr Central City. There are five that have produced pit blende in quantity: the Kirk, Wood, German, Belch and Calhoun. The Kirk, Belcher and German mi are close together on Quartz Hill; the Wood and t Calhoun are in the valley below.

These mines until recently were worked mainly gold. In this district, gneiss and crystalline sch predominate, with intrusive andesitic dikes and oc sionally acid granitic dikes. The rock containing pitchblende, galena, sphalerite, etc., is a fine-grai aplitic granite which probably once contained an preciable amount of biotite. The ore deposits are two general types, one containing pitchblende w pyrite, sphalerite and galena, and sometimes marcas and the other type carrying pyrite, chalcopyr sphalerite and galena, with some gold and sil Generally speaking, the two types are not associa so that the miner has a choice of mining either pitchblende or for gold.

The Kirk mine has probably been the most import producer of the five mentioned, although reliable on the output of pitchblende from this mine, up few years ago, have been difficult to obtain. Du the last 12 years, about 20 tons of ore, with an ave content of 35% U_3O_8, and over 100 tons with a con of 3 to 4% U_3O_8, has been mined. The mine has shut down for some time. More recent operation the German and Belcher mines produced 120 ton low-grade ore, averaging about 1% U_3O_8, and six of high grade. Smaller quantities of ore have been produced at various times from these mines and from the Wood and the Calhoun.

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*An excerpt from a paper presented at the Colorado meeting, September, 1918, of the American Institute of Mining Engineers.

Uranium ores are found in certain localities in Australia. One of these deposits is 80 miles east of Farina, a railroad station on the Great Northern line, in South Australia, and lies between Mount Painter and Mount Pitt. H. L. Y. Brown states that the rocks of the district consist of coarse and fine feldspathic, siliceous, and micaceous granite, gneiss, quartzite and mica schist. The rocks are contorted in places and penetrated by dikes of coarse, pink-colored eruptive granite.

PORTUGAL AUTUNITE

Autunite is found in commercial quantities in Portugal in the district between the towns of Guarda and Sabugal. Apart from the uranium, the rocks of the region are much mineralized, showing deposits of galena, arsenopyrite, chalcopyrite, tungsten and cassiterite. All of the deposits referred to are important and have been developed as commercial sources of radium; in fact, until about seven years ago, they were the only source from which radium ores were obtained.

CARNOTITE DEPOSITS OF COLORADO AND UTAH

About 1910, the carnotite deposits of southwestern Colorado and eastern Utah began to receive attention. They were known as far back as 1881, but the composition of the ore was unknown until 1897. In 1899, an analysis showed that the ore not only contained uranium, but was a potassium uranyl vanadate. In 1900, a small plant was erected in the McIntyre district, south of the Paradox Valley, Colorado, for the extraction and recovery of uranium oxide from carnotite ore. Only moderate success was achieved, and the plant was soon shut down. Operations were also started by other concerns, notably the Western Refining Co. and the Dolores Refining Co. These plants extracted uranium and vanadium only. None of these operations was of importance, and it was not until 1909 or 1910 that any interest was shown in the carnotite deposits as a source of radium. At that time, the ore was almost exclusively shipped abroad.

In the autumn of 1912, representatives of the U. S Bureau of Mines made a thorough survey of the carnotite fields and announced the fact that the carnotite deposits of Colorado and Utah constituted by far the largest source of radium-bearing ores in the world. Developments since then have proved this statement to be correct, as the larger part of the radium that has been produced up to this time has been derived from American carnotite ore.

CARNOTITE AREA 60 BY 20 MILES

The deposits are found mainly in Dolores, San Miguel, and Montrose counties, Colo., and extend over a belt about 60 miles long by 20 miles wide. The ore is also found to the west of the La Sal Mountains in Utah, and along the San Rafael Swell, southwest of Green River, Utah. Small patches of ore are found scattered between these points and extend up as far north as Meeker, Colorado.

The most usual ore is a sandstone so impregnated with yellow carnotite that the color is decidedly noticeable, and contains small kidneys of brown sandy clay. The kidneys constitute a considerable part of some of the ore; in many cases they are thinly scattered through the sandstone. Although ore of the character mentioned is widely distributed in the Paradox and adjacent districts, and constitutes a large part of the ore shipped, it is by no means the only ore of commercial importance. Indeed, the variety of the types of ore in Utah is one of the interesting features of the uranium and vanadium deposits. There are dark blue, brown, and black vanadium ores, the dark blue ores being lustrous when first mined and usually carrying uranium; high-grade carnotite in vug holes so soft that it can be molded in the fingers; and the same kind of ore crystallized with gypsum. Red calcium vanadate is found alone and mixed with carnotite. The ores of the Paradox district differ in many respects from those in Utah, but chiefly in carrying larger proportions of carnotite, and as a rule are more yellow. Not only do they carry more uranium, but also, on the average, more vanadium, although individual shipments from Utah, particularly from Temple Mountain, might seem higher in vanadium than the average ore from the Paradox district.

The deposits are invariably pockets, many of which, however, are of considerable size. A few individual claims have produced as high as 500 tons of shipping ore, but this is an exceptional condition. The ore is found in a light-colored sandstone overlain in places with shale and conglomerate; according to Hillebrand and Ransome, this is the McElmo formation.

FUTURE SUPPLY OF ORE

It is difficult to estimate the exact amount of radium in existence at the present time; probably it is somewhere around 3 oz. of radium element. On account of the great scientific interest attached to radium, and because of its use in the war and in medicine, the permanency of the ore supply is an important question. Considerably more than half the amount of radium now in existence has come from Colorado and Utah carnotite ores. Six years ago, the engineers of the Bureau of Mines estimated that, at the current rate of production, the deposits might last, commercially, 10 or 12 years. At the present time, it is difficult to obtain ore. Most of the deposits are owned by five operating radium companies. The production has increased greatly during the war; and I am doubtful whether it is possible to depend upon American carnotite deposits to yield commercial quantities of ore for more than six or seven years longer. It is my judgment that the fields will not produce more than 100 additional grams of radium element at the most—if that much. This would about double the world's present supply; but, on account of the large use of radium in cancer treatment, such an amount, although large scientifically, would be small in proportion to the probable demand.

RADIUM PRODUCTION FROM AMERICAN CARNOTITE

Year	Tons U_3O_8	Tons U	Grams Ra Contained	Grams Ra (Recovered, 75% Basis)
1912	28.8	24.4	7.4	5.5
1913	41.0	34.8	10.5	7.9
1914	87.2	74.0	22.5	16.9
1915	23.5	19.9	6.0	4.5
1916				
1917	70.0	59.3	18.0	13.5

Molybdenite Operations at Climax, Colorado*

By D. F. Haley

Molybdenite deposits at Climax, Colo., have recently attracted considerable notice, because of their great size, as compared with other known deposits of the same mineral. Climax station is 14½ miles northeast of Leadville, and is 11,300 ft. above sea level. Climatic conditions are severe, and snow may fall in any month.

Some of the richest gold placers of Colorado occur within a few miles of Climax, so the surrounding country has been well prospected, although it is difficult to say when the presence of molybdenite first became definitely known. Claims had been staked as early as 1896, but it is evident that the prospectors at that time were looking for gold.

In 1916, engineers of the American Metal Co. made a thorough examination of the property. They had difficulty in getting concordant results from different assayers, and the return varied between 0.4 and 1.2%. Finally, by systematic sampling and testing, a product of the property was put through flotation machines and a concentrate was obtained, assays of which showed that a recovery of 12 lb. of MoS_2 per ton of ore could reasonably be expected.

The orebodies are found on the southwestern slope of Bartlett Mountain, which consists of alaskite, or highly siliceous granite. Many inclusions of gneiss are found in the alaskite, and on the western flank of Bartlett Mountain thick limestone beds occur, tilted at such an angle as to indicate that they at one time covered the area, but have been removed by erosion. The gneiss may be an altered sedimentary rock. Glacial action has evidently been severe, and the divide is covered by a heavy moraine.

The ore occurs as an intricate system of fine stringers fairly evenly distributed throughout the alaskite. The original granite has been altered and silicified, and appears now to consist only of a quartz ground-mass in which some phenocrysts of feldspar still remain. Little ore mineral is found in the quartz-porphyry occurring throughout the main ore-bearing rock. Associated minerals are iron pyrite and a small amount of copper. Occasionally a small pocket of hübnerite is found, but not in appreciable amounts.

Two systems of mining are practiced. The thin outer edge of the orebody, bounded by the horizontal plane of the tunnel and the steep sloping surface, is to be removed by open-pit gloryhole methods during the summer months. Drifts have been run 40 ft. below the surface and parallel to the contours of the hill. From the drifts, raises will be driven to surface, and the ground broken down through them, drawn into cars and trammed out to the bins. Further in, the ground has been laid out in a series of parallel drifts running diagonally across five parallel patented claims. These drifts are 50 ft. apart and 860 ft. long. From them, raises are put up every 30 ft. and widened out, above the back of the level, to a cone-shaped pocket, at the bottom of which a chute is placed. This widening connects all of the pockets, and, when completed, is ready for shrinkage operations.

The stope drift is 860 ft. long and the stope itself is carried up as two separate workings, each 400 ft. long and 25 ft. wide. In the center, between the stopes, a pillar 40 ft. long is left standing. A two-compartment raise is carried up ahead of the stope through the center of this pillar, and small drift holes are extended from the raise to the stopes on each side about every 20 ft. At the end of each stope, a similar pillar is left, through which a one-compartment raise is carried up, which is connected with the stopes by small drifts. The stopes are to be carried up to the surface as shrinkage stopes, and when the surface is reached, the end and side pillars left between the stopes will be broken down by gloryhole methods.

The ore from the mine is dumped into a 300-ton bin, from which it is drawn into the one-ton buckets of a 700-ft. Leschen jig-back tram. This delivers it to two 400-ton bins, so designed that both bins feed into a 10 x 20-in. Blake crusher. From the crusher, the ore drops on a 16-in. conveyor belt, is elevated to a 400-ton tramway bin and carried to the 500-ton mill bin by means of a 4700-ft. Leschen aërial tramway. The ore is fed by plunger feeders to a 16-in. flat conveyor belt, which delivers to an Allis-Chalmers ball mill. From this 6 x 6-ft. mill, the ore (now crushed to about 20 mesh) goes to a standard duplex Dorr classifier. The overflow goes direct to the flotation machines, and the sands drop to a 6 x 10-ft. Allis-Chalmers ball mill and return to the same classifier until fine enough for overflow. Crushing is to 120 mesh.

The flotation plant consists of five Janney air-mechanical machines, three Callow standard roughing cells, and two Callow one-half-size cleaner cells. The first four Janney cells deliver rough concentrates to the fifth cell, for partial cleaning; cell No. 4 discharges tailings, and the discharge from No. 5 consists of middlings, which are returned to the circuit. The concentrate from No. 5 goes to the first Callow cleaner; the concentrate from this goes to the second Callow cleaner; and in order to improve the grade, one of the Callow roughers has been converted to a third cleaner. The mill is putting through 300 tons daily.

The flotation operation is delicate, as there is nearly three times as much pyrite in the ore as molybdenite, and with a concentration ratio of 115 or 120 to 1, a large portion of the iron must be dropped to get a concentrate carrying from 65 to 70% MoS_2. Another difficulty is that when treating, say, 300 tons per day, carrying 0.92% MoS_2, the resulting concentrate, on present recovery, amounts to only 5100 lb. of 65% product or only about 4 lb. per minute from the cleaner. The size of the cleaner has been reduced, but it still remains somewhat difficult properly to control the grade of the concentrate.

A vanner is being installed to treat the concentrat for the removal of pyrite, as each unit of iron remove will increase the grade of concentrate 2.2%, the concen trate now carrying about 10% iron. Mill recovery i now 60% of the total Mo in the feed, which is equivalen to a sulphide recovery of 82%. Many tests are bein made, with encouraging results, for the recovery of th oxide molybdite. It is interesting to note that the fee to the mill averages almost exactly the figure originall estimated, the recovery being about 11½ lb. of Mo per ton, as against 12 lb. estimated recovery.

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*[illegible] of a paper [illegible] at the Colorado meeting of the American Institute of Mining Engineers, September, [illegible]

Mining in the Telluride District of Colorado

Climatic Conditions, and the Character of the Ore Deposits of an Important Colorado Mining District—Methods of Mining, With Particular Reference to Adit Driving

BY HARRY J. WOLF*

THE first active search for precious metals in the Telluride district was probably about 1875. At that time locations were made on veins now worked by the Smuggler Union Mining Co. From 1875 to 1885 a considerable amount of prospecting was done and many mining claims were located, but early records indicate that the probable production during this period was less than $50,000. In 1890 the Rio Grande Southern R. R. was completed from Ridgway to the town of Telluride, and the camp began to attain importance. Previous to the opening of railway communication, only rich ore could be handled at a profit, because all ore mined was transported on pack animals over difficult trails to distant smelteries, and only light, crude mining equipment could be brought into the district.

SAVAGE BASIN. VIEW LOOKING SOUTHEAST AND SHOWING A PART OF THE TOMBOY SURFACE PLANT

DEVELOPMENT DUE LARGELY TO POWER FACILITIES

Since the completion of railroad communication with the smelteries at Salida, Pueblo, and Durango, the development of the district has been rapid. Large and efficient mining plants have been installed, many mills have been erected, and the old practice of packing out only rich crude ore at great expense has been replaced by the efficient local treatment of large tonnages of low-grade material, and the shipment of concentrate and bullion. Efficient local transportation has been developed by the construction of good trails, excellent wagon roads, and wire-rope tramways. Hydro-electric power has been developed to a high state of efficiency by that pioneer corporation in high-tension power transmission, the Telluride Power Co., which in its early stages of growth was under the skillful management of L. L. Nunn and Cooper Anderson.

The present city of Telluride, with a population of about 2000, is the county seat of San Miguel County, in southwestern Colorado, and is 422 miles from Denver by rail. Telluride is situated in the western part of the rugged district known as the San Juan Mountains and popularly referred to as the "San Juan Country." The city of Telluride, with Ouray, the county seat of Ouray County, and Silverton, the county seat of San

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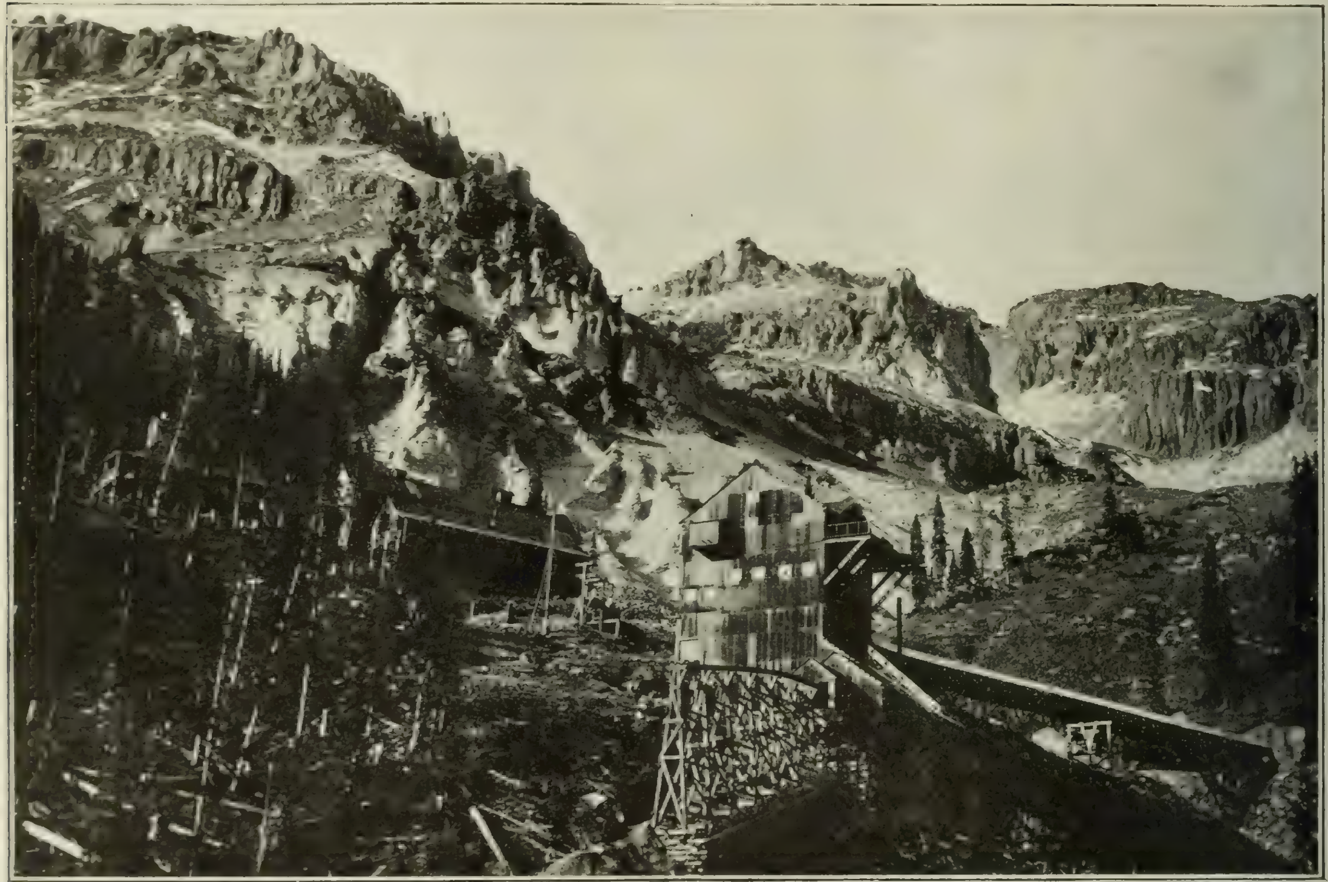
*Mining engineer, Denver, Colorado.

Juan County, forms the so-called "San Juan Triangle," famous for its production of both precious and base metals.

GEOLOGY OF THE TELLURIDE DISTRICT

The valley of the upper San Miguel River, in which Telluride is situated, with its tributary gulches, offers an excellent opportunity for the study of the geology of the district. The elevation of Telluride is 8756 ft., and the mountain ridges surrounding it on three sides rise to altitudes of over 13,500 ft. The deep gulches expose the edges of the horizontally disposed rock strata through a vertical distance of nearly 5000 ft.; and in many places vertical cliffs almost 2000 ft. high present to view several layers of the more important rocks. A generalized section of the sedimentary and bedded volcanic series of the locality is shown in the accompanying table, adapted from U. S. Geological Survey Folio 57.



LIBERTY BELL MINE, CORNET BASIN, TELLURIDE, COLORADO

The more conspicuous of the country rocks are the red sandstone and conglomerate, overlain by andesite, andesite breccia, and rhyolite in horizontally disposed layers. These rocks are cut by nearly vertical fissures containing mineral-bearing quartz. Strong fissures frequently cut through all the layers of country rock and continue to unknown depths, but the most important orebodies are found in veins in the andesite. Some orebodies have continued upward through the rhyolite, and occasionally downward into the conglomerate. In certain exceptional cases small deposits of payable ore have been found in the red sandstone and at the intersection of quartz veins with the limestone.

SEDIMENTARY AND BEDDED VOLCANIC SERIES, TELLURIDE DISTRICT

Period	Formation	Thickness Near Telluride, Feet	Character of Rocks
Neocene and Eocene..	Potosi rhyolite	1,300	Rhyolite flows and tuffs
	Intermediate	200	Andesite and rhyolite
	San Juan	2,000	Andesite breccia
Eocene	San Miguel	500	Coarse conglomerate
		Unconformity	
Cretaceous	Mancos shale	300	Gray sandy shales
	Dakota	150	Gray or brown quartzose sandstone
Juratrias	McElmo	600	Alternating sandstones and shales
	La Plata	100	Two white sandstone beds, with dark limestone between
	Dolores	1,550	Red sandstone, grit, conglomerate and shale
	Alluvium		Lake and river deposits

In the San Juan Mountains the important fissures may be classified in several well-defined systems, according to their strike and dip. In the immediate vicinity and to the northeast of Telluride, the fissures which strike northwest and southeast appear to be the most important from an economic standpoint. The strike of these ranges from N 25° W to N 50° W, and the dip is usually southwest.

Underground development is almost entirely by adits driven on the veins into the steep sides of the mountains. Frequently crosscuts are driven from the surface to cut veins that strike parallel to the mountain ridges, and occasionally shafts are sunk in country rock or on the veins, when such development is more practicable than the driving of an adit or crosscut. Some of the adits and crosscuts have attained considerable length, notably that known as the Revenue Tunnel, which is over 7500 ft. long, and cuts the Virginius vein at a depth below the surface of over 2000 ft. and at an elevation of about 10,800 ft. Development by long adits is usually the most practicable, not only on account of the topography of the country, but because of the heavy snowfall in the higher altitudes, the danger of snowslides, and the expense of transporting machinery and supplies into the upper basins. A record of the snowfall in Savage Basin during the winter of 1910-1911 shows a total of over 36 in. for the period from October 1 to June 16.

MINING METHODS IN VOGUE

The customary methods of mining are by overhand open stopes, waste-filled stopes, or shrinkage stoping. The levels are usually supported by stulls and lagging of red spruce or white spruce timber. Occasionally pillars are left above the levels. Common stoping widths are 3 to 5 ft., rarely more than 8 ft., so that the vein walls may be supported by stulls where timber is used for this purpose. Frequently the narrow veins are mined by stripping methods.

VARIETIES OF ORE MINED

The commercial ores of the district which carry chemically combined gold and silver are galena, argentiferous gray copper, polybasite, proustite, pyrargyrite, and stephanite. The metallic gangue minerals are, in addition to the above, iron pyrite, chalcopyrite, zinc blende, mispickel, magnetite, and native copper. The non-metallic gangue minerals are quartz, calcite, siderite, rhodochrosite, dolomite, fluorite, barite, sericite, biotite, chlorite, amphibole, apatite, garnet, orthoclase, and kaolinite. Payable ores are variable in composition, from a simple gold-bearing quartz to a complex mixture of lead, zinc, and iron sulphides, carrying small amounts of gold, silver, and copper.

PRODUCTION OF THE DISTRICT

During 1916 San Miguel County had 20 operating mines, and produced 428,651 tons of ore, having a total value of $3,319,676. The upper San Miguel mining district, which is immediately tributary to the city of Telluride, produced 424,794 tons of ore, yielding $2,057,586 in gold, 804,795 oz. of silver, 568,947 lb. of copper, 6,088,319 lb. of lead, and 1,098,485 lb. of zinc, with a total value of $3,294,393, as compared with $3,065,758 in 1915.

The bulk of the production of the Telluride district has been maintained by a few large mines, notably the Smuggler Union, the Tomboy, and the Liberty Bell. A brief description of a few of the more important properties will serve to illustrate the mining conditions and practices of the camp.

SMUGGLER UNION MINING COMPANY'S PROPERTY

The Smuggler Union Mining Co. operates two mines—the Smuggler and the Humboldt. The property includes 77 patented claims, with an area of about 996 acres, located in San Miguel and Ouray counties. The ore carries gold, silver, lead, and iron, occurring in a quartz-filled fissure, with an average width of about 2½ ft. The vein cuts through andesite, tuff, and rhyolite for a vertical distance of over 2000 ft., strikes northwest and southeast, and dips to the southwest. The Smuggler mine is about four miles from Telluride at an altitude of 10,900 ft. The vein, which cuts through Marshall Creek Gulch and along the south side of upper Marshall Basin, is developed by adits, the lowest being over 3700 ft. long, from which is sunk a 280-ft. winze. The main haulage level is 3600 ft. long. The workings reach a maximum depth of about 2300 ft. The total workings aggregate over 30 miles. The mine is wet in the tunnels, but not in the stopes, from April until July.

The Humboldt mine is about six miles from Telluride, at an altitude of 12,000 ft. The workings are dry the entire year. The ore is transported from the mines over wire-rope tramways to the milling plant, which is on the railroad at Pandora, about two miles east of Telluride. The Smuggler mill is equipped with 60 stamps, divided into three units of 20 stamps each. One unit is used for the treatment of ore from the Smuggler mine; the second, that from the Humboldt property and the third receives ore from the Black Bear mine, in Ingram Basin, by means of a wire-rope tramway. Following crushing, and wet concentration on tables and vanners, the ore is treated by oil flotation, which has replaced the cyanide process formerly in use at this plant.

The Smuggler Union Mining Co. was the first in the county to adopt oil flotation. The mill treats between 400 and 500 tons of ore daily, of which about 170 tons is from the Black Bear mine. Bulkeley Wells is president and general manager of the company, Charles N. Bell is general superintendent, and Walter L. Reid is mill superintendent. The Smuggler Union Mining Co. is controlled by the New England Exploration Co., of which Bulkeley Wells is vice president.

TOMBOY GOLD MINES COMPANY

The Tomboy Gold Mines Co., Ltd., operates two properties—the Argentine and the Montana. These properties are in Savage and Marshall basins at an altitude of about 11,500 ft. The old Tomboy mine, in upper Savage basin, was worked out 10 years ago. The company owns 76 claims. The Tomboy and Montana properties are developed to a depth of 2400 ft., and the Argentine is developed to a depth of 2200 ft. During 1916, 5159 ft. of development work, made up of 4676 ft. of drifting, 467 ft. of raises, and 16 ft. of crosscuts, was performed in the Montana property, which is now opened longitudinally by the Ophir tunnel level. The old Revenue raise was straightened, retimbered, and converted into a shaft for an additional distance of 168 ft. to a point 25 ft. below the 2050-ft. level. This work has developed the vein for 150 ft. below the 1900-ft. level, and added a considerable block of ground to the ore reserves of the mine. On June 30, 1916, the ore reserves were estimated at 575,000 tons, of which 175,000 tons was in the Argentine and 400,000 tons in the Montana property. The reserve in the Montana mine includes 250,000 tons of ore broken in the stopes. The lower levels of the Argentine mine contain large tonnages of ore carrying from 2 to 5% each of lead and zinc, and from 1 to 2% of copper, that will prove a valuable asset when a process can be applied that will effect both a high percentage of recovery and an economic separation of the constituent metals. Numerous tests by different processes have been made, and are still being carried on, with a view to bringing about a successful treatment of these ores. Some of the tests have given encouraging promises of success.

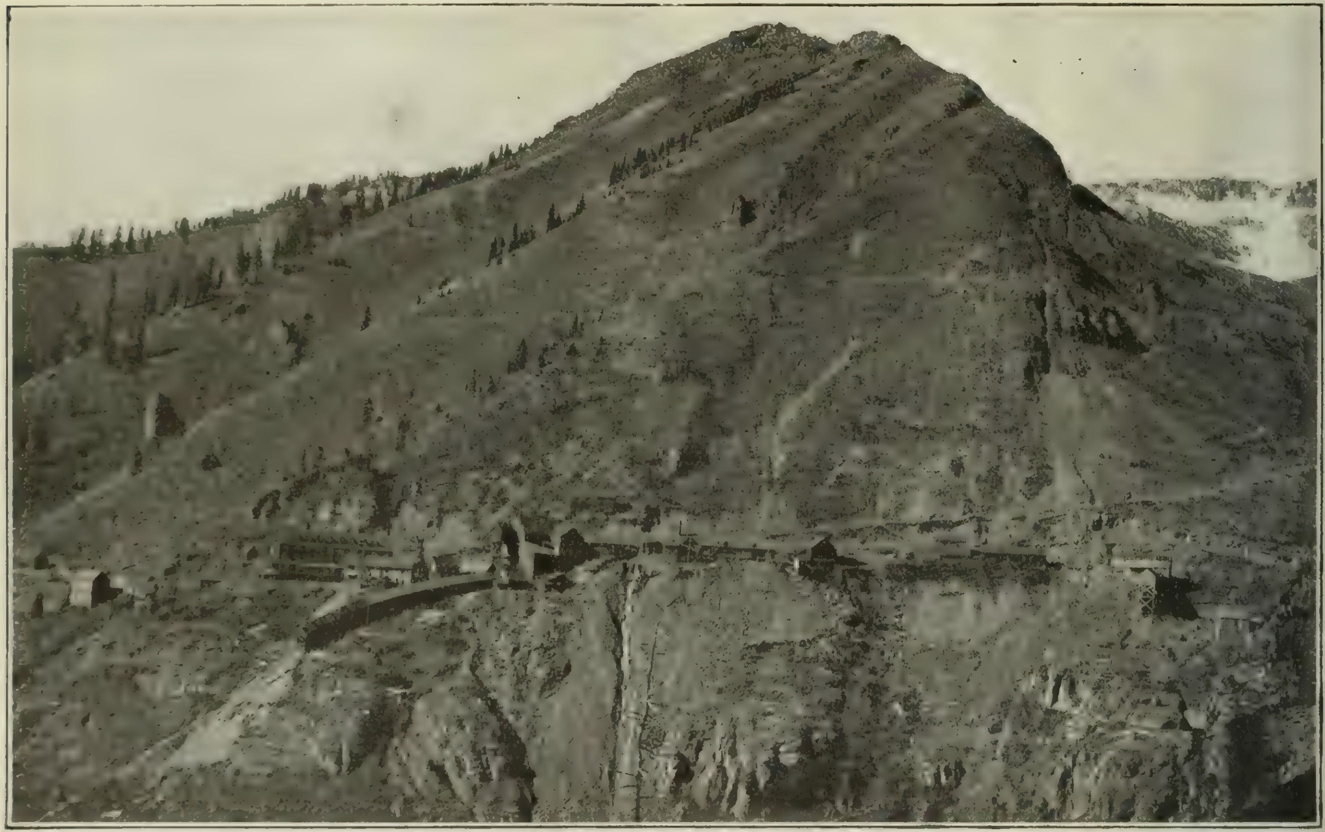
The mill in Savage basin is equipped with 60 stamps, concentration and cyanide equipment, and has a daily capacity of 400 to 500 tons. During the year ended June 30, 1916, the mill treated 150,488 dry tons of ore, which yielded in bullion $327,519, and concentrate worth $586,092, or an average of $7.14 per ton. The cyanide plant treated 132,200 tons of tailings, recovering therefrom bullion valued at $164,476, at a cost of 90c. a ton, and yielding a net profit of 31½c. per ton of tailings treated. Forty-two per cent. of the value of the yield from the ore was in the form of bullion. The costs amounted to $4.92 per ton. The total revenue for the year ended June 30, 1916, was $1,120,320, and the profit was $369,200, which, with a balance of $99,760, made available $468,960, of which $149,000 was paid in dividends. Total dividends since 1899 amount to over 262%. The concentrating mill and cyanide plant have been built and paid for out of profits, as well as additions and improvements to the plant of the Tomboy Tramway and Tunnel Co., which operates a wire-rope tramway between the Ophir tunnel and a loading station at Pandora, for the outgoing concentrate and the incoming supplies. The company is experimenting with flotation. The Tomboy properties have been under the efficient management of David A. Herron for the last 15 years. P. L. Foster is consulting engineer, and W. K. Betty is metallurgical adviser.

The Liberty Bell Gold Mining Co. operates the Liberty Bell mine, in Cornet basin, north of Telluride. The ore is gold- and silver-bearing quartz in a fissure vein averaging 3 to 4 ft. wide. The main orebody strikes northwest and southeast, and dips 57° to the southwest. The property is developed by a 2600-ft. crosscut tunnel, known as the Stilwell tunnel, and a 1000-ft. raise from the tunnel level to the abandoned upper workings. The ore is mined from open stopes on stulls, and by shrinkage stoping. A 500-ton concentrator and cyanide plant is situated on the railroad about one mile east of Telluride. The ore is transported from mine to mill over a wire-rope gravity tramway 1½ miles long. In 1916 the extraction averaged 88 per cent.

RECENT DEVELOPMENTS AT THE LIBERTY BELL MINE DISCLOSED GOOD-GRADE ORE

The most important recent development was the driving of a new level about 150 ft. below the level of the tunnel. This demonstrated the continuance of an oreshoot of a good grade of ore, which is about 400 ft. wide. Further sinking and driving are planned, which will probably develop another block of ore. It is a curious coincidence that the center and greatest depth of the oreshoot has been found in the middle of the property and at the place of maximum early developments through tunnel and raise. The levels driven both east and west of this central area showed absence of ore at depth. Late in 1916 a lease was entered into with the Smuggler Union company for the mining of ore in ground of that company adjoining the Liberty Bell property to the east. Development has progressed in this ground with promising results.

During the year ended Sept. 30, 1916, the total receipts were $823,459, or an average of $4.98 per ton milled. Of this sum, $542 was from stamp bullion, $730,272 from cyanide products, and about $60,975 from concentrate. The total operating expenses were $670,-



BULLION TUNNEL, SMUGGLER UNION MINE. VIEW LOOKING WEST ACROSS MARSHALL CREEK

912, or $4.07 per ton milled. The profit was $152,547, or 91c. per ton milled. The production during the past few years was as follows:

PRODUCTION LIBERTY BELL GOLD MINING CO., 1912-1916

Year	Tons Treated	Ounces Silver	Ounces Gold
1912	175,340	313,845	48,993
1913	179,216	288,602	36,693
1914	173,840	315,919	33,150
1915	174,100	314,432	24,054
1916	165,300	256,711	30,580

The reduction in amount of ore handled in 1916 was due to the scarcity of labor during a great part of the year, and to the scattered and irregular nature of the mining. The company has been managed for many years by Charles A. Chase, H. G. McClain being superintendent.

SMALLER PRODUCERS ARE NUMEROUS

The Colorado-Superior Mining Co. owns the Black Bear Mining Co., which holds 30 claims, including the Black Bear mine, in Ingram basin. The total area is about 322 acres. The mine is situated at an altitude of about 12,500 ft. The ore is lead and zinc sulphides containing gold and silver, in a quartz vein 8 to 10 ft. wide. The vein is supposed to be a southeasterly extension of the Argentine vein in the neighboring Tomboy property. The mine is developed to a depth of 1100 ft. by a shaft at a point 500 ft. from the northwest end of the property, and by crosscuts and drifts. The total underground development aggregates about one mile. After several years' idleness the property was reopened in December, 1914. During the early part of 1916 about 1250 ft. of new underground development was performed. The property is equipped with an electric hoist, two compressors, and a 250-ton flotation unit.

Since the reopening of the mine in 1914 the ore has been treated in the Smuggler mill at Pandora, to which it is transported by a wire-rope tramway, and where 20 stamps have been used on Colorado-Superior ore. During 1916, shipments averaged 170 tons daily, and the total ore milled during the year amounted to 48,450 tons, assaying 0.226 oz. gold, 2.49 oz. silver per ton, 3.23% lead, and 5.77% zinc. The ore reserves are estimated at 100,000 tons averaging better than $5 a ton, with 75,000 tons reported blocked out on July 31, 1917. The mining and milling costs average $2.50 a ton, leaving a substantial margin of profit at the present rate of production. The metals produced in 1916 were: 7055 oz. gold; 68,306 oz. silver; 2,354,459 lb. lead; 2,233,536 lb. zinc; and 15,509 lb. copper. The lead concentrate produced averages 1.81 oz. gold, 18.47 oz. silver per ton, 48.88% lead, 4.9% zinc, and 1% copper. The zinc concentrate averages 0.27 oz. gold, 6.95 oz. silver per ton, 6% lead, and 23.96% zinc. During the year about 6548 tons of concentrates was produced. The ratio of concentration was about 7.4 to 1, and the recovery was from 40% for the zinc to 75% for the lead. J. H. Jasberg is president of the company, and Bulkeley Wells is vice president.

In addition to the mines above mentioned, there are numerous smaller properties in the vicinity of Telluride which are in process of development, and several operating companies, whose production is relatively small. The bulk of the district's production is from the three large operating companies.

On account of the situation of most of the important mines in the upper basins at altitudes ranging from 10,500 to 12,500 ft., mining operations are conducted under severe climatic conditions. The snowfall during the winter and early spring is heavy, and the ground is usually covered with snow from about Dec. 1 to the end of June. It is necessary for the mining companies to provide suitable accommodations for their operating forces. Comfortable bunk houses and boarding houses are provided at the important properties. Board and room are furnished at $1 per day. The company usually furnishes bunks and mattresses, but the men must supply their own blankets. In one of the larger boarding houses each room contains two double-deck steel bunks, one man to each deck, making four men in each room. The best food obtainable is furnished at these boarding houses, the company standing a heavy loss in furnishing board at $1 per day. The company deducts $1.50 per month from each man's pay check, as a hospital fee. The larger companies employ their own physicians, who give first-aid treatment for minor injuries and sickness at the mine. Serious cases are sent to the Telluride hospital, where the men receive treatment under the supervision of the company physician

SCALE OF WAGE AT TELLURIDE MINES

The current daily wage scale of the Telluride district is as follows:

Machine men in stopes	$4 50
Machine men in drifts	4 75
Timbermen	4 50
Timbermen helpers	4 00
Shovelers	4 00
Trackmen	4 00
Trammers	4 00
Miscellaneous mine labor	4 00

There is usually no discrimination in the different nationalities employed, but most of the men engaged in the underground work are foreigners, probably the majority being Austrians, Slavs, Greeks, Italians, Swedes, and Finns.

Manganese Exports From Brazil

Exports of manganese ore from Brazil for the last three years were as follows, the figures being taken from a report of the office of Commercial Statistics of the Brazilian Ministry of Finance, and reproduced in the *Bulletin* of the Pan American Union, June, 1918: In 1915, 288,671 metric tons, of which 266,801 tons were shipped to the United States; in 1916, 503,130 metric tons; in 1917, 532,855 metric tons. In the last two years, the total manganese exported was shipped to the United States.

These figures differ from those published in the *Journal* of Jan. 5, 1918, and we believe the latter, which were reported by the American Consul General at Rio de Janeiro, probably do not include shipments from all ports.

The increase in the import of manganese ores since the beginning of the war has been great, the total exportation in 1913 having been little over 120,000 tons.

No Silver Ore Has Been Mined in the United Kingdom since 1907. During 1916 there was a recovery from copper ore of 687 oz., from gold ore 49 oz., from zinc ore 584 oz., and from argentiferous lead ore 85,165 oz., making a total of 86,485 oz. recovered from ores mined in the United Kingdom in that year.

The Roasting of Sulphotelluride Ores For Amalgamating and Cyaniding*

An Important Paper on the Oxidizing Roasting of Cripple Creek Ores—Details Of Practice and Operating Conditions in the Golden Cycle Mill, At Colorado Springs

BY A. L. BLOMFIELD AND J. M. TROTT

THE Golden Cycle Mining and Reduction Co. operates its custom mill at Colorado Springs on Cripple Creek ores exclusively. These ores are straight sulphotellurides, with practically no base metals. After passing through the sampler, the ore goes to storage bins, where beds of 5000 tons are made to insure uniformity in roasting.

CLASSIFICATION OF ORES

For efficiency, it has been found advisable to separate the ores into two classes, according to lime content. Class A contains not more than 2% CaO and comprises about 66% of the ore treated. Class B contains over 2% CaO, and comprises 34% of the ore treated. Typical analyses of both classes are as follows:

ANALYSES SULPHOTELLURIDE ORES, GOLDEN CYCLE MINING AND REDUCTION CO.

	Class A	Class B
Insol.	86.70	75.90
Al_2O_3	2.30	3.40
Fe	3.26	3.48
CaO	1.57	5.12
S	1.79	1.80
MgO	0.21	1.08
Ignition loss	3.20	6.50
Total	99.03	97.28

The beds of each class of ore are made as large as possible with the available ore as it comes in, to avoid changing from one bed to the other oftener than is necessary. Each roaster will handle 50% more of Class A than of Class B, with practically the same results. This necessitates changing the feeds for each new bed, which has a tendency to produce a poor roast and loss of tonnage at each change.

CRUSHING PREPARATORY TO ROASTING

After leaving the storage bins, the ore is crushed in Schmidt "kominuters," or ball mills. Diagonal slotted screens $^{9}/_{64}$ by ½ in. are used, which give a product as shown in Table I.

Crushing efficiency is increased by coarse crushing in "kominuters," using Chilean mills after roasting. The finer the crushing the greater the dust losses in the roasters. If too fine, there is a tendency for the hot ore to "run" through the roasters. The coarser the crushing the harder it is to roast the occluded sulphides. The ore may appear to be well roasted when too coarse, but, after regrinding, will fill the solutions with soluble sulphides, which increase the consumption of cyanide. The coarse ore itself does not seem to entail a high residue, but the bad effect upon the solution is likely to hinder extraction, unless the plant is extremely flexible. The tendency is toward finer crushing for the more basic ores than for the siliceous. This is roughly adjusted by finer screening before the ore enters the "kominuters" and by using the mills with the newest screens. The average should be not more than 30% coarser than 10 mesh.

The roasting furnaces used are the Edwards Duplex, 54 rabble, supplied by the Stearns-Rogers Manufacturing Co. The length is 115 ft.; width, 13 ft.; line roasting area, 1495 sq.ft.; coolers, 44 ft. long and 14 ft. wide, with an area of 572 sq.ft. There are three fire boxes for each roaster. The temperature of the ore at the discharge point of the roasters is about 485° C.; at the discharge point of the coolers, about 278° C. The temperature depends on tonnage, air temperature, and the rate of rabbling. Trials were made on rabble speeds from 1½ r.p.m. up, and the most efficient cooling was at a rabble speed of 6 revolutions per minute.

The spindles, rabbles and teeth are made of cast iron by a local foundry. The consumption of teeth is 0.1637 lb. per ton of ore; of rabble arms, 0.0684 lb. per ton of ore, and of spindles, 0.0265 lb. per ton of ore.

All rabble arms are water cooled. After passing through the rabbles, the water is run over a cooling tower and pumped back to the storage tank. The temperature of the water going into rabbles is 78 to 93° F., depending upon the temperature of air, the wind, and the tonnage in roasters. Its temperature on leaving the rabbles varies from about 113 to 147° F. The water used per roaster per minute varies from 90 to 115 gal., depending upon the condition of the rabbles and the rate of feed. There are 27 pairs of rabbles in each roaster and 11 pairs in the cooler. In the roaster they travel 3 r.p.m. and in the coolers, 6 r.p.m. The hearth is sloped from feed to discharge end, ½ in. to the foot, which is sufficient to cause the ore to move forward under the action of the revolving rabbles. The greater the rabble speed, the less tendency there is to burn or "ball" the ore under excessive heat. The average time

TABLE I. SCREEN ANALYSIS OF BALL MILL PRODUCT

Size	Old Screens %	Cum. %	New Screens %	Cum. %
Over 5/32 in.	6.1	6.1	1.1	1.1
5/32 + ⅛ in.	5.1	11.2	2.4	3.5
⅛ in. --10 mesh	24.0	35.2	16.6	20.1
10-- 20 mesh	22.2	57.4	26.2	46.3
20-- 30 mesh	8.0	65.4	10.2	56.5
30-- 40 mesh	5.2	70.6	7.6	64.1
40-- 60 mesh	6.4	77.0	9.8	73.9
60-- 80 mash	1.2	78.2	1.2	75.1
80--100 mesh	2.5	80.7	3.0	78.1
100--150 mesh	2.2	82.9	3.9	82.0
150--200 mesh	4.2	87.1	4.4	86.4
Below 200 mesh	12.9	100.0	13.6	100.0
Total	100.0	....	100.0	....

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*Excerpt from paper to be read at the Colorado meeting of the A. I. M. E., September, 1918.

of passage of the ore through the roasters is 6 hours. From 13 to 17 hp. is required for each roaster and cooler, depending on the feed and the speed of the rabbles.

The roasted ore falls from the cooling hearth through a choke feeder onto a 315-ft. reciprocating drag conveyor. The sheet-iron fins are 34 in. long by 8 in. deep. An average of 16½ hp. is required to operate it. The roasters are shut down the first of every month to allow repairs to be made on this drag. The pins that hold the fins are subject to great wear near the discharge end where water is sprayed on the ore before it falls on a rubber conveying belt. This belt is made of specially vulcanized rubber to withstand the heat and moisture. The ore is at about 194° F. when it falls on this belt, and contains 2% moisture. The contained heat serves to warm the building throughout the year. It also, unfortunately, warms the cyanide solution in which the ore is crushed, thus putting large quantities of calcium sulphate into solution.

COAL USED FOR ROASTING

The coal is Colorado Springs lignite, from mines six miles north of the city. The average analysis is as follows: Water, 20.2%; volatiles, 54.65; fixed carbon, 19.75; ash, 5.1; sulphur, 0.30%. Average heating capacity, as mined, 870 B.t.u. For Class A ore, 249 lb. of coal per ton of ore is required for roasting; if for Class B ore, 347 lb. is needed. The firebox requires the use of live steam; 12% additional coal is used to generate this steam. The capacity per roaster ranges for Class A ores from 125 to 150 tons per 24 hours, and for Class B ores, from 80 to 100 tons per 24 hours.

FLUE LOSSES

Extensive stack tests were made in 1909 to determine the flue losses. The method was the use of the Pitot tube for measuring velocities and employing bags for collecting the dust. The volume of flue gases per roaster was 208,000 cu.ft. per min. At the time of the first tests, the revolving cooler was in use, and the stack loss amounted to 13.2c. per ton on 1-oz. ore. After changing to the present coolers, the dust loss was 3 to 4c. per ton of 1-oz. ore. The amount of flue dust collected was formerly from 0.7 to 0.9% by weight and carried a value 32% higher than the ore. It is now 0.4% by weight and carries a value 20% higher than the ore. The open cooler and more careful feeding and discharging had made this difference.

CONDITIONS OF ROASTING

The temperature, as indicated by Brown indicating pyrometers, is as follows:

Class A ore, 800 to 870° C. in the center of the arch, 8 ft. above No. 1 firebox and in the flow of heat; 800 to 850° C. 8 ft. above No. 2 firebox.

Class B ore, 850 to 900° C. above No. 1 firebox; 850 to 870° C. above No. 2 firebox.

In roasting all ores, No. 3 firebox keeps the ore at a red heat up to the point of discharge. The hotter the ore is kept here, the less tendency there is for the sand of Class B ore to "set" in the leaching tanks. Class A ores show no such tendency within the present treatment conditions. Nevertheless, they will do so under other conditions of classification and filling.

The draft should be kept up to about 0.2 in. of water at all times to allow a free escape of the gases and consequently a more oxidizing atmosphere. The flames from the fireboxes must be given an excess of air to keep them from being smoky, as their reducing effect then is strong.

CHEMICAL REACTIONS IN ROASTING

Siliceous Ores—$FeS_2 + \text{heat} = FeS + S$.

$FeS + \text{heat} + O = FeO + SO_2$.

FeO may further oxidize to Fe_2O_3.

$FeSO_4$ is found when roasting at low temperatures, but at high temperatures this decomposes into FeO and SO_3 or $SO_2 + O$.

Basic Ores—In the roasting of calcareous ores containing metallic sulphides, if sufficient sulphur be present the lime is converted almost quantitatively into $CaSO_4$. The behavior of $CaSO_4$, when heated in the presence of CO and C, has been investigated by H. O. Hofman and W. Mostowitsch.[1] The chemical reactions and temperatures stated herein are taken largely from their reports. They are given, as they appear to fit the Class B ores as roasted.

The reduction of $CaSO_4$ by CO is indicated in the equation $CaSO_4 + 4CO = CaS + 4CO_2$. The reaction takes place without any loss of sulphur. Little reaction takes place unless the temperature is above 680° C. Between 750 and 850° C. the action is rapid and is completed at 900° Centigrade.

The reduction of $CaSO_4$ by carbon is indicated in the equations $CaSO_4 + 4C = CaS + 4CO$, and $CaSO_4 + 2C = CaS + 2CO_2$. The action begins fairly well at 700° C. and finishes at 1000° C., proceeding most rapidly between 800 and 900° C. At about 800° C., $CaSO_4 + 2C = CaS + 2CO_2$; above 800° C., $CaSO_4 + 4C = CaS + 4CO$.

It was found that CO acted more readily and effectively than carbon alone, both beginning and finishing at lower temperatures. It is probable that the gases CH_4, C_2H_6, and H would act similarly in the reduction of $CaSO_4$, as they are effective with Na_2SO_4.

CaS, if roasted in pure, dry air, does not all revert to $CaSO_4$, but forms a product of about 76% $CaSO_4$ and 24% CaO, with a loss of approximately 32% S. This loss of S is accounted for by the interaction of $CaSO_4$ and CaS, according to the reaction $3CaSO_4 + CaS = 4CaO + 4SO_2$.

The complete elimination of sulphur at this point is probably prevented by the failure of intimate contact between the CaS and $CaSO_4$ and the formation of CaO between the $CaSO_4$ and CaS. Action between $CaSO_4$ and CaS takes place in a neutral or oxidizing atmosphere, but not in a reducing one.

When heating pure $CaSO_4$ in the presence of oxygen it loses its combined water at 900° C. and begins to decompose at 1250 to 1300° C. In the presence of SiO_2 it starts to decompose and gives off SO_2 at 1000° C. and decomposition is completed at 1250 to 1300° C. The action is shown in the equation $CaSO_4 + SiO_2 = CaSiO_3 + SO_2 + O$. An interesting equation is $CaS + FeSO_4 = CaSO_4 + FeS$. It takes place at a low temperature.

In roasting for cyanide treatment, both sulphates and soluble sulphides are deleterious. Soluble sulphides are active cyanicides, and attack zinc freely. They are active reducing agents, and under certain conditions can completely eliminate all oxygen from the solutions. Though precipitating gold to an appreciable extent only in acid solution, when the solution percolating a charge becomes deoxidized by an excess of soluble sulphide, either gold is precipitated or the undissolved gold is so coated as to render further dissolution so slow that to obtain a low residue is impossible. In agitating slimes, especially without air, a similar condition is brought about.

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[1] Trans. A.I.M.E., (1910), 41, 763.

It is interesting to note that if such a residue is completely dried or thoroughly treated with a solution of permanganate of potash or other effective soluble oxidizer, and then subjected to cyanide treatment, the normal residue is obtained rapidly. Acid sulphates act as virulent cyanicides if not quickly neutralized. Calcium sulphate, formed either in the roasters or by reaction of soluble sulphates in the ore on meeting the lime in solution, is decidedly deleterious. The hot ore warms the crushing solution. This becomes saturated with calcium sulphate and precipitates as the solution cools. These crystals fill pipes, launders and Dorr thickeners, render filter mats and clarifying mats impermeable, coat Merrill filter frames and cloths and form a deposit on the zinc and zinc boxes. In Class A ores these troubles are comparatively unimportant, although considerable time is required to neutralize the solutions, whereas Class B ores often require none.

FORMATION OF SOLUBLE CALCIUM SULPHATE

The chief formation of soluble calcium sulphate, with Class B ores, undoubtedly occurs in the roasters. It will be noted in the roaster equations quoted that, somewhere above 870° C., the final molecule of water is driven out of the calcium sulphate. It then becomes practically insoluble in working solutions and does not form a cement in the sand tanks. For illustration, a ton of deposited calcium sulphate crystals and slime, if fed slowly or rapidly into the Chilean mills, forms a band of cement sand in the leaching vats and redeposits throughout the plant. If, however, 10 tons of this material is fed into the "kominuters" and thence through the roasters, meeting a heat of 870° C. or higher, it cannot be noticed in the cyanide plant.

It is commercially possible to roast ores so that they may be treated with the ease of a free-cyaniding raw ore; this is what is called an "over-roast" at the Golden Cycle mill. Such ore can be extracted to a finished residue in a good standard cyanide plant. Chemical consumption is held at a minimum. Standard classification is sufficient, and no change of solution is necessary. Solution is rapid and reaches a definite end point. But the roast is decidedly more expensive, and the final residue much richer than that now obtained.

Table II shows the value of typical sand residues from Class B ore, first that from an over-roasted ore, and, second, an average sand residue such as is now obtained. The slime residues show even a greater difference in gold content due to over-roasting, the difference being more marked in Class B than in Class A ores.

Having found that a better residue could be obtained by a cheaper and, as indicated by ordinary sulphur analyses, a less complete roast, it was decided to attempt a more efficient treatment by more delicate roasting. This required a quick method of chemical testing and the use of pyrometers to help regulate the temperature of each roaster continuously. Chemical tests were employed for governing the roast. For Class A ores a simple analysis of total, soluble, and insoluble sulphur is a sufficient guide to an experienced fireman, which, with the temperature and appearance of the roaster, soon enables him to regulate his fires. The feed is changed only by the foremen.

TABLE II. VALUE OF SAND RESIDUES FROM CLASS B ORE

	Weight, %	Gold, Oz.	Weight, %	Gold, Oz.
Over 20	...	...	1	0.01
20-- 30	4	0.03	5	0.01
30-- 40	14	0.04	15	0.01
40-- 60	23	0.05	35	0.02
60-- 80	14	0.04	16	0.02
80--100	16	0.05		
100--150	11	0.06	12	0.02
150--200	10	0.09	13	0.02
—200	8	0.12	3	0.04
	100	0.0571	100	0.0185

Total Sulphur in Roasted Ore—Weigh out 1.373 gm. ore, add about 11 drops of a saturated solution of $KClO_3$ in HNO_3, and two or three drops of HCl. Take down to complete dryness to render SiO_2 insoluble, but do not make too hot, or H_2SO_4 will be driven off. Cool, add 5 c.c. HCl, boil off excess, add about 25 c.c. hot H_2O, and boil.

Remove from heat, make alkaline with smallest necessary amount of 1:1 NH_4OH to precipitate iron and leave supernatant liquid clear. Filter and wash twice with hot water. Put filter paper and contents back into same beaker, break filter with 10 to 20 c.c. hot water, and add just enough HCl to dissolve hydrates; put on hot plate a few minutes till solution is effected, then reprecipitate as before with smallest necessary amount of 1:1 NH_4OH, filter and wash into same beaker containing first filtrate. Make filtrate acid with HCl, boil, add a few drops HCl (to prevent boiling over when $BaCl_2$ is added) and then an excess of boiling $BaCl_2$; settle, cool, filter on best double filter paper, wash twice with water, once with 1:1 HCl, then 10 times with water; ignite, and weigh $BaSO_4$.

HCl-Soluble Sulphur in Roasted Ore—Weigh out 1.373 gm. ore, add about 30 c.c. N/10 HCl solution, boil 10 min., filter, and wash well with hot water. Refilter through new double paper and wash well. Boil, add a few drops HCl and an excess hot $BaCl_2$ solution. Settle, cool, filter on double paper, wash, ignite, and weigh. The insoluble sulphur is obtained by difference.

Na_2CO_3-Soluble Sulphur in Roasted Ore—This is run as a check on the HCl method. It gives an insoluble sulphur that is usually about 0.03% higher than the HCl, the notable exceptions being a bad roast on a lime bed, when it may go 0.05 or 0.06% higher.

Weigh 1.373 gm. ore, boil 10 min. with 30 c.c. N/Na_2CO_3 solution, filter and wash well with hot water. Add about 4 c.c. HCl to filtrate, or till acid, boil out CO_2, make just alkaline with a few drops of 1:1 NH_4OH and boil out NH_3. Filter and wash with hot H_2O, acidify filtrate with HCl, boil, add a few drops HCl and an excess of hot $BaCl_2$ solution, settle, cool, filter on double paper, wash, ignite, and weigh.

Class B ores cannot be roasted correctly even approximately by reliance upon visual judgment. The same soluble and insoluble sulphur analyses must be made, but these do not distinguish between the soluble $CaSO_4$ and CaS, the first of which is harmful principally in setting the sand tanks, whereas the second interferes greatly with the extraction.

The usual analyses, therefore, combined with the custom of getting only one report a day, proved too slow to prevent bad roasts, and it was found advisable to develop a quick reliable test for soluble sulphides, by means of which a check could be kept on each individual roaster. Arlo C. Greenawalt was detailed to devote his entire time to developing a method. After trial of all available text-book methods, he decided upon the following as the best practical method:

Rapid Determination of Soluble Sulphides—Weigh 15 gm. roasted ore crushed through 80 mesh into a 150-c.c. casserole. Pour onto it 50 c.c. boiling 5-lb. KCN solution, containing 12 lb. NaOH per ton (0.6%). Boil for 15 min., then filter by aid of a vacuum into a 100-c.c. graduated cylinder. Wash well with hot water and bring volume of filtrate up to 50 c.c. Mix contents thoroughly by inverting the cylinder several times. Extract two samples of 10 c.c. each. To one sample add an excess of $KAg(CN)_2$ solution and about 1 gm. dry CaO. To the second sample add about 2 gm. dry $PbCO_3$. Heat solutions to boiling, filter and wash well with hot H_2O. Add ½ c.c. of 1% KI solution to each filtrate, and titrate with $AgNO_2$ (13.038 gm. per liter). Subtract the amount of $AgNO_3$ used with the solution to which $PbCO_3$ was added, from the amount used with the solution to which $KAg(CN)_2$ was added. To obtain percentage of soluble sulphides, multiply this difference by 0.16415.

EXPLANATIONS AND PRECAUTIONS

The above method is based on the fact that when $KAg(CN)_2$ is added to a solution containing alkaline sulphides, a definite amount of free KCN is formed for every atom of silver that combines with the soluble sulphur to form Ag_2S. the equation being $2KAg(CN)_2 + K_2S = Ag_2S + 4KCN$. It is necessary that the solution of KCN be boiling before adding to the ore, as oxidation of the sulphides will take place in a cold solution. NaOH is added to make the solution alkaline, as results cannot be obtained in acid solution. A weak KCN solution should be used, as it will take the sulphides into solution readily, and will require a minimum amount of $AgNO_3$ for titration. When $KAg(CN)_2$ is added to the solution, the precipitation of Ag_2S is usually incomplete and the precipitate seems to be partly colloidal. The CaO is added to coagulate the precipitate, and boiling insures complete precipitation. The wash water should be hot in order to prevent oxidation of the sulphides to sulphates, which occurs if solutions are allowed to cool. The addition of KI before titration corrects errors due to the presence of caustic alkalies.

Titration of solution to which $PbCO_3$ was added gives the original cyanide present. Titration of solution to which $KAg(CN)_2$ was added gives the original cyanide plus the free cyanide that was formed. The difference between the two, or the free cyanide, is directly proportional to the amount of soluble sulphides present in the solution.

The calculation of the value of 1 c.c. $AgNO_3$ (13.038 gm. per liter), in terms of percentage of soluble sulphides, is as follows:

$KCN = 65.11.$ $KCNS = 97.18.$ $S = 32.07.$

1 c.c. $AgNO_3 = 0.01$ gm. KCN.

$65.11 \div 97.18 = 0.01 \div x.$

$x = 0.01492$ gm. KCNS per c.c. $AgNO_3$.

$32.07 \div 97.18 = x \div 0.01492.$

$x = 0.004924$ gm. sulphur per c.c. $AgNO_3$.

$$\frac{0.004924 \times 100}{15} = 0.03283 = \text{per cent. sulphides.}$$

With 15 gm. ore taken for analysis, 0.03283 × 5 = 0.16415 = % soluble sulphides per c.c. of $AgNO_3$, as titration took place in 10 c.c. and the total volume was 50 cubic centimeters.

If the volume should happen to be larger than 50 c.c., say 57 c.c., the factor is obtained thus: 5.7 × 0.3283 = 0.16696 = % soluble sulphides per c.c. $AgNO_3$. This method can be run through with nine roaster samples in about 1½ hours, and, though not absolutely accurate, is the best developed at the Golden Cycle mill and is sufficient for controlling the feeds to the roasters, when the temperatures as noted above are maintained. The limits of insoluble sulphur are: Class A, 0.10%; Class B, 0.15%. The limits of soluble sulphide are: Class A, 0.10%; Class B, 0.15 per cent.

Experience has shown that Class B ores give good residues, with higher total and insoluble sulphur and soluble sulphide than those of Class A. The chemical reasons for this are still obscure, but it is possible that the interaction between the sulphates and sulphides in the roasters, as noted, gives a larger amount of each as a secondary reaction, and these then do not have so deleterious an effect in the treatment.

OPERATING CONDITIONS IN THE CYANIDE PLANT

The decision to adopt the more efficient and more delicate treatment already mentioned necessitated a more carefully planned and flexible cyanide plant, specially arranged to cope with the ore thus roasted. The following are the more important operating factors:

1. Substitution of blanket concentration of gold for plate amalgamation.
2. Elimination of colloids, so far as possible, from that part of the ore to be leached.
3. Ability to change solutions quickly on both sands and slimes.
4. Filling the leaching tanks with a semi-dewatered product.
5. Aëration of slimes soon after classification.
6. More time of agitation.
7. Use of the Crowe vacuum system of precipitation.

1. Amalgamation plates are decidedly more sensitive to unfinished roasting than in cyanide solution. The coarse gold is coated with an alloy which dissolves slowly and is not wetted by quicksilver. Blankets catch this gold effectively, and the particles amalgamate readily when the surface is abraded. The amalgamation treatment includes a small arrastra, followed by a grinding pan with universal joint between yoke and muller, and followed by another arrastra. The tails are reblanketed before passing into the main mill flow, and the final concentrate is amalgamated in a barrel in strong cyanide solution.

2. The elimination of colloids from the sands is perhaps the most important detail of all. Unless the sands leach exceedingly fast, a "slip-up" in one roaster will cause the complete deoxidation of solution before it reaches the filter bottom, causing a rich residue. If the leaching charges channel perceptibly, the same condition develops in patches. Moreover, in the Class B ores there is a marked tendency for the sands to set while leaching. Freedom from colloids distinctly minimizes such tendency. It was not until 1915 that the more basic ores began to arrive in large quantities and changes in treatment became imperative. There was no available floor space for step classification, and the clumsiness and the expense of a series of cones and pumps were not attractive. The problem was solved by the installation of the Dorr bowl classifier, which makes a separation as efficient, on this class of work,

as any ordinary three-stage classification, uses less floor space than was necessary before, requires the minimum of attention, additional solution, and power, and its cost for installation and operation are less. Golden Cycle plant requirements are: For the slime plant, all material must pass through 100 mesh and not over 12% remain on 200. For the leaching plant, the sands must be free from colloids. Between these limits, the feed to the classifiers may vary from the product of two Chilean mills—400 tons of ore—to six Chilean mills—1200 tons—without any classifier adjustments. This is useful, as power peak is controlled at the Chilean mills.

3. Change of solution must be made quickly to allow a good margin between an over-roast and an under-roast. On the sands, it is done by the back flow or wash solution in the classifiers. The slimes flow to a 50-ft. connected-type Dorr tray thickener. The compartments are shallow and the settling capacity is always ample. Under these conditions, the slime is quickly passed through as thickened product. This thickener practically clears itself of slime in half an hour after the feed is shut off. The pulp then goes to a mechanical agitator containing perforated air pipes, where the first change of solution is made. A further change of solution and partial decantation are made in tray thickeners of the open type. The pulp then passes to agitators.

4. To fill sand tanks by methods such as Butters' distributors, though mechanically cheaper than the present practice, has the chemical disadvantage of allowing the sand to rest too long in a dead solution in the early stages of treatment. It might be possible to overcome this, as the sand has been cleaned, by opening the valves and draining the solution off and back to the crushing plant. The possible saving in cost of operation over the present semi-dry method of belt conveyor and distributor is small, and the method is not so safe from a chemical standpoint.

5. Aëration of slimes immediately after classification is effective—probably such aëration almost instantly gets rid of the unstable soluble sulphides. At the Golden Cycle mill, the endeavor is to do it fairly fast without additional agitation storage. Possibly, if room permitted, an aërating agitator between classifiers and first settler would be more effective.

6. It is found that a roast giving the lowest residue also gives a slow-treating slime. Therefore excessive agitation is a good safety insurance, and the additional agitation is obtained in a 37 x 23-ft. Dorr agitator, at a cost of 4 mills per ton.

7. The precipitation of solutions from moderately roasted ores, especially of the more basic type, has been distinctly difficult. A marked improvement in effectiveness and cost has been made by the installation of the Crowe vacuum treatment of solutions.

There is room for argument regarding the relative efficiency of treating roasted ores in an all-sliming cyanide plant, or in a combination slime and leaching plant. The all-sliming plant is probably less costly to install, and it reduces the number of metallurgical problems. The Cripple Creek ore, however, after roasting, does not require finer grinding than 20 mesh. Further grinding, even in normal times, costs more than is warranted by the extra recovery attained. The slimes from a roasted ore have small adhesive qualities and are incapable of sustaining much sand. This limits the type of cyanide apparatus available, unless the all-sliming process is carried far beyond the economical crushing limit. Undoubtedly, under local conditions, the residues can be dumped far more economically from a combination slime and leaching plant than from an all-slime process.

The ore is high grade and requires a high-strength cyanide solution, thus limiting the effectiveness of the countercurrent decantation system, although this system is partly used with good effect in the present slime plant, both as a help in extraction and in washing the gold from the filter cakes. If the sands are sufficiently eliminated from the slime product, the latter is an ideal filtering material; but, even so, the filter department is more expensive to operate, requires more care and more wash solution per ton of ore, and loses more cyanide and gold mechanically than the sand plant. The deciding feature between the two types of plant lies in the possibility of consistent efficient classification. With poor classification, the advantages lie with the all-sliming process. With good classification, the balance swings decidedly to the combination plant.

Dividends by Colorado Mines

During the last 10½ years, that is, from Jan. 1, 1908, to June 30, 1918, inclusive, the total disbursements by Colorado mining companies which make public reports amounted to $73,007,006. This does not include the American Smelting and Refining Co., which has large interests in Colorado.

The accompanying table gives payments by companies. In addition it may be noted that the companies on the list paid $5,167,606 in 1916; $4,586,532 in 1917; and $1,546,666 in the first six months of 1918.

COLORADO MINING DIVIDENDS, JAN. 1, 1908, TO JUNE 30, 1918

Company	Total to End of 1917	Latest Dividend Date	Latest Dividend Amount
Acacia, g	$122,004	Jan., 1911	$0.00½
Adams, s.l.c	778,000	Dec., '09	.04
Bonanza Dev. g	1,425,000	Oct., '11	.20
Camp Bird, g.s	9,185,498	Nov., '15	.24
Camp Bird, pfd	1,497,655	Jan., '18	.18
Colo. Gold Dredging	775,000	Feb., '16	1 00
Cresson Cons., g	6,539,162	June, '18	10
Derry Ranch, g	100,000	Oct., '17	5 00
Dr. Jack Pot, g	141,698	Jan., '17	01
Dunkin, g	55,000	Aug., '16	.07½
Elkton Con., g	3,579,465	May, '15	.02
El Paso, g	1,707,545	Feb., '14	10
Farncomb Hill Gold Dredg	48,000	Oct., '17	.07
Free Coinage, g	180,000	Dec., '09	1.00
Gold Coin of Victor, g	1,350,000	Feb., '09	.02
Gold Dollar Con., g	100,000	Dec., '12	.00½
Gold Sovereign, g	32,560	Nov., '12	.00
Golden Cycle, g	8,448,500	June, '18	.03
Granite, g	352,500	Jan., '18	.02
Iowa, g.s.l	336,833	July, '17	.01
Iowa-Tiger, g.s.l	25,179	Dec., '15	1.00
Iron Silver, s.l.g	5,250,000	Dec., '17	.10
Isabella Mines, g.s	742,500	Dec., '16	.01
Jerry Johnson, g	187,500	Nov., '14	.00½
Liberty Bell, g	2,193,513	Sept., '17	.03
Mary McKinney, g	1,182,398	Oct., '16	.01
Mary Murphy, g	93,106	May, '16	.07
Monarch-Madonna, g.s.l	40,000	Apr., '11	.01
Modoc, g s	275,000	Dec., '11	.01
Pharmacist, g	87,500	Feb., '10	.01½
Portland, g	12,137,080	Apr., '18	.03
Rico-Wellington, l.z.c	39,600	July, '17	....
Tomboy, g.s	4,126,140	June, '18	.12
United (Crip. Ck.), g	520,385	Dec., '17	.01
Valley View, g	240,000	Dec., '11	04
Vindicator Con., g	3,712,500	Oct., '17	.03
Wellington, g	1,850,000	May, '18	.10
Work, g	172,500	July, '08	.00½
Yak, s.l	3,477,685	Sept., '17	.07

Among the companies not represented because the details are unknown are Stratton's Independence, now being wound up, which has paid dividends of about 85% and the Gold King Gold Mining Co., a close corporation which has probably paid about $1,500,000.

The Manufacture of Ferroalloys In Colorado

Excerpt From a Paper To Be Presented at the Colorado Meeting of the American Institute of Mining Engineers—Details of Ferroalloy Plants and Methods of Manufacture

BY ROBERT M. KEENEY

BEFORE the outbreak of the war in 1914, the only electric-furnace smelting plant operating on a commercial basis west of the Mississippi River was an electric pig-iron plant in California. Rare-metal ores were not smelted, concentrates of molybdenum, tungsten, uranium and vanadium ores being shipped East for reduction. Practically no chrome ore was being mined, and only comparatively small amounts of manganese ore. Today there are two electric-smelting plants in California, one in Washington, one in Iowa, and four in Colorado; two plants are under construction in California, and one in Montana. Ores of manganese, chromium, molybdenum and tungsten are now smelted in the West, and although uranium and vanadium concentrates are still shipped to the East, they will probably soon be treated in Western plants. The four electric-furnace plants in Colorado are listed in Table I.

TABLE I—ELECTRIC-SMELTING PLANTS IN COLORADO

Company	Location	Capacity, Kilowatts	Products
Tungsten Products Co.	Boulder	800	Ferrotungsten, ferromolybdenum.
Boulder Tungsten Production Co.	Boulder	400	Ferrotungsten.
Ferro Alloy Co.	Utah Junction	1200	Ferrochrome, ferrotungsten.
Iron Mountain Alloy Co.	Utah Junction	3000	Ferromanganese.

Power for all of these plants is supplied by the Colorado Power Company.

FERRO ALLOY COMPANY'S PLANT

The plant of the Ferro Alloy Co., at Utah Junction, contains one 750-kw., three-phase furnace, to which power is supplied by three 250-kw. transformers, connected Δ/γ to give 129 volts on the furnace cables, the transformer ratio being 13,200 to 75 volts. The furnace operates with an actual voltage of 120 volts, and produces about three tons of ferrochrome per 24 hours from 40% Cr_2O_3 ore. The furnace consists of a steel shell of circular cross-section, 8 ft. in diameter by 7 ft. deep, lined with magnesite, and having three vertical carbon electrodes 12 in. in diameter.

A 450-kw. furnace, of the same size as the 750-kw. furnace, is also operated on chrome ore. This furnace is three-phase in appearance, but operates electrically as a single-phase furnace. There are three vertical carbon electrodes 8 in. in diameter with a conducting carbon bottom. Power is supplied by three 150-kw., single-phase transformers, two of which have a ratio of 13,200 to 95 volts, and one having a ratio of 13,200 to 100 volts. From each transformer, one lead goes to one vertical electrode, and one lead to the carbon bottom, so that the transformers are electrically independent. The furnace voltage varies from 90 to 95.

At intervals, 150-kw., single-phase furnaces are operated on ferrotungsten. These furnaces have one vertical graphite electrode 4 in. in diameter, with a water-cooled steel bottom contact. The furnace shells are 4 ft. in diameter, and are mounted on trunnions, the slag being poured by tilting the furnace. All of the electrodes are regulated by hand. The chrome furnaces are operated without roofs and the tungsten furnaces with roofs. The whole plant has a power factor of 90 per cent.

IRON MOUNTAIN ALLOY COMPANY'S PLANT

The plant of the Iron Mountain Alloy Co., at Utah Junction, contains one 1200-kw. three-phase furnace, and one 1800-kw. three-phase furnace, giving a total capacity of 12 long tons of ferromanganese per 24 hours. The 1200-kw. furnace is supplied with power by three 400-kw., single-phase transformers, having a ratio of 13,200 to 75 volts, and connected Δ Δ. The pressure on the furnace is 72 volts. The 1800-kw. furnace is connected to three 600-kw. single-phase transformers having a ratio of 13,200 to 75 volts, and connected Δ/Δ. The power factor of the plant is 85%. The furnace shells in both cases are 18 ft. long, 8 ft. wide, 7 ft. deep, and are lined with magnesite. The electrodes on the smaller furnace are of carbon, 17 in. in diameter, and on the large furnace 24 in. in diameter; in both furnaces they are threaded for continuous feeding. No roofs are used, and regulation of electrodes is by hand.

FERROCHROME

The process of making ferrochrome from domestic chromite ore consists of mixing ore, coal or coke, lime, fluorspar, or silica, in proper proportions, and smelting this mixture in an electric furnace. At 2-hour intervals the ferrochrome and slag are tapped into iron pots, the metal settling to the bottom. The pot is dumped when the contents are solidified. Reduction theoretically takes place according to the reaction:

$$FeO.Cr_2O_3 + 4C = Fe.2Cr + 4CO$$

$$9FeO.9Cr_2O_3 + 50C = [2(Fe_3C.3Cr_3C_2) + 3Fe] + 36CO$$

DOMESTIC CHROME ORES

In smelting domestic ore, which has a higher percentage of slag-forming constituents than foreign ore, and averages 40 to 45% Cr_2O_3, considerably higher loss of chromium occurs, and it is more difficult to control the carbon content of the product. By permitting a higher slag loss, the carbon can be kept below 6%, but varies between 4.5 and 8%. The products are sorted into ferrochrome with 6, 7 and 8% carbon; the greatest demand is for the 6% carbon product, but large quantities of the other grades are used by the steel industry. The iron content of domestic ores is higher than that of foreign ores, with the result that the chromium content of the product varies from 60 to

65%, instead of 65 to 70%. In smelting chrome ore to produce a ferrochrome with 8% carbon, considerably higher recovery can be attained than when making a 6% carbon product, for two reasons: (1) excess of carbon permissible in the charge; (2) when it is not necessary to limit the carbon to 6%, fluxing materials can be charged, giving a more fluid slag and resulting in better separation of slag from metal. There is no difficulty in obtaining a recovery of 90 to 95% of the chromium when making 8% carbon product, whereas the recovery on the 6% carbon grade varies from 70 to 80%. Within limits, the grade of ore smelted has no appreciable effect on the recovery when 8% carbon product is being made.

On the whole, when producing ferrochrome with 6% carbon, a small quantity of silica and lime make the most satisfactory flux, if any flux is necessary. The recovery is a little higher than where running with a natural slag, and the presence of silica in slight excess tends to throw carbon and sulphur out of the alloy. Ferrochrome sometimes contains over 2% silicon when sand is charged, but this is not objectionable.

When making 8% carbon product, the slags average 5.21% chromium, as against 13.13% chromium when producing 6% carbon material, a difference of 7.92%. The chromium recovery on ferrochrome of 8% carbon is 94.07%, in comparison with 74.15% when producing material containing 6% carbon, or 19.92% higher recovery.

Ferrochrome containing 6% carbon can be made easily by using a natural slag. The chromium content of such slag is 8.56%, whereas, when using lime and silica, the slag contained 13.13%, and with silica alone as a flux it varied from 17.5 to 26.6% chromic oxide (12 to 18.2% chromium). In the three cases, the actual chromium tapped was respectively 73.0, 74.15 and 71.02%. The combination of lime and silica thus shows a little higher recovery. Generally, however, if the slag will run, it is advisable to use a natural slag. When the alumina is about 35% and the silica 20 to 25%, these slags are exceedingly fluid, but at times retain metallics. The use of a large quantity of silica does not improve the recovery, but it does have a marked effect on the sulphur content of the alloy.

There has been much discussion as to how low-grade chrome ore can be used in the manufacture of ferrochrome. In smelting chrome slag containing from 13.9 to 36.25% Cr_2O_3, an average recovery of 80.2% was made, with the production of metal containing an average of 61.34% chromium, 6.81% carbon, 0.063% sulphur, and 2.5% silicon. Even with a very low-grade slag, 15% Cr_2O_3, a recovery of 85% was made. The cost of actual operation was not much greater than when smelting ore, but, including interest and depreciation charges, the total cost would be considerably higher, because of the small output of metal for the power consumed. From these results, it seems reasonable to expect that a good recovery could be made from ore containing 25% Cr_2O_3 if the product were allowed to contain 7% carbon. Ferrochrome made from domestic chrome ore ranges from 60 to 67% chromium, as compared with 65 to 70% chromium in ferrochrome made from imported ore.

Tungsten is the leading alloy metal used in the manufacture of high-speed steel. Probably about half of the consumption is used in the form of ferrotungsten, the remainder being tungsten metal. Colorado has supplied a large part of the tungsten used in steel manufacture, but is gradually being surpassed by California, where the large scheelite deposits can produce tungsten considerably cheaper. Ferberite, found in Boulder County, Colo., is one of the most favorable forms of tungsten for production of ferrotungsten, containing both iron and tungsten in the proper proportion to yield 70 to 80% ferrotungsten. At present, three electric-furnace plants in Colorado are making or have made ferrotungsten. The standard grade produced by the Ferro Alloy Co. contains 75% tungsten, 0.8 carbon, 0.4 silicon, 0.5 manganese, 0.01 sulphur and 0.02% phosphorus. The Tungsten Products Co. makes about the same grade of product, except that the carbon is kept below 0.5%, and the tungsten runs as high as 85%. The product of this company is probably the highest grade and the purest ferrotungsten made in this country. Ferrotungsten has a high density, fine gray fracture, and is not crystalline—the higher the carbon the coarser the fracture. The carbon in ferrotungsten occurs as the double carbide, $Fe_3C.W_2C$.

One method commonly employed for production of ferrotungsten is reduction of ferberite or some other concentrate in the electric furnace, with carbon as a reducing agent, followed by a subsequent refining and decarburization. Reduction with carbon takes place according to the following reaction:

$$Fe_2WO_4 + 4C = Fe_2W + 4CO.$$

Theoretically, the product would contain 62.3% tungsten, but, owing to the variation in iron in the ferberite, and to the fact that tungsten reduces from ferberite in the electric furnace before the iron comes down, a considerable part of the iron passes into the slag, so that the alloy contains about 70% tungsten. The slag may contain as high as 8% FeO, but less than 1% WO_3. Theoretically, the reduction of 100 parts of alloy from 122 parts of ferberite requires 16 parts of carbon, but practically about 25% excess of carbon is charged. Small amounts of lime and fluorspar are used to flux the silica. Operating in this manner, with an excess of carbon, a product is made containing 3% carbon, 70% tungsten 0.05% phosphorus, and 0.01% sulphur; the slag contains below 1% WO_3. If desired, this product can b tapped from the furnace, but, as its behavior is erratic it is preferable to allow the metal to collect in the botto of the furnace, forming, in a 150-kw. furnace, a butto about 3 ft. in diameter, 6 in. thick, and weighing 100 to 1200 lb.; the slag is poured off by tilting as it fill the furnace.

Smelting of Ferberite Concentrate

A typical operation is conducted as follows: Th initial charge is 65 lb. of a mixture composed of 20 lb. concentrate, 42 lb. coke, 56 lb. lime, 6 lb. fluorspa Three more 65 lb. charges are added at intervals of hour, and, at 2½ hours from the start, the furnace i tilted and the slag poured. This cycle is repeated unt a 1200-lb. button has been formed, requiring 24 to 3 hours. The furnace is allowed to cool, is torn dow and the button of metal removed. This is then clean and broken up, the breaking process being somewh difficult with a 3% carbon alloy.

The slags produced average 0.72% tungsten, a though there is considerable mechanical loss, due principally to dusting, the total loss in practice does not exceed 5 per cent.

REFINING FERROTUNGSTEN

The crude metal, broken to about 6-in. size, is refined as follows: A charge of 150 lb. metal and 75 lb. ferberite concentrate is smelted for ½ hour, when 12 lb. of fluorspar is added. After another 3 hours the slag is poured, and a fresh charge is started. The process is continued for from 36 to 48 hours, until a button weighing 1500 lb. has formed in the furnace, a larger button being permissible because the low-carbon alloy is easier to break. The furnace is allowed to cool, is torn down, and the button of metal removed, cleaned, and broken. The refined button forms compactly and is free from slag. The refining reduces the carbon from 3 to 0.8%, the phosphorus from 0.05 to 0.01%, leaves the sulphur the same, and increases the tungsten from 70 to 75%. The refining slag contains 5 to 20% tungsten, and is resmelted in a special run.

Ferrotungsten is one of the easiest ferroalloys to manufacture, except for the fact that it must be made in a knock-down furnace, due to the high melting point of the alloy, about 2500° C. Metallurgically it is simple, as tungsten has not so great a tendency to form carbides or to oxidize as have chromium and uranium. Ferrotungsten containing less than 1% carbon can be made in a single smelting operation, by careful regulation of the carbon in the charge and the use of an acid slag. The disadvantage of this method is that the product is less pure, and the slag loss is considerably higher. The metal will contain much higher phosphorus and sulphur, and the total loss of tungsten may be 25%, as compared with 10 to 15% by the two-stage process.

Nearly every manufacturer of ferrotungsten has tried to tap it from the furnace, but none has continued the practice. If the tungsten is reduced to 55 to 60%, the alloy can be tapped, even with carbon as low as 0.2%. With tungsten at 70%, metal containing 0.9% carbon has run out while pouring slag, but generally any metal which comes out with the slag will contain 1.25% carbon. The irregularity of tapping operations with ferrotungsten has prevented the adoption of that method, because if part of the metal must be retained in the furnace, it is cheaper to keep it all there. Furthermore, the poured metal is very hard to break.

In ferrotungsten production it is essential to maintain regularity of charging, as this is the only way to insure homogeneous composition of the metal, as the button is not melted throughout. Even during refining, the metal does not melt to any extent, the action taking place while the metal is in a pasty condition. To insure a more homogeneous product, consumers require the alloy to be crushed to ¼ in., this crushing forming one of the main trials of the manufacturer.

FERROTUNGSTEN ANALYSES

Tungsten %	69.7 to 74.19
Carbon, %	0.88 to 1.00
Silicon %	0.39 to 0.76
Manganese %	0.15 to 0.53
Sulphur %	0.002 to 0.055
Phosphorus %	0.013 to 0.037

Analyses of ferrotungsten made from ferberite by smelting and refining indicate the limits in composition shown in the table.

All vanadium ores require a chemical treatment to put the vanadium in the form of vanadium oxide or iron vanadate before it can be reduced to metal. Probably 75% of the ferrovanadium produced is made in the openhearth or crucible furnace, by a modification of the Thermit process, using aluminum as a reducing agent. The remainder is produced by the electric furnace, using 90% silicon metal as reducing agent.

Standard ferrovanadium contains from 30 to 40% vanadium, and less than 0.5% carbon, 1% silicon, 2% aluminum, 0.1% sulphur, and 0.1% phosphorus. It has a fine fracture, is not crystalline, and is bright gray in color. Experience has shown that the 33% grade is best for making vanadium additions to steel. Carbon is objectionable in ferrovanadium, because over 1% carbon causes some of the vanadium to enter the steel in the form of carbide, producing an injurious effect.

The largest output of ferrovanadium is made by reduction of vanadium oxide or iron vanadate with aluminum shot in a gas-fired openhearth, slagging off the alumina by addition of soda ash or fluorspar. If vanadium oxide is used, iron turnings are added as necessary. The process is partly exothermic, but not enough heat is produced by the reaction between the aluminum and the vanadium oxide to carry on the reduction without the application of heat. The use of iron vanadate is open to the objection that additional aluminum is required for the reduction of iron, which increases operating costs considerably at present. Reduction takes place according to the reaction:

$$3V_2O_5 + 10Al = 6V + 5Al_2O_3$$

In the electric-furnace process, the use of carbon as reducing agent for vanadium oxide has been generally discontinued because of the difficulty in keeping the carbon low, and the tendency to form carbides, which the steel manufacturers maintain are injurious to steel. Silicon has been found the best reducing agent, aluminum volatilizing too easily and being more expensive. The raw materials for the manufacture of ferrovanadium in the electric furnace are steel turnings, vanadium oxide, silicon, lime, and fluorspar. The turnings should be low in carbon. Though 90% silicon metal, ground to 60 mesh, is preferable, ferrosilicon can be used if necessary. All of these materials should be low in phosphorus. Any standard type of electric furnace can be used for making ferrovanadium, but it should be lined with magnesite.

The steel turnings are first charged into the furnace; when they are melted, vanadium oxide is added, followed by a mixture of silicon and lime. When the slag is fluid, in from 1 to 1½ hours, it is raked off, and more vanadium oxide charged, followed by a mixture of silicon and lime. About an hour after this the slag is pulled out and the metal tapped. Instead of pulling the slag out through a door, a separate slag tap hole may be provided. A large quantity of slag is formed in the operation, because of the large quantity of lime which must be charged to combine with the silica formed by reduction of vanadium oxide with silicon. If iron vanadate is used instead of vanadium oxide, no turnings are charged, and the quantity of silicon and lime is increased. This operation is based upon the following reactions:

$$2V_2O_5 + 5Si = 4V + 5SiO_2$$
$$5SiO_2 + 5CaO = 5CaSiO_3$$

The ferrovanadium produced in this manner contains from 4 to 8% silicon, 30% vanadium, 0.5% carbon, 0.05% sulphur, 0.05% phosphorus. A product containing 2 to 4 % silicon can be obtained in a single operation by reducing the amount of silicon charged, and allowing a greater loss of vanadium in the slags. The slags from normal operation contain less than 1% vanadium.

In electrical smelting of vanadium oxide there is an average recovery of 75.2% of the vanadium, with a power consumption of 2.1 kw.-hr. per lb. of ferrovanadium. Smelting of iron vanadate shows similar results, except that there is a considerably greater consumption of silicon metal, owing to the necessary reduction of iron oxide.

REFINING FERROVANADIUM

To obtain a ferrovanadium containing less than 1% silicon, the 4 to 8% product from the smelting furnace is refined in the electric furnace with a slag of vanadium oxide, lime, and fluorspar, giving a product containing 35% vanadium, 0.9% silicon, 0.5% carbon, 0.05% sulphur and 0.05% phosphorus. In the refining process, the ferrovanadium is simply mixed with the slag-forming materials in proper proportions, melted in the furnace, and tapped. The removal of silicon in this manner is a simple matter, and much less difficult than refining to remove carbon. The silicon in the ferrovanadium reduces the vanadium from the oxide, and passes off as calcium silicate in the presence of lime. The usual grade of vanadium oxide contains over 80% V_2O_5. Iron vanadate contains from 25 to 40% V_2O_5. Slag produced by refining contains about 5% V_2O_5, and is run back through the refining furnace so that there is no loss of vanadium by this method. Also, there is no danger of reducing the high silica in this slag, as it cannot be reduced when silicon is the only reducing agent present.

The power consumption for refining was 1.7 kw.-hr. per lb. of ferrovanadium produced, which, added to 2.1 kw.-hr. for smelting, gives a total of 3.8 kw.-hr. per lb. of refined ferrovanadium. The increase in grade of the ferrovanadium from 35.8 to 37.0% is due to the replacement of silicon by vanadium during refining. The carbon of the ferrovanadium could be reduced from 1.5% to less than 1%, but a considerable quantity of the vanadium originally present in the alloy oxidized and went into the slag. Also, it was difficult to get clean taps, as the metal did not separate readily from the slag.

FERROMANGANESE

The preparation of ferromanganese in the electric furnace consists in charging a proper mixture of ore, coal, and limestone in correct proportions for the reduction of manganese with a minimum slag loss. The furnace operates at 75 to 100 volts. With dioxide ores reduction takes place according to the reaction:

$$MnO_2 + 2C = Mn + 2CO$$

Iron is added either as a constituent of the ore or in the form of iron turnings. The power consumption varies from 4000 kw.-hr. per long ton in a 3000-kw. furnace to 7000 kw.-hr. per long ton in a 1000-kw. furnace. The electrode consumption is high, ranging from 150 to 250 lb. per long ton of product, when using amorphous carbon electrodes.

Smelting an ore averaging 38.9% manganese and 13.0% SiO_2, the recovery in metal tapped is 75.4%, with an average loss of 17.3% in the slag and 7.3% mechanically and by volatilization. Considerably better results are now being obtained, especially as regards slag loss. The power consumption was 6429 kw.-hr. per long ton of ferromanganese, measured on the primary side of the transformers. The average metal produced contained manganese, 79.34%; silicon, 1,2; phosphorus, 0.202; sulphur, 0.018%. The quantity of coal charged was less than 10% above the theoretical amount required for complete reduction, which is contrary to the practice at several electric-furnace plants.

FERROMOLYBDENUM

The use of ferromolybdenum in the metallurgy of steel is in its infancy. Previous to 1914, probably not over 10 tons was produced yearly in the United States, practically all of this being exported; but with the high price of tungsten, search for molybdenum ores became more active, and now several hundred tons of the alloy per year are made here, practically all of which is exported. The alloy has not been widely used, because of the supposed scarcity of ore and the prejudices of American steel manufacturers against it, owing to difficulties encountered in its use in steel. The scarcity of ore has been overcome, and at present Colorado is the largest producer of molybdenum in the world. The prejudices of American steel manufacturers have not, however, been surmounted.

Ferromolybdenum was made from roasted molybdenite in the crucible before the introduction of the electric furnace, but can now be made directly from raw sulphide in the electric furnace. Another source of molybdenum is lead molybdate, wulfenite, which is fused with soda ash and carbon to produce lead bullion, and sodium molybdate slag. The slag is then smelted in the electric furnace, with carbon as a reducing agent, and suitable fluxes, to produce ferromolybdenum.

The standard grade of ferromolybdenum is not well established. Some manufacturers make a product containing 50 to 80% molybdenum and 3% carbon, and manage to sell it. Others, by different methods, make a product containing less than 1% carbon. A great deal of ferromolybdenum containing 0.25% sulphur has been sold, but most consumers will not accept a product containing over 0.1% sulphur. Ferromolybdenum containing 80% molybdenum has a dull gray iron color, coarse structure, high density, and is non-magnetic. It does not break easily.

FERRO-URANIUM

All ferro-uranium manufactured in this country is derived from the carnotite ore of Colorado. To put the uranium in a suitable form for the production of ferro uranium, the ore is first subjected to a wet treatmen which has as its main object the extraction of radium with uranium oxide and vanadium oxide or iron vanadate as byproducts. Ferro-uranium was developed no because of any particular need for uranium in stee manufacture, but because of the large quantity of sc dium uranate, $Na_2U_2O_7$, that was accumulating as a by product of radium production. As the reduction tem perature of uranium oxide by carbon is 1490° C., th electric furnace is the only available means for pe forming the operation in quantity. The furnace used in the experiments was a small tilter of the Siemens type, with a steel bottom contact, a rammed magnesite bottom, and a graphite electrode of 4-in. diameter. The power input was 30 to 40 kw. Considerable reactance was connected in the circuit, giving a furnace em.f. of 30 to 60 volts.

MANUFACTURE OF LOW-PERCENTAGE ALLOY

Preliminary experiments were directed to the production of a 15% alloy, as several steel manufacturers preferred to try this grade first. Sodium uranate was charged, with petroleum coke as a reducing agent. This 15% ferro-uranium contained 3% carbon, and it seemed impossible to reduce this percentage.

At the start, uranium exhibited one of its fundamental characteristics, its strong affinity for carbon and its tendency to form carbides. Also, in this early work it was found that no fluxing material except fluorspar could be used with sodium uranate; if either lime or silica was added, the uranium remained in the slag with practically no reduction. Here was exhibited its second characteristic, its strong affinity for oxygen, the effect of which is shown in all later work. Because of its high atomic weight, uranium does not hold a large quantity of oxygen, but retains tenaciously the small quantity which is in combination.

The materials used in the manufacture of uranium metal are uranium oxide and petroleum coke. Both of these materials should be low in impurities, especially in iron and silica. The most suitable medium for the production of uranium metal is a stationary Siemens electric furnace, having the crucible bottom as one electrode and a single suspended electrode. The lining is ground, dead-burned magnesite, rammed into place with pitch as a binder, and the bottom electrical connection is made by a small graphite rod buried in the magnesite. Fireclay tiles of hexagonal cross-section also may be used for a furnace.

FURNACE OPERATION

Uranium oxide and petroleum coke are mixed in proper proportions and charged slowly into the furnace. To secure the proper temperature, the furnace must arc all the time. Regular charging is necessary. The uranium metal is allowed to form a sponge on the bottom of the furnace, which gradually builds up. Directly beneath the upper electrode, this sponge is pasty, but not fluid. The charge forms its own furnace lining. When a run is finished, the button of uranium metal is removed from the furnace. The unreduced residue is re-treated with another charge.

The reaction involved is a simple carbon reduction, and the product consists of a mixture of metallic uranium and uranium carbide.

$$\begin{gathered}UO_2 + 2C = U + 2CO\\ U_3O_8 + 8C = 3U + 8CO.\\ 3UO_2 + 5C = U + U_2C_3 + 2CO\\ U_3O_8 + 11C = U + U_2C_3 + 8CO.\end{gathered}$$

A typical charge for the production of uranium metal would be: uranium oxide, 20 lb.; petroleum coke, 2 lb., the oxide containing 94.7% U_3O_8, and the petroleum coke, 85% fixed carbon. Making a recovery of 56% of the uranium, 100 lb. of this charge will produce 44 lb. of uranium metal. By resmelting the residue, practically all of the uranium can be recovered except the small amount lost mechanically. The uranium metal made from this charge contained uranium, 93.0%; carbon, 4.39; silicon, 1.43; iron, 1.35; vanadium, 1.31; phosphorus, 0.051; sulphur, 0.13 per cent.

Standard commercial ferro-uranium contains 35 to 50% uranium and 1.5 to 4% carbon. Ferro-uranium is brittle, has a high density, and when it contains over 20% uranium has a tendency to be pyrophoric, this tendency increasing with the percentage of uranium. A 3 to 5% carbon alloy, with less than 15% uranium, has a dense non-crystalline structure, and is dull gray in color. When the uranium content reaches 18 to 20%, small bright crystals appear; and as the alloy approaches 50% uranium, these crystals become larger, longer, and more distinct. From 18% up, the alloy has a brilliant, flaky fracture. At 18% it is hard to break, but at 50% uranium it breaks easily. With the commercial 50% alloy no graphitic carbon is present if the total carbon is under 5%, but if there is over 5% carbon, this excess carbon is usually graphitic. Any of these alloys has an entirely different appearance if cooled from a white heat in water, this treatment giving it a granular and dirty aspect. If the carbon is less than 1.5%, the alloy has a dense gray appearance and is difficult to break. Under the microscope, the uranium appears to be present as the double carbide of iron and uranium, $Fe_3C.U_2C_3$, in a eutectic mixture of iron and carbon.

Uranium metal with over 90% uranium has a dull black color. It is dense in structure, but powders easily. It is very pyrophoric, and draws a long spark when struck across steel or another piece of uranium metal. Uranium carbide is also pyrophoric, but is more flaky in structure than a mixture of uranium metal and uranium carbide.

Owner's Duty To Safeguard Dangerous Premises Affirmed

By A. L. H. Street*

A mining company maintaining a slush pond into which flowed washings from an ore washer, in a community where livestock was permitted to run at large on the commons, was bound to foresee the natural tendency of a mule to stray upon the premises, allured by inviting pasturage; and the company was liable for loss of the animal due to his walking upon an incrusted surface of the pond, which he did not know, but which the company should have known, was insufficient to bear the weight of stock. The Alabama Court of Appeals made this holding in the case of Hudson *vs.* Auxford Brown Ore Co., 77 *Southern Reporter*, 243, as an abstract proposition of law, conditioned upon proof that the company might reasonably have foreseen that stock would probably be lured to the premises and perish, unless precautions were taken to prevent such consequences. This decision follows the principle applied by other courts in other cases where it has been held that the owner of an unguarded hole or abandoned shaft may be held responsible for such accidents to persons wandering across unfenced lands as might reasonably have been foreseen and guarded against.

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Metallurgical Treatment of Radium Ores*

The Commercial Ore of Radium Contains From 5 to 10 Mg. of Radium Element Per Ton — Separation of the Radium Compounds Is an Intricate Chemical and Physical Process

BY RICHARD B. MOORE†

THE average commercial ore from which radium is extracted contains from 5 to 10 mg. of radium element per ton. Allowing for losses in extraction and recovery, it takes 5000 or 6000 tons of ore to give an ounce of radium element. It can be seen, therefore, that the metallurgical processes involved in the extraction of radium are entirely different from those connected with any other element. There are two general steps which must be followed: first, to obtain a radium concentrate from the ore, and, second, the re-treatment of this concentrate in order to extract a high-grade product. The first is necessarily on a large scale; the major part of the second is done in the laboratory.

The different methods of treating radium-bearing ores to obtain a concentrate may be classed under three general heads: (1) an alkaline leach, followed by an acid leach; (2) fusing the ore with a material that will disintegrate it and make the extraction of the valuable contents possible; (3) an acid leach.

ALKALINE LEACH METHODS

It is probable that some of the early experimental work on extracting radium from carnotite ore involved boiling the ore with a solution of sodium carbonate, thus getting rid of the uranium and vanadium, which go into solution. As radium has properties similar to those of barium, any radium in the ore would be converted into radium carbonate, and on treating the residue with dilute c. p. hydrochloric acid the radium would be dissolved with any other acid-soluble products.

The radium concentrate always obtained is radium-barium sulphate. By adding barium chloride and sulphuric acid, or sodium sulphate, to the slightly acid solution carrying the radium, barium sulphate is formed in the solution and drags down radium sulphate with it. The radium is almost always precipitated in this manner in a liquor sufficient in volume to hold it actually in solution. Undoubtedly adsorption has something to do with the precipitation of the radium along with the barium sulphate, but this does not fully explain the small losses that accompany such precipitation.

The general principles outlined above are included in the Haynes-Engle process, which involves boiling the ore with an alkaline carbonate solution. The object of this process was to recover uranium and vanadium only, and did not attempt to obtain the radium in any form. A patent taken out by Warren F. Bleeker involved the extra step which the Haynes-Engle process did not cover—the leaching of the residues with hydrochloric acid to obtain the radium in solution, after the ore had been boiled with an alkaline carbonate solution.

The alkaline leach method separates the uranium and vanadium from the ore during the first stage of the process. It eliminates sulphates by converting the metallic sulphates in the ore into metallic carbonates and soluble sulphates which go into the filtrate with the uranium and vanadium. The radium is therefore left behind in the residue as carbonate, practically free from sulphates. This prevents the re-precipitation of the radium as sulphate, on treating with acid, until after the acid solution is filtered from the tailings. On the other hand, it has the following disadvantages: It converts some of the silica in the ore into sodium silicate, which makes filtration difficult—in fact, most of the filtering and washing must be done by decantation. It is difficult to treat concentrates obtained by this process, as these are almost invariably of fine mesh, which adds to the filtration difficulties. The treatment with alkaline carbonate converts most of the iron and a good part of the aluminum in the ore into an acid-soluble form, so that the acid consumption is high. The method, however, can be used with success for the treatment of certain uranium ores, particularly carnotite, autunite, and torbernite.

FUSION METHODS

The first method used for the extraction of radium was to fuse pitchblende ores with sodium sulphate. This method was originally used by the Austrian government in connection with the treatment of pitchblende ores from its mines in St. Joachimsthal. By this fusion, the uranium in the ore is changed to sodium uranate, which can be dissolved from the insoluble residue by dilute sulphuric acid, after leaching out the excess of sodium sulphate with water. The radium remains behind with the residue, and before the discovery of radium it was discarded. Afterward, the residue was boiled with sodium carbonate, which converted a part of the radium sulphate into radium carbonate, and this was leached out with dilute hydrochloric acid. After repeating this process several times, practically all of the radium was leached from the residue, and the acid leaches were combined. Barium sulphate was then precipitated in the acid solution in the ordinary manner, and in this way the radium was obtained as a concentrate with the barium sulphate.

A somewhat similar treatment is given to the ores from Olary, South Australia, by the Radcliffe process. The main uranium mineral is carnotite, but this is associated with considerable quantities of ilmenite and other rare-earth minerals that are not found in American carnotite. The concentrates are mixed with three times their weight of salt-cake, and fused in a reverberatory furnace. The fused product is then crushed and agitated in wooden vats, with water. By suitable adjustments it is possible to separate on the bottom of the vats a considerable amount of comparatively coarse material that is almost free from radium and uranium. The turbid overflow carries in suspension the radium, lead, and barium, as sulphates, together with a considerable amount of finely divided silica. The overflow is pumped to large lead-lined tanks and allowed to stand all night. This is nothing but a sliming process and has the advantage that the radium in the form of sulphate always remains with the fine material. The slimes settle completely in 12 hours and are collected periodically and treated for the recovery of radium.

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*An excerpt from a paper presented at the Colorado meeting of the A. I. M. E., September, 1918.

†U. S. Bureau of Mines.

THE SCHLUNDT METHOD

The process of Schlundt, which is being used by one company in the United States in connection with carnotite, is similar to the Radcliffe process. The ore is fused with acid sodium sulphate, leached and washed with water to extract the uranium, vanadium, and other soluble products, and the residue is slimed in order to obtain a crude concentration of the radium, which stays with the fine material.

The U. S. Bureau of Mines has found that if a radium-barium sulphate high in silica is fused with caustic soda containing a small quantity of sodium carbonate, the silica can be easily washed out as sodium silicate, whereas the barium and radium remain behind as radium-barium carbonates, which can be readily dissolved in hydrochloric acid. Usually the commercial caustic soda contains enough carbonate without the addition of an extra amount. This method has been applied commercially to the treatment of crude concentrates, such as are obtained by the Schlundt process.

One firm has used a sodium carbonate fusion. The ore is fused with soda ash, usually about 2½ times the weight of the ore being required. This is done in a reverberatory furnace, lined with magnesite brick, and the fused mass is run directly into vats, in which it is leached. The silica is thus converted into sodium silicate and so passes into solution, together with the uranium and vanadium. The iron, calcium, barium, radium, etc., remain as the insoluble residue, which is washed in filter presses. This material is then treated with dilute sulphate-free hydrochloric acid, which dissolves the carbonates, and the radium and barium are precipitated by the addition of the requisite amount of sulphuric acid, or sodium sulphate. The whole is allowed to stand in settling tanks and the clear liquid is drawn off, leaving the barium-radium sulphates, mixed with a considerable amount of silica and other impurities, as a sludge at the bottom of the tank. This is taken off without previous filtration, and dried, forming a crude radium-barium sulphate, which is then refined.

The main advantages of this method are that it will treat an ore containing considerable quantities of sulphates, as the process removes the sulphates as soluble sodium sulphate in a similar manner to the alkaline each method. In addition, it is applicable to the treatment of concentrates, as fineness of material is really an advantage instead of a disadvantage, as it does not nvolve any "sliming." The main disadvantage is the cost, both for the chemicals and the labor required. The concentrate obtained is also of low grade, which involves additional refining costs.

Leaching with hydrochloric acid gives an excellent extraction, provided the ore is comparatively free from ulphates. As a considerable proportion of such ores contain traces of gypsum, it is a method which must be used on selected ores. A hydrochloric acid leach has been used successfully on Cornish pitchblende, which is practically free from pyrite, but is not applicable in any way to American pitchblende, which contains considerable quantities of pyrite. It has also been used on Portuguese autunite. In general, the hydrochloric method is applicable to certain ores, but has a limited use.

Leaching with nitric acid has been used more successfully. This is the method originated by the U. S. Bureau of Mines[1] and used in the plant of the National Radium Institute. As is generally known, barium sulphate is much more soluble in nitric acid than in hydrochloric acid, and this is especially true when the nitric acid is concentrated and hot. For this reason, ores carrying quantities of sulphates can be successfully treated by a nitric acid leach, and the method has been successfully applied to ores carrying as much as 1% gypsum. On ores carrying small quantities of sulphates, the extraction obtained is high, frequently going, on a commercial scale, to 93 and even to 94%. Boiling 40% nitric acid is used, and filtration is obtained on either a vacuum or pressure filter. Filtration must be done rapidly, because, as the acid cools, the radium has a tendency to precipitate out, especially in the presence of sulphates. During the process of recovering uranium and vanadium by this method, practically nothing but sodium hydroxide and sodium carbonate are added to the nitric acid. Consequently, sodium nitrate is obtained as the final product after the precipitation of the radium and vanadium; and this sodium nitrate is recovered by evaporation and crystallization and used over again for the manufacture of nitric acid in the ordinary way. The average losses of nitric acid were about 15%, so that 85% of the acid used was recovered as sodium nitrate. This actually reduced the cost of the nitric acid below that of hydrochloric, and this, together with the high extraction of the radium obtained, was largely responsible for the low cost of the recovered radium and the success of the method.

The process cannot treat successfully ores carrying as large quantities of gypsum as can be treated by some of the other methods, such as the sodium carbonate fusion, but it is applicable to a large percentage of the carnotite ore produced. Difficulty was experienced in treating concentrates, most of which are below 150 mesh. As already stated, it has been necessary to filter rapidly in order to get a good extraction; and the problem of filtering a 40% boiling nitric solution, containing fine material in suspension, was found to be difficult. It was finally overcome by the development and use of a pressure filter instead of a suction filter. This consisted of a steel shell containing an earthenware filter set in concrete. The earthenware filter had at its bottom, as filtering medium, a plate of either filtros or alundum. The steel top was made tight with swing bolts, and a pressure of 100 lb. was applied.

REFINING

The radium-barium sulphate concentrate obtained in a satisfactory metallurgical process should carry about 1 mg. of radium element per kilogram of concentrate. a ratio of one to a million. The next step is to get this concentrate back into solution. The most successful method is to reduce the sulphate with about one-sixth its weight of pulverized charcoal in a furnace at a temperature from 800 to 900° C. In the presence of silica, the reduction takes place slowly and is not complete; but if the sulphate does not contain more than from 5 to 10% silica, the reduction may reach 90% or more. The radium-barium sulphides are then dissolved in sulphate-free hydrochloric acid, and filtered. From this stage on, the refining process is simply one of fractional crystallization. Radium chloride and bromide are less soluble than the corresponding barium salts. The crystals first obtained on evaporation are therefore richer in radium than the mother liquor from which they are obtained. The difference in solubility of the bromides is considerably greater than that of chlorides; at some stage in the process, all of the chloride salts are converted into bromides, after which fractionation is continued as bromide, in hydrobromic acid solution. The factor of separation is higher in acid than in neutral solution. It is customary, therefore, to fractionate both chlorides and bromides in acid solution. Full details of the methods of fractionation are given in U. S. Bureau of Mines Bulletin No. 104.

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[1] Charles L. Parsons, R. B. Moore, S. C. Lind, and O. C. Schaefer: "Extraction and Recovery of Radium, Uranium and Vanadium from Carnotite." U. S. Bureau of Mines Bulletin No. 104 (1915).

METHODS OF ORE CONCENTRATION

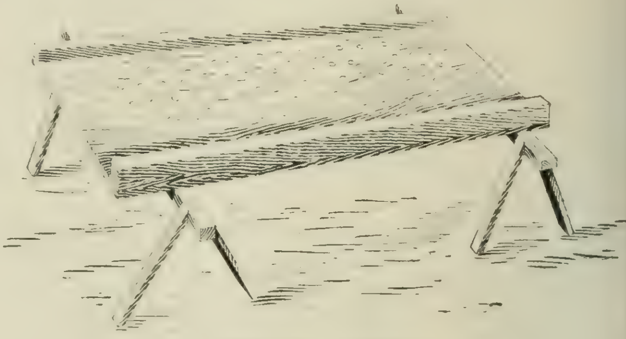
Both wet and dry methods of concentration may be used for carnotite ores. The wet method simply involves crushing the ore and agitating with water in the manner that will best separate the fine-grained particles of carnotite from the coarser silica particles. After allowing to settle, the fine material can be slimed off and run into settling tanks; the coarser tailings are re-leached. The only successful method of dry concentration that has so far been used has involved the Raymond pulverizer and dust-collecting system. The National Radium Institute built a small plant near the claims it was working in Long Park, Colo., and gave the method a thorough testing, with excellent results. The capacity of the mill was a little over one ton of milling ore an hour; and the average output was 365 lb. of concentrate an hour. The milling ore had an average content of 0.85% U_3O_8; the average of all concentrates was 2.92% U_3O_8; the tailings averaged 0.3%; the ratio of concentration was about 6 to 1. As much as 63.7% of the carnotite contained in the milling ore was extracted, and 60% of all the carnotite in this ore was actually recovered in the concentrates.

The Practice and Philosophy Of Ore Sorting*

Following are a few details of practical mining that will prove very useful in ore sorting:

Instead of sorting off of a floor or off of a table, as is usually done, sort off of a horizontal screen placed on two carpenter's horses, as in figure. Screen should be made of light sheet iron (corrugated roofing iron is about right). A screen made of sheet iron is better than a screen made of wire, as the ore can be raked back and forth over it easier. Screening cleans the ore and makes it easier sorted. Placing the screen on tressels makes it possible for the ore sorter to sit in a comfortable position, instead stooping in a back-breaking position, as he has to do when sorting off of a floor.

There should be several screens of different mesh. One screen, on which is placed all ore containing more ore than waste, should have holes big enough to let through all pieces of waste that are so small that it don't pay to pick them up. The principle difficulty in picking waste out of ore, is to keep from wasting one's time picking up pieces of waste that it don't pay to pick up. The other screens, on which is placed ore that contains more waste than ore, should have smaller holes than the first screen. The holes should be of a size that they will only let through waste that it will not pay to pick the ore out of. The smallness of the holes will depend on the proportion of ore to waste; less the ore, smaller the holes.



SORTING TABLE

An ore sorter's work should be judged by the amount of waste he picks out of the ore. Waste has a value determined by the freight and treatment charges. If a man's wages are more than the freight and treatment charges of the waste he picks out, there is no use of him sorting. I have seen two men put in two days picking about 50 lb. of waste out of some rich ore—they thought because the ore was rich that it should be sorted closer. It cost about $16 to pick out the 50 lb. of waste. To ship and treat the same waste would of cost about 50c., where shipping and treating cost about $20 per ton. Waste in rich ore is not worth any more than waste in poor ore. The amount of waste that must be picked out of an ore in order to pay, varies with the cost of transportation and treatment. Greater the cos of transportation and treatment, smaller the holes i the screen should be.

Considering the simplicity, the cost and the benefits sorting off of a horizontal screen placed on tressel ought to find ready acceptance as a useful addition t the many details of practical mining.

The Gigantic Figure of 7,397,553,000,000 was given a the total probable world's coal tonnage in 1913, on th authority of the International Geological Congress held i that year in Canada. This estimate was obtained after a exhaustive analysis had been made of the opinions and ca culations of experts in all the countries of the world, ar refers to the coal existing from the surface to a depth 6000 ft. Of this huge total nearly 50% is found in tl United States. Great Britain is in a much less fortuna position, although the quality of the Welsh coal is exce tionally high.

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*[As a contribution to the discussion on the advisability of sorting ore previous to metallurgical treatment, the views and suggestions submitted will lose none of their force, nor the arguments their logic, by appearing as received and without having been modified to conform to the ordinarily used style. We work, necessarily, under an accepted system of typographical and publication rules, which, in such instances as the present contribution, are [illegible] Editor.]

Petroleum in Colorado

Colorado began petroleum production in 1887. It now produces about 200,000 bbl. per annum. The maximum production was 501,000 bbl., in 1904. In 1916 the average price received at the wells was $1.10 per bbl., and the value of the output was $217,139 (197,235 bbl.). Production comes principally from two fields, the Boulder and the Florence. Of these the Florence field is the more important, as it furnishes 95% of the Colorado production. The oils produced are principally of paraffin base and are suitable for refining by ordinary methods.

The Rangely district, in Rio Blanco County; the De Beque, in Mesa County, and oil-shale land areas in Garfield County are considered of importance as prospective petroleum producers. Some production has been made from wells, but it is not improbable that the distillation of the petroliferous shales can be established as a profitable industry. The proof of the commercial potentialities of the oil-shale areas can be established only by experimental distillation on a commercial scale.

The Government has classified 3,692,036 acres of oil-shale land in the West. During the last year two oil-shale reserves were created for the use of the Navy, one of 45,440 acres, in Colorado, and the other in Utah.

In Colorado, according to the U. S. Geological Survey, it is estimated that the shale deposits are capable of yielding 20,000,000,000 bbl. of crude oil, giving upon refining 2,000,000,000 bbl. of gasoline, and those of Utah may produce an equal amount. The Colorado shale will probably also produce about 300,000,000 tons of ammonium sulphate, a substance useful as fertilizer and for the production of nitric acid for use in explosives. At many places in Colorado and Utah the rich shale has only a light overburden, and could be mined with a steam shovel, in this respect possessing a great advantage over the method of mining oil-shale deposits in Scotland and France. But there are particularly tough layers of shale which wear out steam-shovel teeth rapidly, even those of manganese steel, which will be an important factor in the cost of mining. However, in Scottish oil-shale operations some pits and shafts are 1000 ft. deep, which factor is not present in the Colorado and Utah deposits.

According to J. C. Morrell and Gustav Egloff, the average of 51 samples of Colorado shale which were retorted gave an oil gallonage of 16.2. Of the 51 samples, 29 were tested for ammonium sulphate, with an average of 7.6 lb. per ton of shale. For the State of Utah the average of 38 samples under similar conditions gave 25 gal. of oil and 5.3 lb. of ammonium sulphate per ton. Wyoming gave 16.4 gal. of oil and 6 lb. of ammonium sulphate per ton as an average of 42 samples retorted. The oil shales of Utah indicate a 40% greater yield of oil per ton than those of the states of Colorado and Wyoming. Twenty samples of the Colorado shales were tested to determine cubic feet of gas per ton of shale retorted, and the average was found to be 2705.

The oil-shale area is at present the most promising in Colorado as a source of petroleum. The great variety of the products makes the commercial development of these deposits highly desirable. Several companies have already started operations, and results, or at least a knowledge of the commercial possibilities, may soon be obtained.

The Crowe System of De-aërating Cyanide Solutions*

By Thomas B. Crowe

In the cyanide work in the mills of the Portland Gold Mining Co., oxygen has been found to be the greatest enemy to precipitation. A few years ago I made some bottle tests under vacuum. An acid bottle was partly filled with mill solution and connected by a rubber hose to a vacuum pump. When the vacuum was suddenly applied, a cloud, composed of thousands of small air bubbles, rose out of the solution, showing the amount of dissolved air it contained. The metallurgical results were surprising, indicating that under vacuum practically no gold dissolved, which confirmed my belief that Elsner's equation was true and also led me to investigate the amount of dissolved air carried by solutions at atmospheric pressure.

Large tests were tried, apparatus was designed that would continuously apply a vacuum to solution during its flow to the precipitation presses, and gradually the vacuum system of precipitation worked its way into the company's mills, with the result that the zinc consumption has been halved, which fact is especially gratifying during the war period, with its prevailing high prices.

As the price of cyanide kept soaring, it was decided to try to make a reduction in cyanide consumption. A scrutiny of former work revealed the fact that, for dissolution purposes on this particular ore, the cyanide solution strength was much higher than was necessary. The strongest solution was the barren; and this, being used as a wash on the filters, occasioned high cyanide consumption. The high strength of the barren solution was caused by the necessity of adding lump cyanide at the head of the precipitation plant to insure low-grade solutions for washing.

With the installation of the vacuum system, it was found that perfect precipitation could be maintained without the addition of lump cyanide; and today the Portland Gold Mining Co. mills are running with the highest solution strength in the agitators. This, together with a generally lower solution strength in all parts of the mill, has allowed a material reduction of cyanide consumption.

The accompanying table will give an idea of the amount of cyanide and zinc used before and after the installation of the vacuum precipitation.

COMPARISON OF ORDINARY AND VACUUM PRECIPITATION SYSTEMS AT PORTLAND GOLD MINING CO. MILL

	Tons of Solution Precipitated	Pounds NaCN per Ton Ore	Pounds Zn per Ton Ore	Pounds Zn per Ton Sol
12 months, 1915	503,819	0.331	0.407	0.174
12 months, 1916	536,455	0.320	0.369	0.150
6 months, 1917	249,988	0.175	0.191	0.084

Years 1915 and 1916, ordinary zinc-dust precipitation. Year 1917, vacuum precipitation.

The Electrolytic Zinc Plant at the smeltery of the Mammoth property of the U. S. Smelting, Refining and Mining Co. started operations in 1917, according to the report for that year. The problem confronting this plant is a novel and difficult one. The material to be treated is the baghouse dust from the smeltery, a complex and troublesome material. The technical features may be considered satisfactorily solved. The mechanical appliances, however, have presented many difficulties, which are gradually being overcome.

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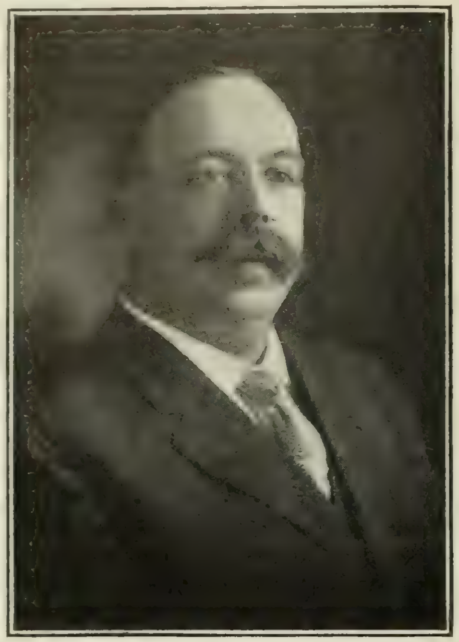
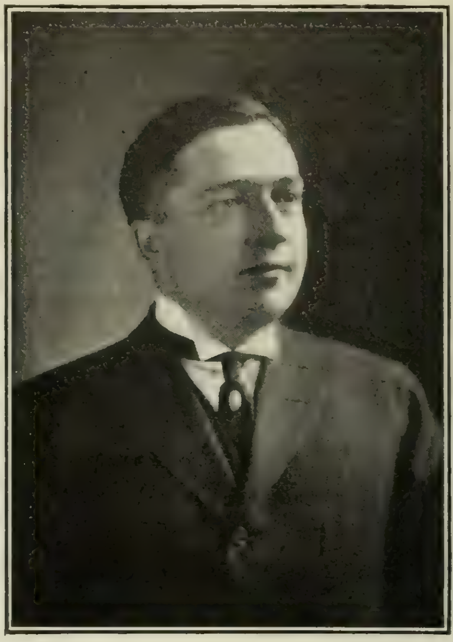
*Excerpt from a paper to be presented at the Colorado meeting of the A.I.M.E., September, 1918.

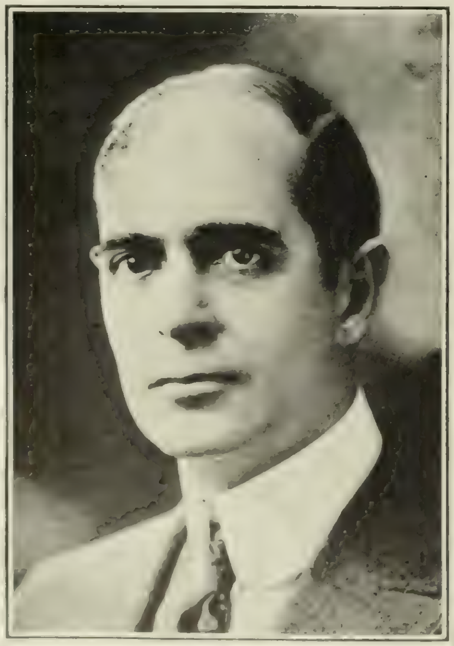
Prominent Colorado Mining Engineers



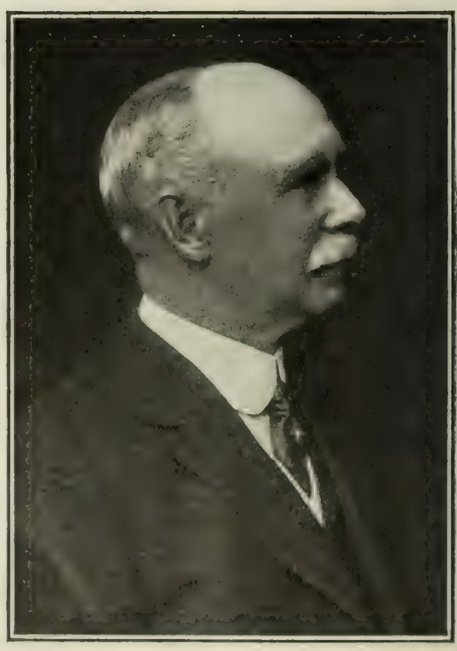
PHILIP ARGALL



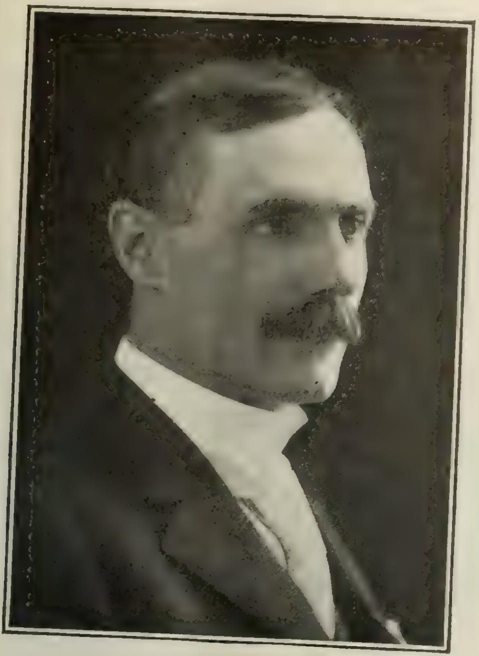
GEORGE O. ARGALL



BULKELEY WELLS



D. W. BRUNTON



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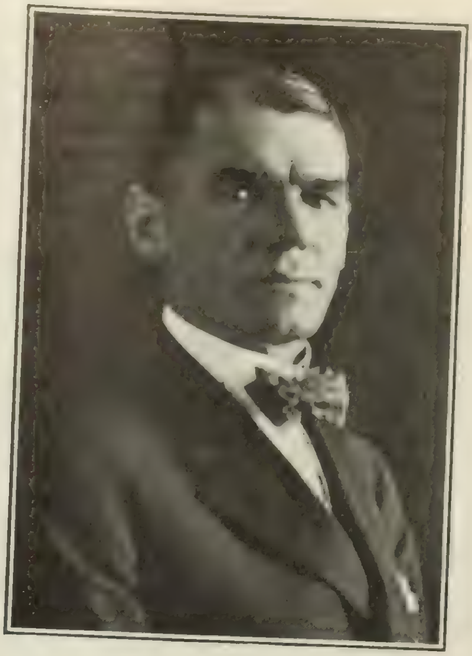
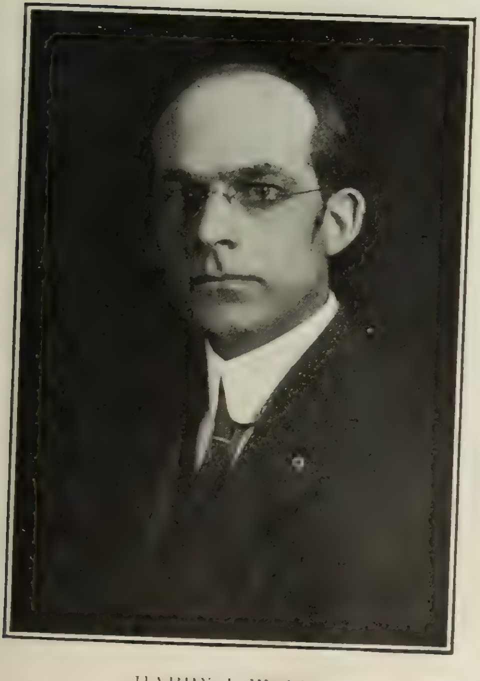
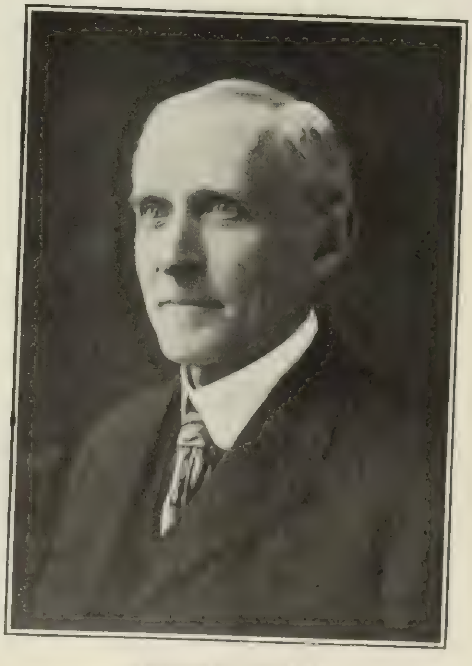


CHARLES A. CHASE



HARRY J. WOLF



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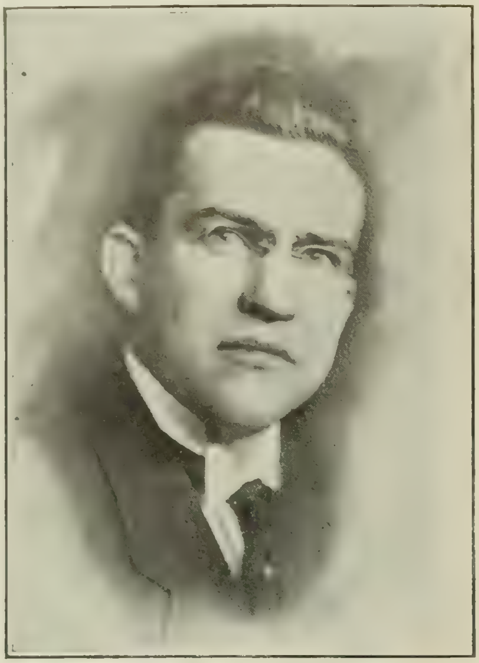
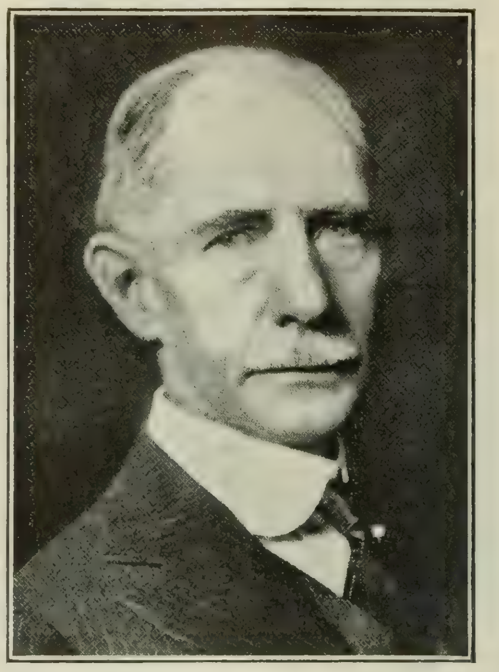
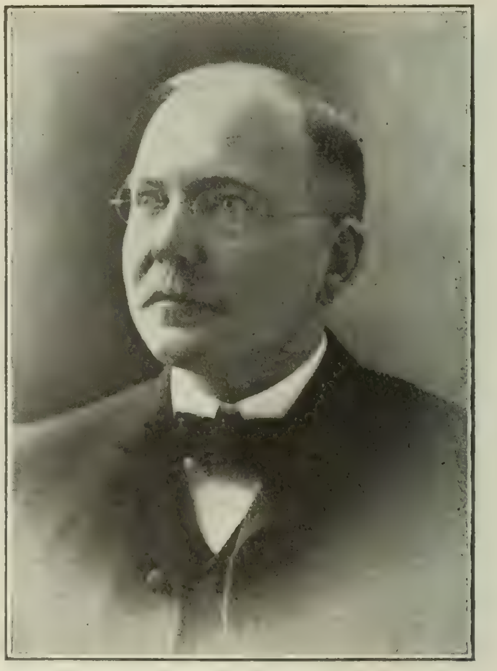


HOWLAND BANCROFT



RICHARD A. PARKER

ETIENNE A. RITTER



GEORGE A. MARSH

Events and Economics of the War

Repeated blows by the French and British on the front between Soissons and Arras, culminating in a heavy attack along the entire line, have given the foe little time to organize his resistance and have brought the British into the outskirts of Bapaume on the old Hindenburg line; the French, after taking Lassigny, are closing in on Noyon, whose downfall is imminent; the number of prisoners and guns captured is constantly growing. The Germans are continuing their withdrawal along the Lys. Spain, after many denials, has admitted notifying Berlin that she will seize interned German vessels to replace those sunk by U-boats. Word from Russia states that the Bolshevik "Reds" declared war on America on Aug. 2. North of Vladivostok, Czecho-Slovak and Allied troops have been forced to fall back. Widespread riots over the price of rice have occurred in Japan.

At Washington, the Man-Power bill is the center of attention; the bill has passed both houses. Secretary Baker advocated the passage of the Sims Water-Power bill before the Interstate Commerce Commission, declaring he favored Government ownership of power plants. Fuel Administrator Garfield refused to allow an increase in coal miners' wages. In reporting its findings, the Senate committee investigating airplane production charged that most of the $640,000,000 appropriated was thrown away. Sweden has entered into an agreement with the United States and others of the Allies to furnish 400,000 tons of shipping and certain products, including rich Swedish iron ores.

American Gold Conference Organized

Relief by the Government for the gold producers of this country to correspond with the increased cost of production, the extent of such relief to be fixed from time to time to meet changing conditions, was said at the meeting of the American Gold Conference, held in Reno, Nev., on Aug. 12 to 14, to be the most effective measure yet proposed to maintain and encourage production of gold in the United States. The conference passed a formal resolution to this effect, which was not to be construed, however, it was said, as recommending any change in the amount of gold in the dollar, or the placing of a premium upon the metal. It was pointed out that under present conditions capital not only cannot be obtained for gold mining, but is generally being withdrawn, wherever possible, from the industry.

The conference was presided over by Governor Emmet D. Boyle, who said that the purpose of the convention was to bring together all interested in the production of gold to consider plans to relieve the present situation. During the first session Governor Boyle was elected permanent chairman and Mayor Frank J. Byington, of Reno, vice chairman. Addresses were delivered by the following: J. F. Callbreath, secretary of the American Mining Congress; John G. Kirchen, of Tonopah, Nev.; H. N. Laurie, of Portland, Ore., chairman of the Oregon Bureau of Mines; Whitman Symmes, of Virginia City, Nev.; W. C. Ralston, of San Francisco; Courteney De Kalb, and John Clausen of San Francisco.

A permanent organization was decided upon, and the following general committee was appointed: I. Pett, Utah; Bulkeley Wells, Colorado; J. A. Burgess, Arizona; George T. McGee, Montana; Robert N. Bell, Idaho; B. L. Thane, Alaska; H. N. Laurie, Oregon; E. H. Clark, South Dakota; S. J. Kidder, New Mexico; John G. Kirchen, Nevada; Milnor Roberts, Washington. The following were appointed as an executive committee: Emmet D. Boyle, W. J. Loring, Bulkeley Wells, Whitman Symmes and George W. Starr.

The committee on resolutions appointed during the first session consisted of the following: James F. Callbreath, Washington, D. C.; E. C. Hutchinson, Jackson, Calif.; W. J. Loring, San Francisco; Bulkeley Wells, Denver; John G. Kirchen, Tonopah, Nev.; W. C. Ralston, San Francisco; H. N. Laurie, Portland, Ore.; Prof. Carl Plehn, Berkeley, Calif.; John Fulton, Melones, Calif.; J. A. Burgess, Oatman, Ariz.; Fletcher Hamilton, San Francisco; George W. Starr, Grass Valley, Calif.; John Clausen, San Francisco.

A resolution by G. McM. Ross, requesting the governors of the different gold mining states to use their influence to prevent the dismantling of gold mining properties, was referred to the general committee. A subscription was taken to secure money for the immediate needs of the organization. Permanent offices will be opened in Reno, where the business of the organization will be conducted. Eugene Davis was selected to take charge of this office. The conference was attended by many well-known mining men from the gold-producing states and other parts of the country.

Mexico Stands Pat on Oil Question

Mexico's new oil decrees separating the title to surface lands from the subsoil deposits, which the government claims, under the new constitution, are not intended to interfere with the oil supply of the Allies, according to Luis Cabrera, Carranza's former Foreign Minister, an interview with whom has recently appeared in the press. The oil producers concerned seem less optimistic, however, and an association has recently been formed by the important companies to protect their interests

The Mexican constitution among other things provides that royalties received from the production of oil be taxed 50%. The government also issued a proclamation requiring all oil companies to file manifests of the property they own and from whom purchased, together with other details. The decree was modified on Aug. 12, in response to a protest from Washington, to the extent that companies having invested money in Mexican oil properties for the purpose of developing them need not file the statement called for, but must pay a reguar bi-monthly tax of 50% on royalties paid on output. This, in effect, means that the government demands one-sixteenth of the output of each foreign-controlled well.

Violation of the modified decree will be punished by voiding the operators' claims; in other words, by virtual confiscation. The Allies and the United States need 90,000 bbl. of Mexican oil per week, according to Mark L. Requa, head of the oil division of the U. S. Fuel Administration.

Bonus for Coal Miners an Evil

An increase in the wages of coal miners as a substitute for the payment of bonuses, for the stopping of which drastic steps are to be taken, will not be approved by Fuel Administrator Garfield. President Frank J. Hayes and other officials of the United Mine Workers of America received this answer from the Fuel Administrator on Aug. 23 in response to their request for a flat increase in wages in lieu of the payment of bonuses.

Bonuses were characterized by Dr. Garfield as "an evil." He announced that the first action toward forcing the abandonment of the practice would be a reduction of 20c. a ton in the price of coal in the Cambridge and Hocking fields of Ohio, and a reduction of 5c. a ton in all other Ohio fields except the Eighth District. From these fields, it was said, were received most of the complaints as to the payment of bonuses.

In spite of this attitude on the part of the Fuel Administration, the United Mine Workers of America have appealed to Dr. Garfield for a reopening of the wage question.

Polish Iron Furnaces Lack Ore

In Russian Poland before the war there were 125 iron furnaces, according to the *British Ironmanger's* translation from *Stahl und Eisen*. Eleven of these were blast furnaces, 27 were open-hearth, 62 reheating and the rest puddling furnaces. At Dombrova, where the furnaces were blown in again last fall, the chief works are Huta Bankowa, which previous to the war had Russian support, as the operating company was French. Rails, axles and wheels came solely from these works, the others supplying mainly sheets and merchant iron. Two spelter works which belonged to the Société Minière Franco-Russe are also at Dombrova.

The inadequate supply of ore from South Russia placed the Polish furnaces before the war at a disadvantage compared with those in South Russia, but the German periodical states that Austrian ore will be furnished the Dombrova stacks as far as possible. The lack of raw materials will probably continue to prevent the blowing in of other furnaces, though the important Milovitz iron works, which formerly produced mainly merchant iron, wire and railroad accessories, has repeatedly sought permission to resume operations. An expansion of its plant by this company a few years before the war has so far been useless to it. There are even some firms belonging in whole or part to German interests that are in similar straits owing to the lack of raw materials.

Limits Set to Coal Storage in East

A meeting of state fuel administrators from all states east of the Mississippi as well as from Minnesota, North Dakota and South Dakota was held in Washington on Aug. 20, to consider ways of securing bituminous coal for special war purposes in the Eastern part of the country, particularly for the Navy and transport purposes, without disturbing the supply moving to other industries. The demand for this coal is rapidly increasing, according to a bulletin of the U. S. Fuel Administration, so that it has become necessary to draw more heavily on Eastern coal fields than was originally contemplated.

At this meeting it was decided that to accomplish the desired result it would be necessary to limit the amount of coal that industrial plants would be allowed to carry on hand and to fix a uniform amount for each state. The maximum limits of storage of steam coal, byproduct and gas coal for public utilities, preferred industries and non-preferred industries in the states concerned have been indicated in a committee report adopted by the meeting and concurred in by Dr. Garfield. Preferred industries will be allowed to carry from 20 to 60 days' supply of steam coal, depending on the state, with the exception of Maine, in which a 90-day supply will be permitted. Non-preferred industries in these states may accumulate from 15 to 30 days' supply of steam coal.

U. S. Technical Employment Bureau

The privileges of the Division of Engineering of the U. S. Employment Service are open, free of charge, to all engineers and technical men. To make use o them, all that is necessary is to apply to the nearest branch of the U. S. Employment Service. For additional information and for application blanks one shoul address the department, Division of Engineering, U. S Employment Service, Chicago, Ill. Whether in need o war work or not, every technical man is advised b A. H. Krom, head of the division, to apply at once fo blanks, so that he may record his ability with the Government and thereby at any future date secure a position, without any charge whatever.

The record for last month of the Division of Engineering offers testimony as to the amount of work i has done in a very short time. In this period, th division has received 468 applications for help fro employers; 1314 applications for help from workers has referred out 1063 applications, and actually place 483 men.

Control of Sulphur-Bearing Materials

In our issue of Aug. 17, a statement was made to th effect that sulphur and pyrites consumers' answers to questionnaire should be sent to the Sulphur Committe 15 William Street, New York. They should be addresse care of A. D. Ledoux.

The Service Bureau (F. W. McReynolds, Director) c the Committee on Public Information, the office of whic is at 15th and G Streets, Washington, is organized t supply information respecting Government officials, the functions, and the situation of all Government depar ments. Persons needing such an official guide in Was ington will do well to bear this in mind.

Dr. Douglas' Will

The will of James Douglas was filed in the Bronx Surrogate's office on Aug. 20. It disposes of an estate valued at approximately $20,000,000. Under the will the American Institute of Mining Engineers, 29 West 39th St.; the American Museum of Natural History, and the Kingston General Hospital, Kingston, Ontario, receive definite bequests of $100,000 each, and McGill University, Montreal, is to get $50,000. Bequests of from $5000 to $50,000 are made to relatives in Canada and England. To the widow, Mrs. Naomi Douglas, the real estate in Riverdale and in Spuyten Duyvil is given, together with the home and stables, personal property and securities which are expected to yield an annual income of $50,000.

A trust fund of $400,000 is created and placed in the hands of two sons, James Stewart Douglas and Walter Douglas, for two grandchildren, Wilmot Douglas Hayter and Herbert Cecil Hayter, of Flamborough, England, who are to receive the bequest when the younger of the two becomes of age. The father of these two boys, Colonel Herbert Ross Hayter, now fighting in France, is to get $50,000. Children of the testator are to receive annuities in the following amounts: Elizabeth Douglas, $5000; James Stewart Douglas, Walter Douglas and Edith Mary Douglas, $2500 each.

Six workmen on the Spuyten Duyvil estate receive $2000 each, and four $1000 each, and all in the employ of the estate more than five years are to receive $500 each. Four house servants are to receive $2000 each, one is to receive $1000, and all over two years in the employ of testator are to receive $500. The residuary estate is divided equally among the four children.

In the will the testator states that he was at one time the manager of an insane asylum, and that his father had been impoverished by mining swindlers. At the age of 40, the testator states, he took up the study of mining engineering and began operating in Canada, Mexico and the United States, with the result that fortune smiled upon him abundantly.

Oil From Shale Rock

With the demand for gasoline and for the crude oil from which it is made, as well as for the ammonia to be used in fertilizers, growing more and more imperative, it is encouraging to learn that rapid progress is being made in producing these materials from the oil shales that are found in the Western States, especially in Colorado, Nevada, Montana, Utah, and Wyoming. More than a dozen large companies have been organized to win oil from these shales and are now making experiments to determine the most efficient and economical way of doing so. Aërial tramways are being built to bring the shale from mines, to be opened high on the sides of the mountains, down to retorts or distillation plants to be built in the valleys near water and lines of transportation.

Chemists are finding that a great many useful things can be made from the oil shales—such as dyes, explosives, paints, fertilizers, and substitutes for rubber, as well as gasoline, kerosene, parafin, and flotation oil—but the industry is not yet far enough advanced to enable any one to tell which of these products, or how many of them, can be manufactured at a profit. The industry must eventually succeed, but its success may depend largely on the profits derived from the sale of the byproducts.

A report[1] recently published by the U. S. Geological Survey shows the results of geologic examinations of oil shale in the Uinta Basin, Utah, by D. E. Winchester, and gives records of distillation and tests of samples of shale collected elswhere in the United States. The oil shale in Utah is black or brownish black, except on weathered surfaces, where it is bluish white or white. It is fine grained, slightly calcareous, and generally free from grit. It is tough, and its thinner beds are remarkably flexible. Its flexibility distinguishes it from ordinary carbonaceous shale, which is brittle. When ignited with a match a thin splinter of oil shale burns with a sooty yellow flame and gives off an asphaltic odor.

Oil shale is heavier than coal, having an average specific gravity of about 1.6, but the richer shales are not so heavy as the leaner ones. The oil shale of the Green River formation contains about 60% of ash. As good coal contains less than 10% of ash, oil shale cannot be profitably used directly as fuel. In order to obtain its content of oil, the shale must be mined like coal, crushed, and distilled in huge retorts, in which it gives off crude shale oil, ammonia, and fuel gas, products from which may be made a number of valuable substances. Though some of the shale has on distillation yielded more than 2 bbl. of oil to the ton, little of the oil is in the shale in the form of oil. The shale contains a great mass of partly bituminized vegetable matter, which can be converted into oil by heat.

Colorado Mine Adits

The rugged topography of Colorado and the occurrence of many steeply inclined veins have made the development of such veins by adits attractive to miners. Deep drainage has also imposed upon Colorado miners the necessity for constructing long adits. The table below comprises mining companies developing through adits and also gives the length of the adits:

COLORADO MINE ADITS	Length Adit, Feet
Argo Mining, Drainage, Transportation and Tunnel Co., Idaho Springs	21120
Atlas mines, Sneffels	7800
Laurium mine, Breckenridge (Blue Flag Gold Mining Co.)	1800
Camp Bird Mining, Leasing and Power Co.	2100
Camp Bird, Ltd.	10000
Carbonero Mines and Reduction Co.	2700
Carter Mining Co., Ohio	7850
Colorado Central Mining Co., Georgetown	4700
Commonwealth Mining Co., Alma	1800
Creede Exploration Co., Creede	3600
Dinero Mining and Tunnel Co., Leadville	4500
Eagle Rock Tungsten Production Co., Boulder	3000
Excelsior mines, Frisco	1400
Hahn's Peak Gold Mining and Milling Co., Columbine	1275
Hope Mining and Milling Co., Aspen	5644
Lackawanna Mining and Reduction Co., Silverton	1200
Mary Murphy Gold Mining Co., Romley	4500
Midwest Metal Mining Co., Denver	1300
Mineral County Mining and Milling Co., Creede	15000
North Fork Power and Mines Co., Salida	1250
Ophir Loop Mines, Ames	1800
Rawley Mining Co., Bonanza	6325
Roosevelt Tunnel, Cripple Creek	23000
Sandy Hook Mining and Milling Co., Ohio	1800
Smuggler Union, Telluride	7000
Sunnyside M. and M. Co., Eureka	1200
Tomboy Gold Mines Co., Ltd., Telluride	5000-10000
Tonopah Belmont Development Co., Dunton	3300
United States Gold Corporation, Sugar Loaf	1600
Western Gold Mining Co., Alma	3600
Yak Mining, Milling and Tunnel Co., Leadville	16000

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[1] Bulletin 691-B, U. S. Geological Survey

A GROUP OF OFFICERS OF THE 27TH ENGINEERS

Two of a Kind

AN ISSUE of the Journal such as the present, devoted largely to the war meeting of the Institute to be held in Colorado during the coming week, would be incomplete without some reference to that other body of mining men engaged in war work, the 27th Engineers, many of whom are members of the Institute. As representative of the mining industry as the Institute itself is the mining regiment, the men of which have been drawn together from every mining district of the country. We have been fortunate in securing a photograph of a group of the regiment's officers, which is shown on this page. A brief account of the organizing of the regiment, written by Private E. Hall, of Company D, has recently appeared in the *Bullet*, published at the Navy rifle range at Glenburnie, Md. Private Hall says in part:

> When the regiment was first authorized, Mr. O. B. Perry (now Lieutenant Colonel), consulting and mining engineer and general manager of the Yukon Gold Co., was selected by the War Department to organize and command the 27th. When regimental headquarters was moved to France, Lieut. Col. Gilmore, who served as a government engineer in the construction of the Panama Canal, was attached to the regiment to command the Second Battalion. Capt. Norval J. Welch, of Company A, the first company to be sent across, is a mining engineer. Capt. Ward Royce, a mining engineer, was prior to entering the service managing a mining property in Mexico. Capt. F. S. Norcross, of Company C, was superintendent of the Canada Coppe Corp., of British Columbia, and is a mining engineer. Capt R. E. Franklin, commanding Company D, an electrical engineer, was superintendent of the power and water suppl of the Yukon Gold Co., in the Yukon Territory and Alaska Capt. C. D. Brown, of Company F, a mining engineer, ha been in charge of a large mining property in the Britis Congo. Capt. H. L. Jacques, of Company F, is a civil an mining engineer from Arizona and California. The othe officers of the regiment are from all over the continent an are civil or mining engineers.
>
> Lieutenant Colonel Gilmore is a veteran of the Cuban wa Captain Franklin and First Lieutenant Burnside, of Com pany D, are veterans of the Philippine insurrection, as Captain Brown, commanding Company E. Many of th enlisted men of the regiment are also veterans of the Spa ish-American War.

Our friends are urged to let others share any new they may receive from the men of the Twenty-sevent What interests one may interest many. Make t *Journal* a clearing-house for news of the mining reg ment—and don't forget the Comfort Fund.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$13,664.
Students of Wisconsin Mining School	50
A. M. Plumb	5
C. W. Snow	2
Charles A. Mitke	5.
A. A. Hassan	10.
A. A. Hassan, Jr	5
Emin A. Hassan	5
Bernard MacDonald	5
C. F. Rand	50

Calumet & Arizona Mining Co. and New Cornelia Copper Co.	400.00
Oscar Lachmund (fourth contribution)	10.00
C. N. Bell	10.00
C. S. Witherell	25.00
W. G. McBride	25.00
Karl Eilers	50.00
R. T. Hancock	5.00
E. E. White	100.00
S. Ringlund	10.00
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
A. F. Taggart	10.00
G. E. Farish	25.00
H. K. Sherry	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
Total	$16,184.61

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

The Sulphur Controversy

The controversy among Government departments respecting sulphur supplies waxes furious, or we might say sulphurous. The alarmist party always admitted privately that there was a large stock of sulphur on hand, but shook its head over the danger of some calamity to the mines, such as a German submarine bobbing up and bombarding them. On Aug. 6 a cyclone swept through a part of Louisiana in which is the plant of the Union Sulphur Co., and did some damage. Here was the opportunity for further exploitation of the hysterical propaganda. Government "experts" were rushed to the scene, and the *Globe* of New York, Aug. 21, came out with a sensational story, under the caption "Sulphur Crisis Alarms Experts." Dr. R. H. McKee and Andrew Murray Hunt were quoted at length as to the desperate situation that would exist *if* our sulphur supply should be suspended. The statements of these gentlemen are qualified with that "if" and it does not appear that they examined the situation in Louisiana, but "Government engineers have finished a survey of the plant," says the press dispatch, and it is understood, according to them, "that the mining of sulphur will not be resumed for many weeks, and maybe the Union Sulphur Co. will not again be a factor in sulphur production for many months." Engineers familiar with the conditions are represented as saying that the great danger of delay lies in the cooling of the ground and the consequent necessity of reheating it before the sulphur can be liquefied again and once more pumped to the surface.

Some bureaus in Washington have received confidential advices to the same effect. On the other hand, the War Industries Board, through the Committee on Public Information, under date of Aug. 23, authorizes the following:

> Advices to the Chemicals Division of the War Industries Board are that mining operations have been resumed in part at the plant of the Union Sulphur Co., at Sulphur, La., where considerable damage was done by the hurricane that swept over that region on Aug. 6. Shipments of sulphur were resumed last week from the accumulated stocks, and rapid progress is being made in the work of restoring normal conditions. Considerable rebuilding will have to be done, but ample material is on hand for the work.
>
> The company carried immense reserves of sulphur above ground, so that there will be no interruption in the manufacture of sulphuric acid and other necessary war materials. This reserve pile of the Union Sulphur Co. measures 800 ft. in length by 200 ft. in width, 40 ft. high, and represents about 15 months' mining.
>
> The plant of the Freeport Sulphur Co. at Freeport, Tex., is producing its normal tonnage and has a considerable reserve above ground. While the damage to the Union Sulphur Co. is unfortunate, especially at this time when sulphuric is being produced in such enormous quantities, the reserve stock situation is such that there is no cause for worry. The Union Sulphur Co.'s operatives are working day and night in the rebuilding of their plant. The sulphur is melted in the ground by steam and hot water and forced to the surface through wells where the molten sulphur solidifies on exposure to the air. The sulphur deposit underlies a bed of quicksand through which it is impossible to drive shafts and mine in the ordinary way. The development of this project is one of the interesting mechanical and chemical achievements of the past decade and, together with the Freeport Co.'s developments, makes the United States by far the greatest producer of sulphur.
>
> There are two other known deposits which can be quickly opened up in case of necessity. Work is now progressing on the development of one of these deposits.

Our own information (and we are quite satisfied as to its authenticity and reliability) is to the effect that the hurricane of Aug. 6 did a good deal of damage, which was not at all serious. Shipments by the Union Sulphur Co. were held up for four days, but on Aug. 10 were resumed and since then have been proceeding normally. The producing wells were interfered with temporarily, owing to the derricks being thrown down; but this will all be cleared up by the end of August, or a few days later. The boiler houses were damaged to the extent of having the corrugated iron roofs blown off and the smokestacks blown down; but this was all light stuff and quickly replaced.

Slacker Committees Among Coal Miners, where the men themselves keep tabs on their fellow workers who take days off without legitimate excuse, are described by president Loomis of the Lehigh Valley Coal Co. Gigantic thermometers are being erected near the entrance to each colliery, showing the tonnage produced each day, compared with its best record, and alongside are posted the names of absentees, with an estimate of what the tonnage would have been if they had all put in a full day's work.

Editorials

Our Sulphur Supply

WE TALK about the Government having certain opinions, certain policies, etc., and we think of the GOVERNMENT in capital letters. It is a convenient, and usually a conclusive, phrase to use. The Government thinks this, the Government wants that, the Government orders so and so, and that ends inquiry, discussion, or criticism. The magic word of "Government" is all-sufficient.

But when one branch of the Government says one thing, and another branch says another thing, what is the wayfarer going to do? The Fuel Administration and the Federal Trade Commission are notoriously at odds. The War Industries Board quarrels with, or at least differs from, a famous circle of other bureaus. One bureau says that there is a dangerous shortage of platinum; while another bureau says not so. One bureau becomes hysterical over the prospective scarcity of sulphuric acid, while another pronounces that the supply of that essential commodity is adequate. Are we o be misunderstood for being contemptuous of the half-baked inexpert expressions of opinion that too often emanate from Washington as the representations of the Government?

Sulphuric acid is the great basic commodity of the chemical industry. It is of basic importance in the manufacture of explosives. If we did not possess an adequate supply of sulphuric acid, our military operations would be seriously crippled. Considering this, some of the bureaus in Washington became greatly exercised over the matter of sulphuric-acid supply. Astounding estimates of the quantity of sulphuric acid required were published. The exclusion of Spanish pyrites by the War Trade Board in order to save shipping was regarded as a calamity. Commissions were appointed to investigate domestic resources of pyrites (which, of course, was a proper thing to do). The necessity of stimulating the exploitation of previously unprofitable pyrites mines was one of the main inspirations of the bill for a mines administration, with an appropriation of $50,000,000, that is still pending before Congress.

We could never work ourselves into excitement over the supposedly desperate situation with regard to sulphuric acid, but heretofore we have been unable to discuss this matter, lest we should violate a confidence. However, inasmuch as William G. Woolfolk, the sulphur expert of the War Industries Board, has himself disclosed the key to the situation that has existed all along, we are naturally released. The key has been that there is above ground, and has been all along, at the mines in Louisiana and Texas, over 1,000,000 tons of brimstone. According to Mr. Woolfolk, the present consumption of brimstone is approximately 120,000 tons a month; wherefore the existing stock is sufficient for eight months to come, even if production should be suspended entirely, which is scarcely conceivable. M Woolfolk is, therefore, of the opinion that there ha not been occasion for alarm over the alleged sma supply of sulphur in this country. On this subject w may usefully quote from the following report by W. I Ingalls to the Senate's Committee on Mines and Mining

> An increased requirement for sulphuric acid and a nece sary reduction in the importation of pyrites from Spai have created a deficiency in the supply of this importar mineral; but the tension in the situation is probably over estimated and natural factors are applying the true cor rectives.
>
> In Louisiana and Texas we possess the greatest deposit of sulphur (brimstone) in the world, exploitation of whic has heretofore been limited more by inability to market th product than anything else. Without any doubt, the suppl can be increased immensely. The matter of sulphuric aci is perhaps the most complex of these problems. The Unite States possesses ample sources of sulphur, but the grea resources are remote from the places where the sulphur mainly needed, and both utilization and transportation di ficulties stand in the way. Spanish pyrites come cheapl to places where there are acid works and local channels acid consumption. The utilization of the enormous quantit of sulphurous gas that is dispersed daily into the atmo phere at Anaconda, Mont., for example, would necessitat a stupendous outlay for manufacturing plant, for tanl cars and for transportation.
>
> The production of sulphuric acid in terms of monohydrat (H_2SO_4) in 1917 was about 4,300,000 tons, against abou 3,900,000 in 1916. The Government estimates a requir ment of 5,000,000 to 5,600,000 tons. We imported fro Spain about 833,000 short tons of pyrites in 1917, whic may be reckoned as making about 1,000,000 tons of su phuric acid (monohydrate). If, therefore, we are to r quire as much acid as the Government's maximum estimat stupendous though it be, and if we were not to import ar pyrites from Spain, we would have to find raw materia for about 2,300,000 tons of acid. Although that is a ve large figure, the situation as to brimstone, which perha ought not to be divulged, is of such a nature as to dispel ar alarm. Moreover, importations of pyrites will not checked entirely; the domestic production of pyrites is i creasing; and smelters are adding to their production acid as a byproduct; wherefore it need not be assumed th new sources for 2,300,000 tons of acid must be found. 1915-16, sulphuric acid of 60° B., which in pre-war times re ized about $6@8 per ton, sold at $50@60 per ton. Befo the end of 1916 the price had receded practically to the pr war normal. Referring to this subject, the *Engineeri and Mining Journal* remarked, Nov. 18, 1916, that: "One the war commodities that has come down to earth is s phuric acid. In the acute period this fetched $50@60 p ton. Ordinary tower acid is now down to about $7@8 p ton, which is only a trifle in excess of what it used to in normal times. The explanation is increased producti The consumption is still very large."
>
> The price of $7@8 per ton at that time was undoubte sub-normal, considering increased cost of production. the beginning of 1917 the market was $12@13, and e that was regarded as low. It advanced during 1917, was quoted at $22@25 at the close of the year. The cent price in the open market has been about $25, but War Industries Board has arranged for Government quirements at $18.

Officials in Washington talked about a sulphuric- requirement of about 9,000,000 tons per annum, wh looked staggering in comparison with all previous productions. The look was different, however, when it developed that it was chamber acid, containing only about 62% of H_2SO_4, that was being talked about. Sulphuric acid is produced in four common forms, viz., chamber acid, tower acid (containing about 77.5% H_2SO_4), acid of 66° B. (containing about 93.5% H_2SO_4), and strong acid, containing 96 to 98%. The only safe statistical basis is the monohydrate (H_2SO_4). Reduced to that basis, 9,000,000 tons of chamber acid becomes about 5,600,000 tons.

The results of the hurricane in Louisiana on Aug. 6 were not such as to lead to an alteration of the views expressed in this article. The controversy among several bureaus of the Government is described in detail elsewhere in this issue.

Anaconda Shows Its Nerve

SPEAKING at a mass meeting in Butte, on July 25, held in honor of the visit of John D. Ryan, president of the Anaconda Copper Mining Co., and Major-General Kenley, commander of the American air forces at home and abroad, C. F. Kelley, vice president of Anaconda, said that on that very afternoon he had been served with a demand from the I. W. W. that wages of Anaconda's employees be advanced to a minimum of $6 per day, men to be lowered and hoisted on the company's time, and calling for abolition of the rustling system and recognition of the I. W. W. If these demands were not granted by the following Saturday, there was threatened a general strike.

This announcement caused a wave of indignation to sweep through the meeting. There was a roar of applause when Mr. Kelley said:

"They don't have to wait until Saturday. They have their answer right now. The demand will not be granted. The company I represent and other operating companies in Butte will listen to any request from organized labor, but we will not deal with or recognize the 'wobblies.'"

This was the straight, bold reply that excites admiration. When the Government arranged with the producers for the 23½c. price for copper, last September, Anaconda, along with the others, agreed not to reduce wages, although they were then on the 26c. basis. When on July 2, 1918, the Government raised the price for copper to 26c., Anaconda voluntarily raised wages to the extent that, after allowing for increased freight rates, the company itself received practically no benefit from the advance. The copper producers are doing their utmost to maintain the output of copper, but are unable to equal the rate of 1917, or to supply all the requirements. For any body of men to talk or think strike in this juncture is scarcely short of treason.

Mr. Kitchin Disregards Mr. McAdoo

IT IS a fair question whether Mr. Kitchin wants to help his country win the war, or whether he merely desires to take advantage of the opportunity to punish the wealthy. Mr. McAdoo, who may be fairly regarded as representing the Administration, advises and protests in vain against the depressing plans of Mr. Kitchin, and so does Secretary Lane. The latter points out the great interest of the Administration in maintaining and increasing mineral supplies, for the purpose of which new capital must be invested, and asks properly how anybody is to be expected to invest capital for this or any other purpose if it is going to be confiscated promptly by taxation.

The bill that has finally been framed by Mr. Kitchin pays scant attention to the recommendations and wishes of Mr. McAdoo. Fortunately the Senate will have a lot to say about the matter, but unfortunately the delay in passing this legislation will have an adverse effect upon the forthcoming Liberty Loan flotation. Mr. Kitchin is to be regarded as one of the liabilities of the Administration, rather than as one of its assets.

BY THE WAY

Mining Camp Hygiene

Dave Foley, for 30 years chief of police for the companies operating the iron mines on the Michigan peninsula and in northern Minnesota, had a rare fund of personal experiences, but, being about as garrulous as a ton of iron ore, he had to be approached with great caution, reminisced R. H. Little in the *Chicago Herald*. If the listener had patience enough, the moment would come when Mr. Foley, his face lighting up with animation, would tell a story. Such a moment arrived on one occasion, and the buzz of conversation quieted down as it became apparent that Dave Foley was suddenly moved to talk. His face lighted up as he said:

"And have ye ever heard of the time we put the lads in the biggest bunkhouse on the range into nightgowns? There wuz four hundred of the lads in this wan big bunkhouse. They wuz mostly Monteniggers an' Croastians an' Maltese, with here and there a Finn an' a Wap. The cumpany had the idee of lettin' 'em live their own ways in th' bunkhouse, an' each divil had a bunk, in which he slept and where he always kept a blanket an' a shirt an' three er four yards of sausage an' a couple o' bottles o' beer an' half a cord of black bread an' a bushel of garlic. When they turned in fer the night they jest crawled in, clothes, boots an' all, with th' beer an' the sausage an' the garlic.

"But wan day an officer of the cumpany comes out from Pittsburgh, or one of them seaport towns in the East, an' he takes one look at the bunkhouse, and they carried him out in a dead faint. We had no pulmotor in them days, but we gave him all the fresh air on the Mesabi range, an' burnt a rag under the nose of him an' sent all the way to Hibbing fer a bottle of o' de cologne out of the barber shop to sprinkle on his face.

"When he comes to he goes to the office an' he says a few things, an' then the superintendent sends fer me an' he says: 'Foley,' he says, ''tis a new order. The men cannot sleep in their office clothes any more at all, an' they must be taught that 'tis unconstitutional in the land of the free an' the home of the brave fer to go ter bed with their muddy boots still fastened tite on the feet of 'em. An' they must get over the foreign habit of sleepin' on top of th' groceries, Foley. Let the garlic an' the sausages be kept elsewhere. And

Foley,' says he, rather shamed-face-like, 'I must tell ye, furthermore, that the order is that the men from now on and forever more shall wear becoming nightgowns when they retire to their rest each an' every night. That's all, Foley.'

"'An' after I git the heathen into their little white nighties,' I says. 'Do I listen to them sayin' their prayers an' thin tuck 'em in bed and kiss 'em good night?'

"'You can suit yourself as to that,' says the superintendent, 'but get 'em into their nighties.'

"'Twas a fine job that was picked out fer me. I paraded the divils at noon an' talks to thim with the interpreters all jabberin' after me that which I was sayin' every time I stopped for breath.

"'Men,' says I, ''tis a Christian country you are in,' says I, 'an' ye will become citizens as soon as you show enough intelligence to put the ballot that is placed within yer hand into the ballot box. But no man can become a citizen of the United States except he takes his pants an' his onion soot an' his boots offen him at nite and wears a nightie. You are hereby ordered to buy nighties an' to sleep in th' same as well. Those of you that refuse to become Christians can get yer time from the offis an' beat it off the range.'

"They yelled blue murder in 25 different languiges an' made a break for the offis for their pay. An' thin they thought it over an' sed they would stand for the nighties, an' I assessed each man 50 cints fer a night shirt. I sent a polisman to raid all th' towns on the range an' buy four hundred night shirts. He got 'em, an' that night come bedtime I marched in with ten of the mining company police, all carryin' fine, long clubs fer the purpose of skiddin' the terriers out of their clothes an' sliding 'em into the nighties.

"'Twas a busy night, but finally the job wuz done an' each an' every man was sittin' on the edge of his boonk saying horrible things in a furrin languige, but every man Jack of 'em was fairly radiant in his cute little nightie.

"You shud have seen 'em. There wuz about only 50 he-nighties to be found in th' stores, an' so the man I sent to buy 'em had filled out the order with ladies' nightgowns an' dressing jackets that was all frills an' soft laces an' blue and pink ribbons forninst them. Ah, 'twas a sight of a lifetime. But a week it took before we could persuade 'em to git into their nighties without threatenin' 'em with an ax. Every night after that after the men had crawled into their boonks we would make the grand rounds to see that ivery man hed on his nightie. An' there was many to point out thim that had put their nighties on over their coat an' pants because they wanted to see us haul 'em out. And every man we wud catch who had tried to deceive we wud rap briskly on the feet of him with a poplar club. 'Come out, ye stiff-necked polar bear,' I wud say, 'skin off yer clothes an' yer onion soot an' climb inter yer little lace nightie like a citizen of the United States. 'Tis the law of the land!'

"But after awhile they got used to the nighties, an' very proud of them, too, did they get, an' they took to wearing 'em on Sunday the same as you would a dress suit an' a silk hat. An' when new immigrants arrived they wouldn't let 'em into the bunkhouses unless they cud show a proper nightie."

Edward Dyer Peters

We abstract the following from a biography of the late Edward Dyer Peters by Eleanor Bradley Peters, recently published:

Extract from a Colorado paper 1870 or 1871:

> Middle Boulder: Silver Bullion Shipments. The first two shipments of silver from A. D. Breed's new reduction works at Middle Boulder were made within the past five days. The first of these embraced 400 lb., and the last 6200 oz. of silver, in bars, the product of ore from the Caribou mine. The bullion has been forwarded to New York . . . . Under the skillful management of such competent millmen as Charles E. Sherman and E. D. Peters, this mill will henceforth be found all that could be desired and will take the lead in Colorado in the production of silver bullion.

From another Colorado paper of a little later date (1872):

> A Good Appointment: Edward D. Peters, a young man of rare abilities and acquirements, and who has few equals, theoretically or practically, in mining and milling, has been appointed and confirmed territorial assayer for the southern district of Colorado, the office being located at Fairplay, Park County. At present Mr. Peters is engaged at A. D. Breed's reduction works, at Middle Boulder, as assayer. We congratulate him upon his appointment, and the people of the South in obtaining the services of so thorough and correct a metallurgist.

His first contributions to the *Engineering and Mining Journal* were made at this time, while he was assayer at the first Caribou Silver Mill, in Boulder County, when he sent some brief notices, on milling results, to Dr. Raymond.

From July, 1871, to March, 1872, he was superintendent and metallurgist of the largest silver mine in the country (the Caribou), which position he resigned, having received an appointment in February, 1872, from the Governor of the Territory, as territorial assayer for the southern part of Colorado. In the fall of the same year he built the Mount Lincoln smelting works. He writes from Dudley, Feb. 1, 1873:

> It is a beautiful winter's morning, and I can hardly realize that I am in the center of the Rocky Mountains almost 11,000 ft. above you. My office is in a little flat, surrounded by thick pine forests, and just at the very foot of the highest peak in this whole range from British America to Mexico. The ground commences rising from my very doorstep, and, in the course of one-eighth of a mile, becomes so steep that only the little Mexican jack can be used to pack up provisions and supplies to our mines, which are situated almost on the summit of the highest peaks. As the snow lies some five feet in the timber on the mountain sides, even they are useless now, and are down on a rancho, in the valley, some 50 miles from here, dying as fast as they can, from the epizoötic. We have lost some 40 in the last month, and all the horses have it so badly that we only get our mails from Denver every two or three weeks, brought up by bull-teams. The smelting furnace, which I built last fall, and for which I imagine that I have the same sort of affection that a mother has for a pet child, is running finely, without any delays or drawbacks, and is building me up quite a reputation throughout the territory. When I came here I was simply "Professor" or "Captain" (every man has a title out here, you know). When the furnace started up successfully I was at once dubbed "Major," and since then have usually been addressed as "Colonel." I expect a Brevet Generalship shortly, as promotion is rapid in this country, but if I should ever make a failure it would not take long to degrade me to the ranks. However, I am not afraid of that. The ores are easily treated. There is a fascination in the business that I am engaged in that you will not appreciate. It is certainly a pleasant trade to take the muddy ore from the mines, to determine its exact value and pay for it, to put it through the different furnaces, and finally bring out the gold, silver, copper and lead, and, above all, to have the products agree exactly with the amount that you promised beforehand. There is a touch of old alchemist's mysteries about it which renders it always new and interesting, and one feels every day that he is not only adding to the material wealth of the world, but is also filling his own mind and pocket.

In November, 1874, he returned to the East. Mining was at that time in a very low state; the ores in Colorado were supposed to be worked out, and Peters gave up all hope of continuing in his chosen profession.

"The Rocky Mountain Canary," as the burro is called there, is an important link in the war organization in France, which at present is impressing itself so strongly upon the German consciousness, says the *Sun*. He is lending his strength to the Entente as a bearer of materials to fields of battle to which the motor truck and the horse cannot penetrate.

Patient beyond praise, uncannily surefooted, reflective, slow but certain, and indifferent to the enemy' shell fire, the burro is making himself a name in the line He has made a record in France by his ability to g anywhere and his phlegmatic indifference to fire.

Personals

Have You Contributed to the Association of the 27th Engineers?

Ernest Hibbert is with the British America Nickel Corp., at Sudbury, Ontario.

Harry J. Wolf examined silver-lead properties near Georgetown, Colo., recently.

H. C. Bellinger, general manager of the Chile Exploration Co., has recently returned from Chile.

S. Ford Eaton, of the Guomoco Mining Co., Simiti, Colombia, expects to be in New York in October.

G. L. Sheldon, of Ely, Nev., is doing examination work in Beaverhead County, Montana, and has headquarters at Dillon.

George Ridgway has retired from the management of the Lancefield mine, Beira, West Australia. He has been succeeded by **A. E. Faul.**

L. W. Trumbull, state geologist of Wyoming, recently spent a week in Beaverhead County, Montana, examining the various oil fields.

Samuel W. Cohen has returned to Montreal after a month's tour of inspection of mining properties in Northern Ontario, Nevada and Colorado.

A. G. Mackenzie, secretary of the Utah section of the American Mining Congress, is in Washington in the interest of mining in the intermountain region.

George A. Packard has returned to his office at 50 Congress St., Boston, Mass., after having been absent on consulting work in the West for five months.

Prof. R. C. Wallace, head of the department of geology and metallurgy, University of Manitoba, has been appointed mining commissioner of Northern Manitoba.

Sergio Bagnara, metallurgist of the St. Joseph Lead Co. of Bonne Terre, Mo., is on his way to Washington, having been appointed metallurgical engineer to the Ordnance Department.

Richard Hamilton has been elected president of the Chamber of Mines of Western Australia, for the twentieth year. **G. M. Roberts** has been elected a vice-president, vice **R. B. Nicolson,** deceased.

D. D. Conduit and **F. W. Reeves,** of the U. S. Geological Survey, have recently been in the Dillon, Mont., section, studying oil possibilities and in particular examining oil shales, of which samples were taken.

Forest Rutherford, consulting engineer, is in Colorado making an examination of some large mining properties, and while there will attend the Colorado meeting of the American Institute of Mining Engineers.

E. J. Mehren, editor of "Engineering News-Record," and **Floyd W. Parsons,** editor of "Coal Age," will attend the Colorado meeting of the American Institute of Mining Engineers during the coming week.

S. F. Shaw is making a trip of inspection to the Monclova, Reforma and Bonanza units of the American Smelting and Refining Co., after which Mexican headquarters will be at Charcas, San Luis Potosí.

Prof. Theodore Simons, of the Montana State School of Mines, has returned to Butte from a two-weeks' visit to Philipsburg, Mont., where he investigated the manganese mining and milling problems of the district for the U. S. Bureau of Mines.

Walter Harvey Weed recently returned from the West after several months' absence from New York and left again to examine a lead-zinc property in Quebec on Aug. 25. He will therefore be unable to attend the Colorado meeting of the American Institute of Mining Engineers.

Forrest B. Caldwell, of the California State Bureau of Mines, has arrived at Medford, Calif., as the reprensentative of the U. S. Bureau of Mines, to examine the chrome deposits in Jackson County, after having completed a similar survey in Siskiyou County.

Percy E. Barbour, formerly managing editor of the "Journal," has been appointed Captain in the U. S. Engineers, and is awaiting assignment. Mr. Barbour left the "Journal" to become Deputy Superintendent of the New York State Troopers, from which organization he has received a leave of absence for the period of the war.

Miss Helen E. Guyer, of Boston, has been appointed chief clerk of the Tucson station of the U. S. Bureau of Mines. This is the first time that such a position has been awarded to a woman. Miss Guyer was formerly an assistant in the chemical division of the University of Illinois. She joined the Bureau of Mines force in 1916.

Capt. Curtis W. McGraw, a son of James H. McGraw, president of the McGraw-Hill Co., Inc., has been wounded in France by a shell fragment and is now convalescent in a British military hospital near London. Captain McGraw is a graduate of the 1917 Plattsburg Camp and was commissioned in August of last year. He has two brothers in the service.

James Colquohoun, for many years in charge of the Arizona Copper Co.'s mines at Clifton, Ariz., is thought to have been lost in the general disorder that has followed the rise of the Russian Bolsheviki. He left Arizona to develop copper deposits in the Caucasus mountains. Latterly he is understood to have been operating in the oil fields of the Batum district of southeastern European Russia. Mrs. Colquohoun has received no word from her husband for the last five months. One of her two sons, both born in Clifton, was killed in a Scottish regiment during the first few months of the war. The second is with the British forces in France.

Obituary

Earl G. Austin, an American mine foreman employed at Nacozari, Son., Mex., died on Aug. 13 from wounds inflicted by three Mexicans whom he had refused to promote from muckers to timbermen. He was buried in Colorado Springs.

N. Bruce MacKelvie, president of the Butte & Superior Mining Co., was drowned on Aug. 17, while bathing near his estate at Port Washington, N. Y., due to a stroke of apoplexy. Mr. MacKelvie was 39 years old. He was connected with the brokerage firm of Hayden, Stone & Co., of New York, and was a director in various other corporations.

Societies

Chemical Alliance, Inc. The committee on acids has called a meeting of all members of the acids section at the Hotel Traymore, Atlantic City, N. J., on Sept. 6 at 2.30 p. m. All members of the fertilizer section who are producers of sulphuric acid have been notified to be present.

Northwest Mining Association has decided to call an international conference to discuss the gold problem and suggest methods to aid production. All in northwestern states and British Columbia have been invited to attend. Special invitations have been sent to the Minister of Mines and Minister of Finance for British Columbia.

Engineers' Club of Northern Minnesota visited the mines of the Cuyuna range on Aug. 23 and 24. The members left Hibbing on Aug. 22 in automobiles for Grand Rapids, Minn., where supper was served. Starting anew, they reached Crosby, Minn., on the evening of Aug. 23. The following day was spent in visiting the mines near Crosby.

American Institute of Mining Engineers, New York Section. The following will attend the Colorado meeting of the Institute during the coming week: Sidney J. Jennings, Herman Garlichs, C. S. Witherell, W. R. Ingalls, Bradley Stoughton, J. I. Thompson, D. J. McAdams, Jr., J. Malcolm Muir and guest, Mr. and Mrs. H. N. Eavenson, Mr. and Mrs. C. Kemble Baldwin, Mr. and Mrs. A. T. Hyde, Mr. and Mrs. Rudolf Gahl, and Mr. and Mrs. George D. Barron.

Duluth Engineers' Club. Following the first meeting on May 20 at the Kitchi Gammi Club, Duluth, Minn., at which the question of organizing a club was discussed, the committee of Duluth engineers called another meeting on Aug. 5 and held a dinner at which Alfred D. Flinn, secretary of Engineering Council, was a guest. Mr. Flinn delivered an address upon the "Centralized Activities of National Engineering Societies." The committee submitted articles of incorporation, which were adopted with minor changes. The following officers were elected: W. G. Swart, president; E. R. Lewis, first vice president; W. N. Ryerson, second vice president; W. H. Woodbury, secretary; W. H. Gallagher, treasurer; F. E. House, T. W. Hugo, W. F. Seawedes and F. E. Downing, directors. Efforts are now being made further to develop the organization in which it is planned to include all who can properly be classed as engineers. The highest professional standard is desired that is consistent with broad-minded democracy.

Trade Catalogs

Taber Rotary Pumps. Taber Pump Co., Buffalo, N. Y. Catalog No. 14; pp. 80; 6⅞ x 9¼; illustrated.

Conduit Fittings, Etc. Steel City Electric Co., Pittsburgh, Penn. Catalog No. 33; pp. 108; 6 x 9; illustrated.

Electric Grab-Bucket Hoists. Sprague Electric Works of General Electric Co., New York. Bulletin No. 48,938, superseding No. 902; pp. 24; 8 x 10½; illustrated.

Internal Combustion Locomotives is the title of Record No. 85, issued by the Baldwin Locomotive Works, Philadelphia, Penn., and dealing with gasoline locomotives of a number of sizes and classes. Pp. 32; 9 x 6 in.; illustrated.

Transformers. General Electric Co., Schenectady, N. Y. Bulletin No. 45,203; pp. 4; 8 x 10½; illustrated. Describes the construction and equipment of type H, form KDD, circular coil transformers, oil insulated and self- or water-cooled, made in medium sizes for moderate voltages.

Industrial News

Chicago Pneumatic Tool Co. announces that the contract has been let and work started on the erection of an up-to-date addition to its Cleveland plant, which is planned to double the present output. It is expected that work will be completed on the building itself about Nov. 1 and that the additional production contemplated will be available very soon thereafter. The company has appointed **C. W. Cross** as special representative for the sale of pneumatic tools to railroads, vice **L. C. Sprague,** promoted to be district manager of sales for the company at New York.

New Patents

United States patent specification listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Mine Hoists, Interlocking Control For. Charles L. Perry, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,273,661; July 23, 1918.)

Sulphur from Pyritic Material, Process of Recovering. Addison F. Hoffman, Pittsburgh, Penn. (U. S. No. 1,273,370; July 23, 1918.)

Nickel from Nickel-Copper Alloys, Method of Separating. Joseph Dhavernas, New Brunswick, N. J., assignor to United States Nickel Co., New Brunswick, N. J. (U. S. No. 1,273,465; July 23, 1918).

Cerium, Process for Making Metallic. Alcan Hirsch and Marx Hirsch, New York, N. Y., assignors to Alpha Manufacturing Co. (U. S. No. 1,273,223; July 23, 1918.)

Ore-Separator. Frank Gottfried Schmidt, San Jose, Calif. (U. S. No. 1,272,125; July 9, 1918.)

Concentrator, Dry. August B. Emery, Messina, North Transvaal, South Africa. (U. S. No. 1,272,642; July 16, 1918)

Magnesium Oxide from Dolomite, Process for Obtaining. Ardon M. Mitchell, Tuckahoe, N. Y., assignor to Mitchell & Grenelle, Inc., New York, N. Y. (U. S. No. 1,273,110; July 16, 1918)

Silver, Preparation of Proteid. Yutaka Nukada, Tokyo, Japan. (U. S. No. 1,272,987; July 16, 1918)

Specific-Gravity Scale. Christopher A. Becker, West Nutley, N. J., assignor to the Torsion Balance Company, New York. (U. S. No. 1,272,605; July 9, 1918)

Titanium Oxide Concentrate and Method for Obtaining Same. Auguste J. Rossi, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,272,855; July 16, 1918)

Tube-Mill Feeder. Harry W. Hardinge, New York, N. Y. (U. S. No. 1,272,801; July 16, 1918)

Editorial Correspondence

SAN FRANCISCO—Aug. 21

The Second Annual Report of the Pan-American Petroleum and Transport Co. for the year ended Dec. 31, 1917, shows net earnings applicable to dividends on common stock amounting to $3,536,728, an equivalent to $5.80 per share on 609,895 shares, outstanding, of $50 per share par value. Gross income from operations for the year amounted to $4,512,649. Only $401,372 of this total was received from operation of oil properties. The revenue derived from steamships amounted to $4,111,278. The company now has 18 ships afloat, of an aggregate carrying capacity of 145,965 tons. Five ships are under construction, of an aggregate carrying capacity of 28,305 tons.

Road Construction for Transportation of chrome ores in Siskiyou County is receiving Government aid through the Forestry Service and at the suggestion of Albert Burch, of San Francisco, representing the War Industries Board. The advice of Congressman Raker as to the part the Government would assume in the undertaking makes it appear that a sum of $97,000 will be expended in road construction and that Siskiyou County had contributed $10,000 of this amount; the inference following that the Government will provide the remaining $87,000, which would be ridiculous if true. The facts are that through the Forestry Service the Government has appropriated $10,000 and the County of Siskiyou $10,000, making a total of $20,000 to be expended under the direction of the Department of Agriculture. The chrome producers have agreed to contribute at the rate of 4c. per ton mile, or a maximum of $2 a ton, toward the maintenance of the roads.

Gold Production in California in 1918 will probably be 20 or 25% lower than in 1917. This falling off is due, of course, to high costs of mining, delay in receiving supplies and materials, diminution in labor and the decreased efficiency of labor. There has been practically no new investment in gold-mining properties so far, and it is not likely that whatever relief may come from the Government will be effective early enough to encourage renewed investment and development of new ground before 1919. The remedy of the present evil suggested by the conference of Aug. 12-14, that the Government provide a bonus for gold production, does not meet the approval of most of the large producers. The disavowal of intention to place a premium on gold with which the resolutions of the conference were concluded may, in theory, mean just what the conference meant to express: but in its practical application a bonus amounts to the same thing as a premium. And so far as any actual relief to the gold miners is concerned, the thoughtful and conservative gold producers of California believe the plan to be impracticable and without merit of serious consideration. It would no doubt be a scheme of great prospective prosperity for the promoter and stockseller.

DENVER—Aug. 20

Cripple Creek Gold Production is being maintained at its normal level of about $1,000,000 monthly, in spite of adverse conditions in the form of increased cost of all mining supplies and increased freight rates. Present prospects are that the production will be kept up to normal during the war, but it will probably be increased after the war when a downward adjustment in cost of labor and supplies may be expected.

Manganese Ore is available in large quantities in the Leadville district but the mining outlook is not encouraging on account of the uncertainties of the future caused by war conditions. Most of the ore [illegible] [illegible] careful handling and the margin of profit is small. If the current market price of the metal drops a few points the shipper faces a loss. It is possible that shipments of this ore will disappear on account of the [illegible] increase in freight rates unless a corresponding increase in market price is allowed.

A Bonus on Gold was one of the chief subjects discussed at the recent meeting of the Colorado Metal Mining Association and the Colorado Chapter of the American Mining Congress held in Denver. Resolutions were adopted calling attention to the deplorable situation of the gold mining industry. In resolutions it was pointed out that owing to the rapidly increasing cost of labor and supplies in gold mining operations, with the value of gold at a stationary level, most of the larger low grade and virtually all of the smaller gold mines cannot be operated at a profit. Attention also is called to the important fact that our war operations must be financed on a gold basis of credit, and that the production of gold should be maintained and increased. With such conditions prevailing the mining men resolved that it was the sense of the meeting that of the various relief measures proposed, the following will be most effective in stimulating and maintaining the production of gold in the United States: "Purchase by the United States Treasury of all gold newly produced from mines in the United States and its dependencies at a price sufficient to cover the increased cost of production since July, 1914, adequate provision being made that all amounts over and above the standard price of $20.67 per ounce shall accrue to the benefit of the companies or individuals who produce the ores or mill products from which the gold is derived, and no part of such amounts shall be absorbed by increased charges for smelting, milling, refining, or freight."

SALT LAKE CITY—Aug. 23

Increased Wages for Shaftmen demanded in the Tintic district, would raise the pay for this class of work to $7 per day. This wage, as fixed by the Tintic District Miners' Union, will amount to $1.75 more per day than the wage of the ordinary miner in Tintic, which is $5.25 per day. It has been the custom at Tintic to pay 50c. a day more for shaft work than the ordinary miner received. The effect of this demand on undertakings where shaft work is needed can easily be imagined. The case in point is the new shaft of the Chief Consolidated Company. At the beginning of this work the men received $6.50 a day, and when they struck for more pay, new men were put on. Then followed the action of the Tintic District Miners' Union, which passed a resolution fixing the wage at $7 a day.

Utah Chapter of American Mining Congress received the following telegram on Aug. 3 from secretary A. G. Mackenzie, which embodies the reply of Secretary of Labor W. B. Wilson to the telegram sent by the chapter on July 29.: "Have just finished interview with Secretary of Labor Wilson and Felix Frankfurter, Assistant Secretary of Labor and Chairman of the War Policies Board, at which your telegram of July 29 was presented by me. After reading your message and discussing the Utah situation, Secretary Wilson asked me to give you his definite assurance that no attempt to establish fixed scales would be undertaken until after all interests concerned had been freely consulted and had an opportunity to present suggestions and criticisms of any plan offered. He said he appreciated some of the difficulties under which Utah metal producers are now operating and that his department, although anxious to reduce as soon as possible the economic waste resultant from labor drifting from place to place, is also anxious not to take any action that would force any properties to suspend operations. He said local conditions should be fully recognized in any wage-stabilization plan undertaken and asked me to assure you that he does not favor the suggestion to establish a uniform zone scale and leave adjustments until later, as he recognizes that such a program would be very likely to lead to disturbances."

Preliminary Figures of Utah Production for 1917 compiled by the U. S. Geological Survey show the value of the output to have been $99,298,000, holding the record, in spite of higher costs than in 1916, shortage of labor, smelter embargoes, and exceptionally severe weather during a large part of the winter. Also the prices obtained for metals except in the case of silver, were not as high as in 1916. The gold output for the year amounted to $3,355,156, and the silver output to 13,479,133 fine oz. Copper produced was 246,674,153 lb., of a value of $67,342,044; lead, 178,521,958 lb., of a value of $15,352,888; and zinc, 21,286,871 lb., this being slightly less than the 1916 production. Comparing production during the latter half of 1917 with production during the first part of the present year, it appears that Beaver County and Park City have been making increased shipments, and that less ore has been coming in from Bingham and Tintic, the latter district showing a decrease to about 28,000 tons a month. Park City production has this year been at the rate of about 9000 tons monthly. Of the total output of the state, Bingham produced 75 per cent. Production by Utah Copper during the first quarter of 1918 was slightly less than in 1917, though in April and May there was improvement. The new leaching plant of this company—in part in the experimental stage—is treating 1500 tons of low-grade carbonate ores, and may add much to the copper output of the state. The Ohio Copper company is expected to show increased production in 1918. On the whole, great increase in the copper production of the state in 1918 is predicted. Most of the lead produced by the state comes from Bingham. Here there has been no increase in the output of that metal. The increase in lead production by Park City may make good the decrease on the part of the Tintic district. The Tintic Standard in the eastern part of the Tintic district, is making good shipments of lead-silver ore. In regard to the production of zinc, an increase during 1918 is not expected.

CALUMET, MICH.—Aug. 21

Constant Demand for Lake Tonnage continues at Portage Lake and Torch Lake ports to handle consignments of refined copper for the East. Boats are loading every week at Hubbell, Houghton, Hancock and Dollar Bay, and several cargoes have already gone East by the Lake route this season. The Lake shipments of copper can be continued well into Novembe and perhaps up till December 1.

DULUTH, MINN.—Aug. 22.

Organized Assessment Districts of St Louis County will practically double th valuation of mining lands within their borders as a basis for 1919 taxation, accordin to assessors. Mines which have been value at $1,000,000 on the basis of 50% of th true value will probably be put up to $2,000 000, and others will follow the same sca As the bulk of the income of all the districts along the Mesabi and Vermilio ranges is derived from ore lands and mi ing properties, both above and below th ground, it is evident that the incomes each district, including organized town cities and villages, will be greatly increas next year unless steps are taken to low the tax rate accordingly.

The Oliver Iron Mining Co. has be made defendant in three suits filed in t district court, the total amount of damag sought being $215,305.10. Plaintiffs are t Leon Investment Co., which asks $14 264.64; the Higgins Co., which claims th it has been damaged to the extent of $5 171.76, and the Gilbert Investment C which seeks to recover $20,868.70. All thr allege that on Jan. 2, 1913, they possess interests of varying proportions in t Norman mine at Virginia, and that on th date the Oliver Mining Co. entered up an agreement with each whereby it was continue mining the ore as heretofore, b this time under a contract which wo allow certain percentages of profit to ea holder of the land. The complaints alle non-payment of these profits.

TORONTO—Aug. 23

A Lignite Utilization Board, charged w carrying out the establishment of a pl for producing fuel for domestic uses carbonizing and briquetting the lignite Saskatchewan, has been appointed as result of an agreement between the g ernments of Canada, Saskatchewan Manitoba. The board consists of R. Ross, consulting engineer of Montreal, w has taken a keen interest in the prob and is an active member of the Council for Scientific and Industrial Research; J. M. Leamy of Winnipeg, provincial electrician of Manitoba; and J. A. Sheppard, a prominent business man of Moose Jaw, Sask. In addition to producing fuel briquets it is proposed to recover important by-products, including oil, pitch, ammonia, sulphate and gas. The expenditure involved is estimated at $400,000, of which the Dominion contributes $200,000 and the provinces interested, $100,000 each.

Charged With an Infringement of the Ontario Land Surveyors Act in connection with some work he had done for the Dominion Reduction and Aladdin Cobalt mining companies, N. P. MacDonald, mining engineer of Cobalt, was given a hearing in the Cobalt police court on Aug. 21. The case involves an important point as to the respective rights of mining engineers and surveyors, the latter being the authorized technical body, qualified to make surveys for recording purposes. This point is not in question, the issue involved being the right of a mining engineer to do limited survey work that is, surveys and measurements on ground contained within properly recorded boundaries and on privately owned property. This has been a common practice in Cobalt and Ontario and hitherto regarded as legitimate, as the technical training of mining engineers includes surveying work. The evidence of a number of mine managers and employees was heard and judgment reserved until September 11.

The Mining News

ALASKA

ALASKA SHIPMENTS of domestic copper, ore and matte to the United States during July were 9350 gross tons, having a copper content of 3,994,204 lb. and valued at $927,579.

ARIZONA

Mohave County

MOSSBACK (Kingman)—Shaft down 340 ft. and good gold ore has been cut. No drifting to be done until 500 level is reached.

STANDARD MINERALS (Kingman)—Expect to have 50-ton mill in commission by Nov. 1.

TINTIC AND MERRYBELLE (Kingman)—Hoisting plant installed at Tintic, and shaft to be sunk. Tunnel is being driven at Merrybelle.

Pima County

NEW CORNELIA (Ajo)—Good progress made in three-compartment shaft. Station cut at 250 level and drift being driven.

Pinal County

U. S. VANADIUM (Kelvin)—Five tons of vanadium concentrates shipped to Denver this week by Allied Metals Corporation. Harry S. Bryan is in charge.

ARMOUR COPPER (Price)—Is prospecting a group of claims in the Red Hill district by means of churn drills.

AJAX (Ray)—Work is to be resumed after long period of idleness. Controlling interest recently purchased at sheriff's sale by F. M. Allen of Globe. E. W. Holt will be in charge.

COPPER BUTTES (Ray)—Now being operated by old company and making regular shipments of three cars a week.

INDIAN SPRINGS (Ray)—Group owned by Joe Sherlock and Pete Schillings has been sold to Ray Broken Hills Mining Co. Group is geologically a part of the Broken Hills section and can be developed to advantage.

RAY-HERCULES (Ray)—First 500-ton unit of the 1500-ton mill in operation.

Yavapai County

BLUE MONSTER (Jerome) — Main working shaft down 280 feet.

VERDE SQUAW (Jerome)—New machinery has arrived and is being installed.

POCAHONTAS (Mayer)—Mill and a 50-ton flotation unit to be installed.

CALIFORNIA

Amador County

TREASURE (Amador City)—Good grade of ore cut in lower levels. O. H. Rohlfs is superintendent.

Del Norte County

CHROME DEPOSIT in hills near Crescent City reported by Mosely brothers.

Inyo County

CALIFORNIA SULPHUR (Talus)—Refining sulphur from deposit at Coso hot springs. Two retorts to be installed with capacity of 30 tons per day. O. B. Bachman of Los Angeles is manager.

Los Angeles County

CALIFORNIA GRAPHITE (Los Angeles)—Mill operating and shipping product.

Nevada County

CHROME DEPOSITS are being operated in Alta Hill district, formerly large gold producing region.

GRASS VALLEY CHROME (Grass Valley)—William F. Mau interests purchased by A. A. Codd, a mining engineer of Reno. Arranging to ship 140 tons mined by Mau.

COLUMBIA CONSOLIDATED (Washington)—Property to be closed temporarily. Large tonnage of ore said to be blocked out.

Riverside County

TEMESCAL TIN (Corona)—Property will be reopened and developed by New York men. Early development consisted of two 180-ft. shafts and vein followed by drifting for 300 ft. Idle many years.

Shasta County

CRESCENT COPPER (Keswick)—Good ore reported. Situated between Keswick and Shasta. John E. Baker is manager.

SEAGRAVE CHROME (Redding)—Hauling ore in wagons over new road 1½ mi., then by sled down ½-mi. incline; hauled on light trucks 4½ mi. to Noble station near Harrison Gulch. There it is loaded on large motor trucks and hauled 45 mi. to Redding and thence by rail 25 mi. to Heroult smeltery.

Sierra County

CHROME SHIPMENTS by motor trucks from Downieville, Gibsonville and other points going to Nevada City and Quincy in large amounts. High-grade ore shipped from Gold Bluff-Oxford mine to Nevada City for treatment.

Siskiyou County

CHROME ORE mined by Dr. J. F. Reddy of Medford, Ore., near Hamburg Bar will be hauled by 15 motor trucks to Hornbrook, a distance of 50 mi., over the road now being constructed and repaired by joint labor of Siskiyou County and the U. S. Department of Agriculture. Five trucks have arrived and 10 more are ordered. Hauling contract provides for handling minimum of 500 tons and maximum of 1000 tons per month.

Tuolumne County

LA GRANGE GOLD DREDGING CO. (La Grange)—Operating in Stanislaus, Stanislaus County, has purchased reservoir site at a cost of $35,000.

BELMONT-SHAWMUT (Shawmut) — Formerly known as Eagle-Shawmut. Large gold production maintained and 60-stamp mill operating regularly.

COLORADO

Custer County

PASSIFLORA (Westcliffe) — Sinking Herman shaft to 330 level.

Gilpin County

GILPIN-EUREKA (Central City)—Main shaft now down 720 ft. and 700 level is being extended on both sides of shaft. Percy R. Alsdorf is to superintend installation of flotation system in the mill. E. L. Clark is general manager.

IMPERIAL MINING (Central City)—To sink shaft at Homer mine 100 ft. further. To enlarge shaft house and make room for compressor recently purchased.

Lake County

JASON (Leadville) — Reopening and equipping old Neptune shaft.

San Juan County

SUNNYSIDE (Eureka)—Production of 600-ton mill reduced, owing to scarcity of labor.

GOLD KING (Silverton)—To remodel old 300-ton stamp mill.

HAMLET (Silverton)—Remodeling mill to install flotation unit for selective work on zinc-lead, silver and copper ore.

IDAHO

Shoshone County

SPOKANE METALS (Mullan)—New 200-ton mill in operation on tailings at Government Gulch.

OLD VETERAN (Wallace)—To drive crosscut from main drift to footwall in lower tunnel.

MICHIGAN

Copper District

BALTIC (Baltic)—Shaft No. 2, down to 19 level, providing more than half of mine output.

CALUMET & HECLA (Calumet) Steel for new flotation plant at Lake Linden in place. Plant under cover and ready for installation of machinery.

SENECA (Calumet)—Vertical shaft sunk 100 ft. during first half of August.

FRANKLIN (Demmon) — Resumed operations at mine and mill.

HANCOCK (Hancock)—Has installed electric locomotives on the two levels opened on two eastern lodes.

MAYFLOWER-OLD COLONY (Houghton)—Shaft down 550 feet.

AHMEEK (Kearsarge)—Resumed hoisting at No. 4 shaft, temporarily closed down on account of fire.

MICHIGAN (Rockland) — Accumulated considerable mass copper during August. Increased rock shipments to four cars daily.

Iron District

BARNES-HECKER (Ishpeming) — Construction of power plant commenced.

REPUBLIC (Republic)—Contract for erection of 47 x 67-ft. power plant has been let.

MISSOURI

Joplin District

DEWING (Granby)—Purchased and will erect 200-ton mill on lease south of here on site of old Valentine mine.

BANKERS (Joplin)—New 250-ton mill being erected on lease northwest of Chitwood.

MONTANA

Beaverhead County

TUCARORA (Argenta)—Two cars of ore shipped recently by H. H. French and Warren Greater.

POLARIS (Polaris)—Operating small force. Changing mill to lixiviation process.

Lincoln County

LUKENS-HAZEL (Libby)—Contemplating installation of 250-ton mill and hydro-electric power plant.

Missoula County

IRON MASK (Carter) — Has awarded contract to drive 100-ft. extension of main tunnel.

Silver Bow County

ANACONDA (Butte) — Concreting of Moonlight shaft to begin soon. Sinking Mountain View shaft. Shaft sinking in progress at Belmont and Original mines.

DAVIS-DALY (Butte)—Opened up copper-silver ore on 2300 and 2500 levels of Colorado mine.

TUOLUMNE COPPER (Butte)—Has cut new oreshoot 300 ft. east of main crosscut on 700 level, carrying good copper and silver.

NEVADA

Esmeralda County

RED HILL FLORENCE (Goldfield)—Crosscutting on 500 level and driving north on 300 level to connect with Mohawk shaft.

SILVERMINES CORPORATION (Hornsilver)—Milling plant treating over 100 tons of custom ore per day from various mines in district. Considerable activity now in evidence; several old mines have been reopened,and development work is exposing new oreshoots.

Humboldt County

PACIFIC TUNGSTEN (Winnemucca)—Closed deal for purchase of 17 tungsten-bearing claims belonging to Charles Nofsinger and L. S. Evans, of Winnemucca. Claims are located three miles south of Rose Creek. Work on large scale to commence at once; first work to be construction of boarding and bunk-houses for crew.

Lyon County

MASON VALLEY MINES (Thompson)—Regular shipments 6000 to 7000 tons weekly received at smelting plant. Bluestone, Mason Valley Co., and Nevada-Douglas are largest individual shippers.

NORTHERN LIGHT (Yerington)—Making shipments of high-grade copper ore.

Mineral County

CANDELARIA DISTRICT is showing activity and small shipments of silver ore are being made.

OLYMPIC MINES (Mina)—Mine and mill operating steadily, but at reduced tonnage on account of water shortage.

PITTSBURG-DOLORES (Rockland)—Mine and mill closed down and will probably remain so until gold mining operating conditions improve

Nye County

UNION AMALGAMATED (Manhattan)—Crosscut on 700 level has entered fault zone adjoining ore zone opened on 350 and 600 levels. Heavy flow of water struck in crosscut but pumps handling it without difficulty.

WHITE CAPS (Manhattan)—Preparations made to sink shaft another 125 ft.

WILLIAM PATRICK (Manhattan)—Ground developed warrants installation of mill. Huntington mill has been purchased.

LABOR SITUATION IN TONOPAH is serious, labor being both scarce and inefficient. The Tonopah Belmont company, largest employer of labor in the district, has adopted a contract system, paying by footage or tonnage, which makes it possible for employees to earn more than the regular day's pay of district.

GREAT WESTERN (Tonopah)—Ore shoot recently opened on 1100 level [illegible] ft beyond point where ore was known to be cut in adjoining West Tonopah ground. Further development work to be done on 1050 and 1100 levels, as soon as present excessive water flow stops.

MONTANA TONOPAH (Tonopah)—Operated entirely on leasing system for past four years, will again be operated by company. One of first properties in Tonopah district to open high-price ore. Charles Knox is president.

TONOPAH EXTENSION (Tonopah)—Extensive development work in Merger and Victory veins continue to open milling-grade ore. Over 300 tons daily being milled. Large flow of water struck in sinking Victory shaft 10 ft. below 1750 level, retarding progress of work. New pump to be installed at 1680 level.

WEST END CONSOLIDATED (Tonopah)—Connection made on 800 level between West End shaft and Ohio shaft workings. Regular development has blocked out large tonnage of ore in Ohio ground, which, until connection was made with West End shaft, could not be handled, as Ohio shaft is old and not properly equipped. Mill tonnage from mine to be increased.

OKLAHOMA

Joplin District

SKELTON (Douthat)—Two of six mills idle have resumed operations.

STERLING (Douthat) — Commenced operations after idleness of six months.

CONSTITUTIONAL (Miami)—Plan to start Midas plant in North Century after sinking shaft to 226 level.

MAGNETIC (Miami) — Has purchased lease of Johnson Mining and Development Co. Drilling property; has cleaned out old shaft and plans to build mill soon.

BLACKHAWK (Picher)—Building 350-ton mill.

OZARK LEAD AND ZINC (Picher)—Has suspended mining on account of water. Pumps being installed.

WALKER (Picher)—Treating ore from six shafts—four on its own lease and two on adjoining tract.

RED ROSE (Quapaw)—Sinking shaft to deeper level and cut ore at 182 feet.

OREGON

Coos County

COAL & METAL TRUSTEES (Marshfield)—Have taken over Granite and Rusty Butte groups of copper mines; also Monumental and Salmon groups of gold mines, which they purpose developing. Properties are all old producers.

INMAN (Marshfield)—Completed tunnel to divert Saxes river.

SOUTH DAKOTA

Lawrence County

SEIM (Deadwood)—Loading pyrites for shipment to eastern market.

CUSTER PEAKE (Roubaix) — Copper ore mined from Jungle mine for shipment to smeltery. Boiler and hoist being installed.

Pennington County

AMERICAN TIN AND TUNGSTEN (Hill City)—Cowboy mine being unwatered. Mohawk and Anna also to be worked. Additions under way at concentrator. Motor truck to be used to transport ore to railroad.

BLUE LEAD (Hill City)—New boiler and compressor to be installed.

LAST CHANCE (Keystone) — Making regular shipments of mica under lease to Producers' Mica Co., of Chicago.

LITHIA MINES (Keystone)—All lithia properties making regular shipments. Shortage of labor prevents larger output.

UTAH

Beaver County

UTAH SULPHUR CORPORATION (Milford)—Work begun in old sulphur mine at Sulphurdale; material and supplies being hauled. New company prospecting area of about 70 acres with core drills. New buildings being put up at Sulphurdale, now to be known as Morrissy, named after M. P. Morrissy, president. Expect to begin shipments soon.

Juab County

GODIVA (Eureka)—Lessees continuing shipments. Has cut new ore on 900 level and below 1200 level.

TINTIC MILLING (Silver City)—Newly leased Dragon Consolidated ground expected to furnish tonnage to keep mill supplied.

SCOTIA (Tintic)—Fourth car silver-lead ore shipped recently. Workings to be deepened.

Piute County

BRADBURN (Marysvale) — To build nine buildings and 150-ton bin to hold potash ore. Property adjoins Mineral Products and Florence Mining and Milling Co's. claims.

Salt Lake County

MICHIGAN-UTAH (Alta) — Shipping three cars daily of lead-silver and copper ore.

HIDDEN TREASURE (Bingham)—Leased to George Yeadon. High-grade lead-silver ore has been cut.

OHIO COPPER (Bingham)—Fire starting at trestle of Mascotte tunnel at Lark destroyed trestle and damaged mill. Expect to have three units of flotation section operating in a month.

MIDVALE MINERALS (Midvale)—Treating old U. S. mill dumps near smeltery.

Summit County

ONTARIO (Park City)—Recently opened oreshoot on 1600 and 1700 levels which is furnishing large part of output. Water being taken care of by pumping equipment on 1700 level.

CANADA

British Columbia

VELVET (Rossland)—Under investigation by Granby Consolidated. Main shaft down 500 ft. and six levels opened up. Mine closed down for some time.

Ontario

ANKERITE (Porcupine) — Extensive diamond-drilling campaign to be carried on to determine extent of two large parallel orebodies at depth.

DAVIDSON (Porcupine)—New section of property being developed. Second shaft being sunk to 750 level from a point 300 ft. north of No. 1 shaft. Diamond drilling has shown orebody at depth of 544 ft.

DOME (Porcupine)—Development being continued at 1250 level. A raise from this level is underway.

COBALT DISTRICT SHIPMENTS for the week ended Aug. 16 were: Coniagas 170,370 lb.; Buffalo, 87,884; McKinley-Darragh, 83,592; La Rose, 65,943; Penn Canadian, 64,688; O'Brien, 64,100; National, 60,655 lb. Total, 597,242 pounds.

GENESEE (Cobalt) — Development a 500 level has been retarded by water difficulties. Extra pumping equipment is bein installed.

GREEN MEEHAN (Cobalt)—Edward Wright Co. operators have decided to continue work at greater depth.

LAKE SHORE (Kirkland Lake)—Durin July estimated output was $39,000, recovered from 1580 tons of ore, averagin $24.68 per ton. Mill ran 84% of possib running time.

COLTER (Boston Creek)—Property lyin east of the Miller Independence has bee purchased by Toronto interests identifi with the Bourkes mine.

HILL (Painkiller Lake)—Mill buildi being enlarged and alterations made. U derground operations temporarily su pended.

MEXICO

Boja California

COMPAGNIE DU BOLEO (Can Rosalia)—Copper production during Ju was 1,697,360 lb. Copper ore averag 3.29% copper.

The Market Report

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver		Aug.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
22	4.7550	101⅛	49½	26	4.7550	101⅛	49½
23	4.7550	101⅛	49½	27	4.7550	101⅛	49½
24	4.7550	101⅛	49½	28	4.7550	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Aug.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
22	*26	†	8.05	7.75	9 @9¼
23	*26	†	8 05	7.75	9⅛ @9¼
24	*26	†	8.05	7.75	9¼
26	*26	†	8.05	7.75	9⅛ @9¼
27	*26	†	8.05	7.75	9⅛ @9¼
28	*26	†	8.05	7.75	9.10 @9.20

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Aug.	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
22	122	122	137	373½	373½	29½	28½	54
23	122	122	137	371½	371½	29½	28½	54
24	...	...	...	.	...	..		..
26	122	122	137	367½	367½	29½	28½	54
27	122	122	137	367½	367½	29½	28½	54
28	122	122	137	363½	363½	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK, Aug. 28, 1918

There were no new features of special interest in the metal markets this week.

Copper—The situation is apparently becoming a little easier, although producers are still much behind in their commitments.

There is general uneasiness at the smelteries and refineries respecting the forthcoming draft.

We fell into an error in our report last week respecting the relations between the American Metal Co. and the Granby, owing to a misunderstanding on our part. The matter of selling contract between these companies has not come up for consideration.

Copper Sheets—The base price of copper sheets is 34½c. per lb. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—The situation is still easier, owing to the large arrivals in this country, which during August will probably exceed 6000 tons. At the close we quote Straits at 90c., Banka at 86c., and Chinese at 83@84c.

Singapore quoted £373½, c.i.f., London, on Aug. 22; £371½ on Aug. 23; £367½ on Aug. 26; £365½ on Ang. 27; and £363½ on Aug. 28.

Lead—There is no change in the situation. September lead is no longer available except through the Lead Producers' Committee. Vigorous efforts toward a further curtailment of consumption are being made.

Zinc—The little boom that was in full swing last week continued until 9¼c. was touched, with diminishing sales on the way up. The top notch was reached on Saturday, following which the market became dull and easier.

The continuance of the price of 12c. for Grade A spelter was not a bull argument on common. This was equivalent to imposing a maximum price for common as well as for Grade A; for with the contraction in the margin between these grades redistillation will necessarily be discontinued and more common spelter will become available, which will tend to cause the price for common spelter to fall off to the point of equilibrium. The only condition under which this factor would not operate is such a demand for common spelter as would elevate the price for it, regardless of the price for high grade. No such demand seems now to be in sight.

The President has approved an agreement made between the producers of sheet and plate zinc and the price-fixing committee of the War Industries Board, (after investigations by this committee in conjunction with the Federal Trade Commission as to the cost of production) that the maximum base price of 14c. per lb. f.o.b. plant for plate zinc, and 15c. per lb. f.o.b. plant for sheet zinc, shall be continued on deliveries from Sept. 1, 1918, to Jan. 1, 1919, subject to the usual trade discounts and extras or differentials that were in effect Feb. 13, 1918. These discounts and extras shall be effective on all contracts executed between Feb. 13, 1918, and Jan. 1, 1919. Sheet zinc shall be considered as including all gages of ⅛ in. thickness and less and plate zinc as including all gages thicker.

The announcement with regard to Grade A zinc is as follows: "The President has approved an agreement, made between the producers of Grade A zinc and the price-fixing committee of the War Industries Board (after investigations by this committee in conjunction with the Federal Trade Commission as to the cost of production) that the maximum price on Grade A zinc of 12c. per lb. f.o.b. East St. Louis shall be continued on deliveries between Sept. 1, 1918, and Jan. 1, 1919. The price at point of delivery is to be the East St. Louis price plus the freight from East St. Louis to point of delivery."

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged. In announcing the continuation of the maximum price fixed for aluminum, the War Industries Board issued the formal statement which follows in part:

"The President has approved an agreement made between the producers of aluminum and the price-fixing committee of the War Industries Board (after investigations by this committee in conjunction with the Federal Trade Commission as to the cost of production) that the maximum base price for aluminum of 33c. per lb. f.o.b. U. S. producing plants, for 50 tons and over, of ingot of 98% to 99%, be continued until Mar. 1, 1919. Differentials for sheet, rod and wire and differentials for quantity, for grade and for alloys will remain those approved by the price-fixing committee as effective from June 1, 1918. Copies of the price list including differentials may be obtained upon application to the non-ferrous metals section of the War Industries Board.

"These prices will be effective on deliveries made during the period from Sept. 1, 1918, to Mar. 1, 1919, on contracts made during said period; and, furthermore, the new prices will be effective on deliveries made during said period on existing contracts which specify that the price shall be that in force at the time of delivery. Deliveries made during the period of Sept. 1, 1918, to Mar. 1, 1919, on other contracts shall be at the price stated in such contracts, except that on existing direct and indirect Government contracts containing a provision that refund is to be made of the difference between the price stated in the contract and the 'Government fixed price, if, as and when made,' such difference shall be refunded on deliveries made during the period from Sept. 1, 1918 to Mar. 1, 1919, on presentation of proper proof that the purchasing government gets the benefits of the refund. The conditions are the same as before."

Antimony—This market touched 14½c. during the week, at which point the demand lessened and the market became dull and easier. At the close we quote spot at 14⅜@14½c. We quote futures at 13½c., c.i.f., in bond, for September shipments, and 13¾c. for September-October.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadnium—This metal is quoted at $1.50 @ $1.75 per pound.

Nickel—Market quotation: Ingot 40c.; shot 43c.; electrolytic 45c. per lb.

Quicksilver—This market became a little stronger, and we quote $125@$127.50. San Francisco reports by telegraph, $120, steady.

Silver and Platinum

Silver—Quotations have remained unchanged the last week in London and New York. Silver is in demand at the maximum price fixed by the Treasury of $1.01½ per fine oz. on orders from the British government for shipment to London and India, and the market is likely to rule steady and unchanged for some time.

Mexican dollars at New York: Aug. 22, 78; Aug. 23, 78; Aug. 24, 78; Aug. 26, 78; Aug. 27, 78; Aug. 28, 78.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 24—Blende, per ton, high, $77.45; basis 60% zinc., premium, $75; Class B, $65@60; Prime Western, $55; calamine, basis 40% zinc, $37.50@32. Average selling prices: Blende, $56.60; calamine, $36.71; all zinc ores, $55.93.

Lead, high, $103.20; basis 80% lead, $100; average selling price, all grades of lead, $100.32 per ton.

Shipments the week: Blende, 7126; calamine, 247; lead, 1077 tons. Value, all ores the week, $523,180.

With the upward shift of spelter the first of the week, sellers thought of holding for $60 basis. As spelter lowered and only two buyers were in the market for a normal tonnage, sales were made on $55 basis, but nothing was reported lower except slimes and flotation concentrates, which sold at $50 and $45 basis. Shipments were lowered over one-third from lack of cars, buyers having a large purchased tonnage in bins.

Platteville, Wis., Aug. 24—Blende, basis, 60% zinc, highest price reported, $72; base price for premium grade, $75; base price for high-lead blende, $47.50 per ton. Lead ore basis 80% lead, $95 per ton. Shipments reported for the week were 2426 tons blende, 99 tons galena and 615 tons sulphur ore. For the year to date the totals are 84,797 tons blende, 4899 tons galena and 32,432 tons of sulphur ore. During the week 2557 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Dull and easy, with sellers over. Ore of 40% grade is quoted nominally at $1.40 per unit.

Manganese—Unchanged.

Molybdenum Ore—A little more inquiry is reported, with sales at $1.

Tungsten—Spot tungsten ores have been sold to a considerable extent during the week. There is little scheelite of the highest grade obtainable. Buyers who are making inquiries for monthly supplies to cover the rest of this year have had little encouragement in offerings of high-grade scheelite, which sold for $25.50 per unit. High-grade wolframite has sold for from $24.50 to $25.50 per unit. Lower grade ores have sold at prices ranging from $20 to $24, according to the amount and kind of impurity.

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight; but no sulphur imports are being received. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines f.o.b. mines. Unchanged.

Iron Trade Review

PITTSBURGH—Aug. 27

In keeping with the trend of the last few months, the War Industries Board's estimate of the steel requirements has increased further, and as high as 25,000,000 net tons for the current half year has been mentioned, although a conservative estimate for that period's production is not over 18,000,000 net tons.

Pig Iron—The steel mills continue short of pig iron, and allocations are frequently required to keep them going. Practically no pig iron is being delivered except for purposes far up in the preference list. Ordinary market transactions are absent. After the recent activity in contracting for the first half of 1919, such business is practically ended, and the total volume was not large. The market remains quotable at the set limits: Bessemer, $35.20; basic, $32; foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight to Pittsburgh from Valleys being $1.40 and from six detached furnaces somewhat less.

Steel—There are occasional offerings of small lots of odds and ends of discard steel, but discard steel of favorite analysis and size is generally absorbed in war work. Ordinary soft steel offerings are practically non-existent. The market remains quotable at the set limits: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Scrap—The scrap committee of the Institute and the American Board of Scrap Iron Dealers have both issued sharp circular letters regarding the rather widespread abuse of the regulations as to selling heavy melting steel limited to $29, as the so-called "unguaranteed low-phosphorus scrap," at $34. The Institute committee calls upon steel works to stop making such purchases, and the scrap dealers' association calls upon dealers to stop making such sales. Each circular promises "drastic action" if the practices are not stopped.

Ferroalloys—There is only a moderate amount of ferromanganese business being done as a result of the recommendation of the Institute that consumers place contracts for the first half of 1919. Some are covered, though in instances large consumers have hardly started to buy. There seems to be little apprehension that the market will advance. The market has been steady for some time at $250, delivered, for 70% alloy, with $4 a unit for higher manganese content. Though the price was not fixed in the same manner as pig iron and steel prices were fixed it is regarded as an authorized price. Spiegeleisen continues at $75, furnace, for 16 per cent.

Coke—The byproduct ovens are having more trouble getting full supplies of coke, and there has been practically no stocking against winter difficulties. The Carnegie Steel Co. now has about 350 ovens in operation of the 640 byproduct ovens at Clairton that have been under construction for more than two years, but the output is not yet up to rated capacity. The whole original plant is expected to show full production by the end of the year, with 768 additional ovens due next year. Connellsville coke production has suffered a little on account of the coal drain for byproduct ovens, but the total coke output from Connellsville coal, by beehive and byproduct ovens combined, has increased in the last three or four months.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	......	31.498	43.418	......
Sept.	68.515	100.740	......	32.584	50.920	......
Oct.	67.855	87.332	......	32.361	44.324	......
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	......	122.391	......	137.000	......
Sept.	25.073	......	117.500	......	135.250	......
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	......	243.978	......
September	61.542	......	244.038	......
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	....	10.518	.....	30.500	.....
September	8.680		8.611	.....	30.500	.....
October	6.710	....	6.650	.....	30.500	.....
November	6.249	....	6.187	.....	30.500	.....
December	6.375	....	6.312	.....	30.500	.....
Year	8.787		8.721	.....	30.500	.....

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.373	8.473	8.338	54.000	54.000
August	8.360		8.190	.	54.000	. . .
September	8.136		7.966	. .	54.000	
October	7.983	.	7.813		54.000	. .
November	7.847		7.672		54.000	. .
December	7.685	.....	7.510		54.000	......
Year	8.901		8.813	.	52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17		50.37		53.95	
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Aug. 27
Alaska Gold M.	3⅛
Alaska Juneau	2
Am.Sm.& Ref.,com.	77¾
Am. Sm. & Ref., pf.	105
Am. Sm. Sec., pf., A	90½
Am. Zinc	17¼
Am. Zinc, pf.	49½
Anaconda	67¾
Batopilas Min	1⅛
Bethlehem Steel	85
Butte & Superior	26⅞
Butte Cop. & Zinc	‡11⅜
Cerro de Pasco	33⅜
Chile Cop.	16½
Chino	39⅜
Colo.Fuel & Iron	46½
Crucible Steel	69
Crucible Steel, pf.	90½
Dome Mines	8¾
Federal M. & S.	15⅛
Federal M. & S., pf.	42
Great Nor., ore ctf.	32¼
Greene Cananea	45
Gulf States Steel	80½
Homestake	75
Inspiration Con.	53
International Nickel	29⅞
Kennecott	33⅜
Lackawanna Steel	84¾
Mexican Petrol	100¾
Miami Copper	27⅛
Nat'l Lead, com.	58¼
National Lead, pf.	101⅞
Nev. Consol.	20⅛
Ontario Min	9¾
Ray Con.	24
Republic I.&S.,com.	93½
Republic I. & S., pf.	101
Sloss-Sheffield	61½
Tennessee C. & C.	18⅝
U. S. Steel, com.	115¼
U. S. Steel, pf.	110⅝
Utah Copper	82¾
Va. Iron C. & C.	73

BOSTON CURB*	Aug. 27
Alaska Mines Corp.	.12
Boston Ely	.60
Boston & Mont.	.48
Butte & Lon'n Dev.	.15
Calaveras	1
Chief Con.	2 11/16
Contact	.15
Corbin	10
Cortez	.08
Crown Reserve	.15
Crystal Cop.	.44
Eagle & Blue Bell	2 5/16
Houghton Copper	.75
Intermountain	‡.05
Iron Cap	19¼
Mexican Metals	.40
Mines of America	1
Mojave Tungsten	.09
Nat. Zinc & Lead	.16
Nevada-Douglas	.45
New Baltic	.80
New Cornelia	17⅞
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.07
Yukon Gold	.90

SAN FRAN.*	Aug. 20
Alta	.03
Andes	.05
Best & Belcher	.02
Caledonia	.04
Challenge Con.	.03
Confidence	.06
Con. Virginia	.22
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.07
Mexican	.17
Occidental	‡.51
Ophir	.05
Overman	.02
Savage	.03
Sierra Nevada	.03
Union Con.	.40
Utah Con.	.01
Belmont	2.50
Jim Butler	.55
MacNamara	.31
Midway	.04
Mont.-Tonopah	.09
North Star	.06
Rescue Eula	.12
West End Con.	1.05
Atlanta	.03
Booth	.04
Comb. Frac.	‡.02
Florence	.11
Jumbo Extension	.10
Kewanas	.03
Nevada Hills	.03
Nevada Packard	.27
Round Mountain	.18
Silver Pick	.05
White Caps	.24
Big Jim	‡.75
United Eastern	3.25

COLO. SPRINGS*	Aug. 20
Cresson Con.	4.81¼
Doctor Jack Pot	.03¼
Elkton Con.	.04¼
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.69¼
Granite	.17
Isabella	.04½
Mary McKinney	.07½
Portland	.80
United Gold M.	13
Vindicator	40

BOSTON EXCH.*	Aug. 27
Adventure	‡.60
Ahmeek	‡75½
Algomah	‡.15
Allouez	‡49
Ariz. Com., ctfs.	16
Arnold	‡.20
Bingham Mines	‡9⅜
Bonanza	‡.16
Butte-Balaklava	‡.25
Calumet & Ariz.	68½
Calumet & Hecla	464
Centennial	‡12
Copper Range	47½
Daly West	‡2⅝
Davis-Daly	‡5¼
East Butte	10
Franklin	‡3¾
Granby	‡79
Hancock	6
Hedley	‡12
Helvetia	‡.15
Indiana	.60
Isle Royale	27
Keweenaw	‡.87
Lake	‡5
La Salle	‡2½
Mason Valley	‡3¼
Mass	‡4⅜
Mayflower	2½
Michigan	‡2½
Mohawk	56½
New Arcadian	‡1¼
New Idria	‡13
North Butte	‡14½
North Lake	‡.60
Ojibway	‡.65
Old Dominion	39½
Osceola	‡50½
Quincy	‡69½
St. Mary's M. L.	50
Santa Fe	.60
Seneca	‡11
Shannon	‡3¾
Shattuck-Ariz.	‡15½
So. Lake	1
So. Utah	‡.16
Superior	‡4⅝
Superior & Bost.	3½
Trinity	3
Tuolumne	1⅛
U. S. Smelting	42½
U. S. Smelt'g, pf.	43½
Utah Apex	‡1⅜
Utah Con.	10
Utah Metal	2
Victoria	‡2
Winona	‡1¼
Wolverine	22½
Wyandot	‡.50

N. Y. CURB†	Aug. 27
Big Ledge	13/16
Butte & N. Y.	‡.75
Butte Detroit	‡.15
Caledonia	.43
Calumet & Jerome	1 1/16
Can. Cop. Corpn.	2
Carlisle	‡2
Cashboy	.05
Con. Ariz. Sm.	1⅜
Con. Coppermines	‡5
Con. Nev.-Utah	‡ 3/16
Emma Con.	‡.10
First Nat. Cop.	1¾
Goldfield Con.	.21
Goldfield Merger	‡.03
Greenmonster	‡ 7/16
Hecla Min.	4 13/16
Howe Sound	‡4⅛
Jerome Verde	‡.50
Louisiana	‡ 3/16
Magma	29
Majestic	.17
Marsh	‡.04
McKinley-Dar-Sa.	.42
Milford	‡.75
Mother Lode	.35
Nixon Nevada	.40
Ohio Cop.	1
Rawley	‡2¼
Ray Hercules	4½
Richmond	‡.56
Rochester Mines	.34
St. Joseph Lead	14
Standard S. L.	‡1
Stewart	.13
Success	‡.12
Tonopah	2⅛
Tonopah Ex.	1 11/16
Tribullion	‡ 5/16
Troy Arizona	.12
United Cop.	‡ 5/16
United Verde Ext.	37½
United Zinc	1⅛
Utica Mines	‡.08

TORONTO*	Aug. 27
Adanac	‡.06
Bailey	.03
Beaver Con.	.20
Chambers Ferland	.12
Coniagas	2.50
Hargraves	.04
Kerr Lake	5.62½
La Rose	21½
Min. Corp. of Can.	2.00
Nipissing	8.37½
Peterson Lake	.08
Temiskaming	28
Wettlaufer-Lor.	‡.03
Davidson	‡.25
Dome Exten.	.12
Dome Lake	.10
Hollinger	4.50
McIntyre	1.25
Newray	‡.56½
Porcu. Crown	.10
Teck-Hughes	‡.14
Vipond	10
West Dome	05

* Bid prices. † Closing prices. ‡ Last Quotations.

Engineering and Mining Journal

McGraw-Hill Co., Inc. Price, 20c. New York, September 7, 1918

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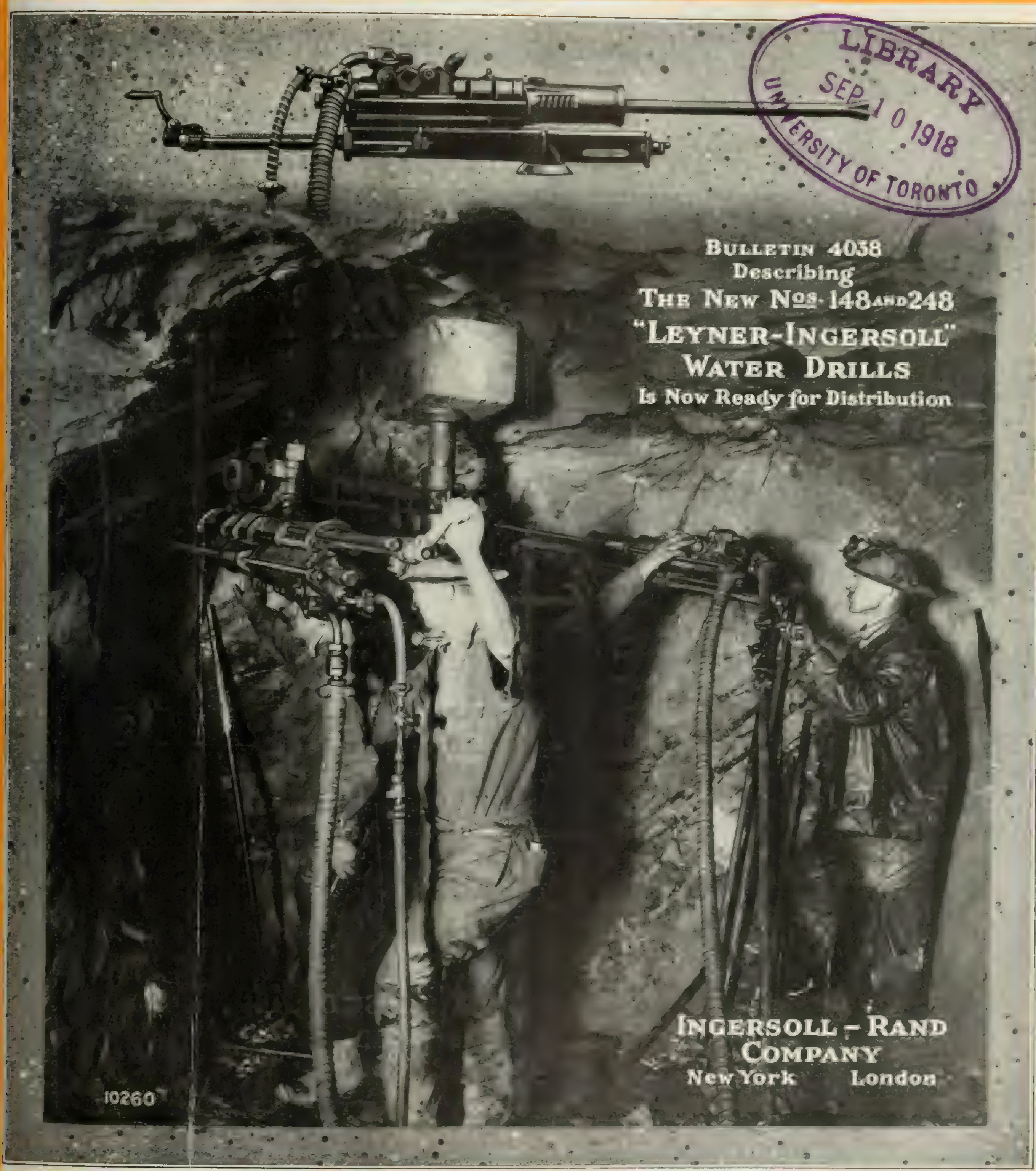

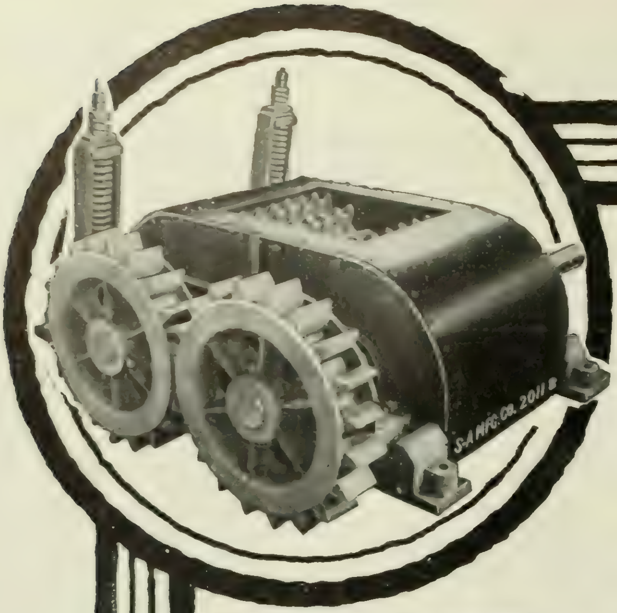

S-A

Double Roll Crushers

Have maximum crushing action. Reinforcing webs are cast between the teeth, giving extra strength and forming a pocket into which the tooth of the opposing roll meshes. They are equipped with a toggle spring release so that there is but little danger of damage to the rolls from any kind of hard foreign substance that may get into the crusher.

These crushers are built in different sizes with capacities up to 150 tons per hour—each well designed, carefully built and strong enough to stand up under the hardest kind of service.

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Stephens-Adamson Mfg. Co.
Aurora, Ill.

Engineering and Mining Journal

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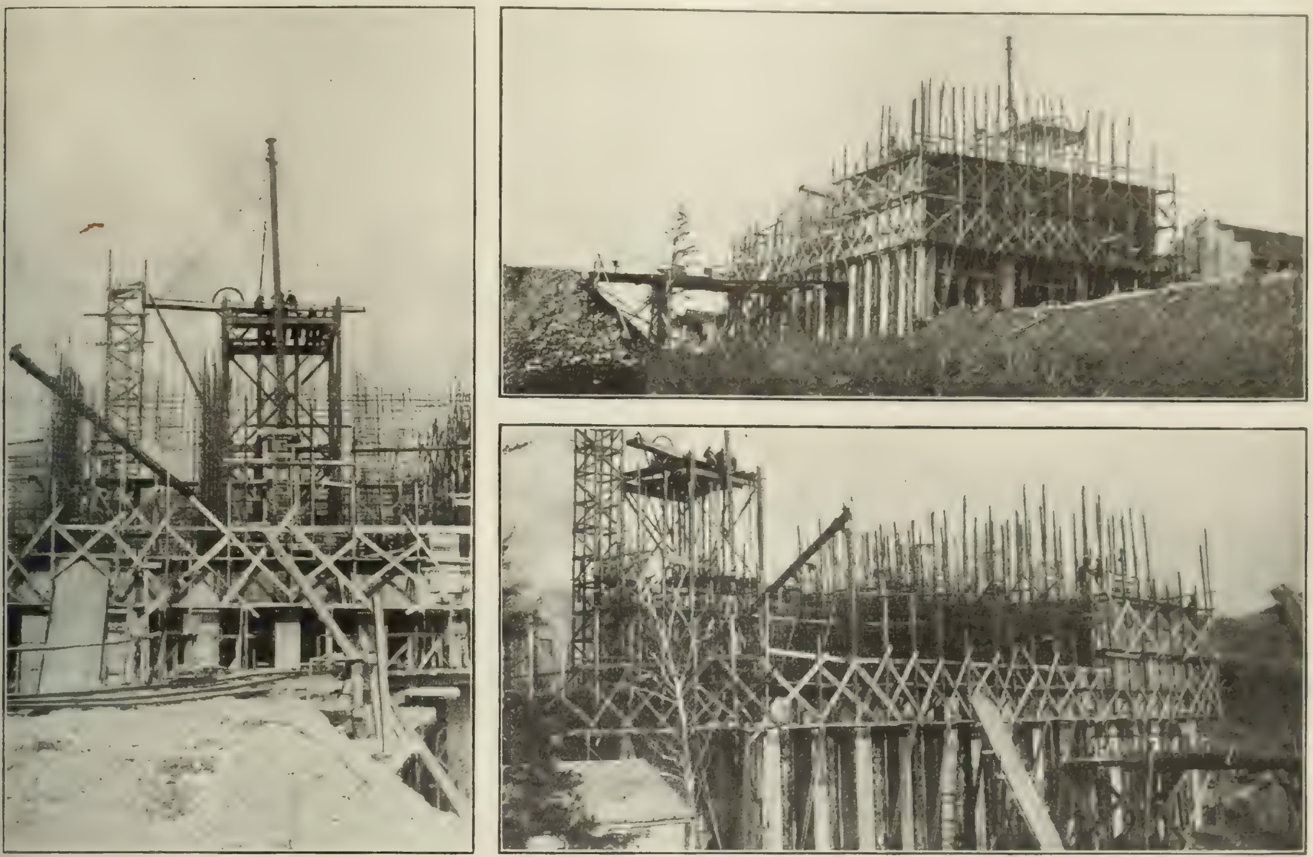
Volume 106

Number 10



FERRO-CONCRETE CONSTRUCTION AT THE PLANT OF THE ROCK SALT CORPORATION, ITHACA, NEW YORK

Salt Mining and Dressing

BY J. B. CALKINS*

Brief history of the salt industry, with a detailed account of the mining and milling operations at a property in New York State. An output of 2000 tons of prepared salt per 10-hr. day is planned, shipping facilities for double that tonnage have been provided, and there will be storage capacity for 20,000 tons. The paper presents details as to haulage, dressing and mechanical equipment.

THE production of salt is of economic importance and a sure gage of industrial and social progress. Everything eaten has its portion of salt. The stock raiser must have salt for his cattle and sheep; the packer for his meat; the chemical manufacturer for sodium hydroxide, chloride of lime, other chemicals and asphyxiating gases; the textile manufacturer requires salt for his dyes.

Some of the earliest developments in the mining industry were connected with the production of salt. History records that the Romans found the barbarians mining salt in central Europe before the Christian era. For hundreds of years the evaporation of salt from brine was unknown. It was then introduced into England and mine salt was dissolved in fresh water and then evaporated by the solar process.

Until the eighteenth century practically all the salt used in this country was imported from England. Nevertheless, as the frontier pushed westward in New York State, the settlers found that the Indians knew of a source of salt, and finally discovered that they were boiling down the water that issued from salt springs near where Syracuse is now situated. Until after the Civil War this district was practically the only salt-producing locality on the North American continent, and even then the greater proportion of the salt consumed was imported from Europe. With the introduction of the process by means of which fresh water is forced down through drill holes into the crystalline salt bed between the casing and the tubing, the dissolved salt in the form of brine returning through the tubing for evaporation, many new fields were opened, and salt plants erected. The first operated in New York State were just south of Rochester, in Wyoming and Genesee counties, and later in Tompkins, Schuyler and Oneida counties. This development was followed by the erection of plants in central Kansas, Ohio, lower Michigan and Louisiana; and the discovery of the salt deserts in the Southwest.

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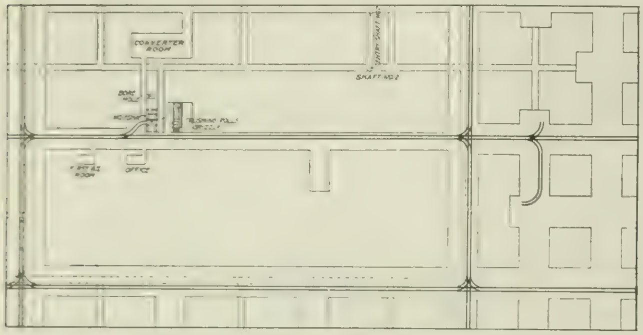
*Assistant general manager and chief engineer for the Rock Salt Corporation, Ithaca, New York.

With low initial cost and cheap fuel, the evaporation process has supplied domestic needs and a large part of the industrial business up to the present time; but with the ever-increasing costs and difficulty in getting coal (and it takes nearly a ton of coal to produce two tons of evaporated salt), mine salt is rapidly assuming a commercial status that will enable it to meet industrial needs and bids fair to encroach on the domestic trade. With this new and enlarging demand, the mine-salt industry has received a great impetus. One of the results is the opening of a new mine by the Rock Salt Corporation, near Ithaca, N. Y.

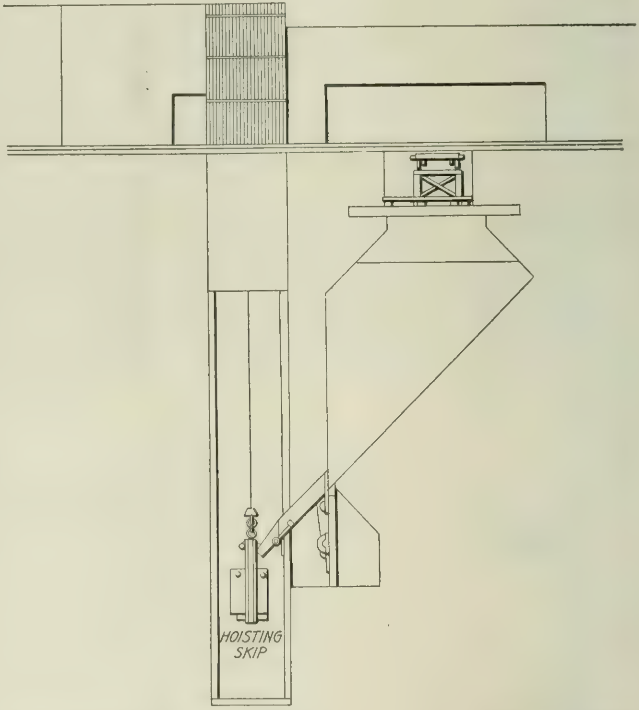


LAYOUT AT FOOT OF SHAFT

Salt beds in the East are generally fairly regular in their geological features and consist of horizontal strata from 10 to 50 ft. thick, with possibly a slight pitch to the southward. Nevertheless, where this corporation has sunk its shaft rather unusual conditions are found. In exploration, drillings were made about a mile on either side of the shaft site, and salt was found about 1400 and 1500 ft. from the surface, respectively; also water at about 1000 and 1100 ft. The shaft itself is situated between these two drill holes, and, although only 100 ft. from the shore of Cayuga Lake, is practically dry. What is more remarkable, instead of striking the usual 50 ft. of salt at the average depth of 1450 ft., it was found at 1365 ft. and consisted of an upper bed of 12 ft., then 41 ft. of mixed shale and salt in the middle, and 97 ft. of clear crystalline salt at the bottom, comprising one of the finest salt beds ever developed. The company contemplates working the lower 97-ft. bed.

After a thorough exploration, the company purchased title or mining rights on about 650 acres of land, including a mile front on the lake; and in July, 1916, began work on the shaft and breaker. The shaft is 9 x 21 ft. inside the timbers, and is divided into five compartments, namely, two skip roads 9 ft. x 5 ft. 8 in. each, one-man cage road 5 x 5 ft., an air way 4 x 5 ft., and a ladder way 3 x 9 ft., partitioned off between the skip roads and the remainder of the shaft to give up- and down-cast ventilation. The shaft is timbered throughout with 10 x 12-in. white oak sets placed on 6-ft. centers and lagged with 2-in. oak plank.

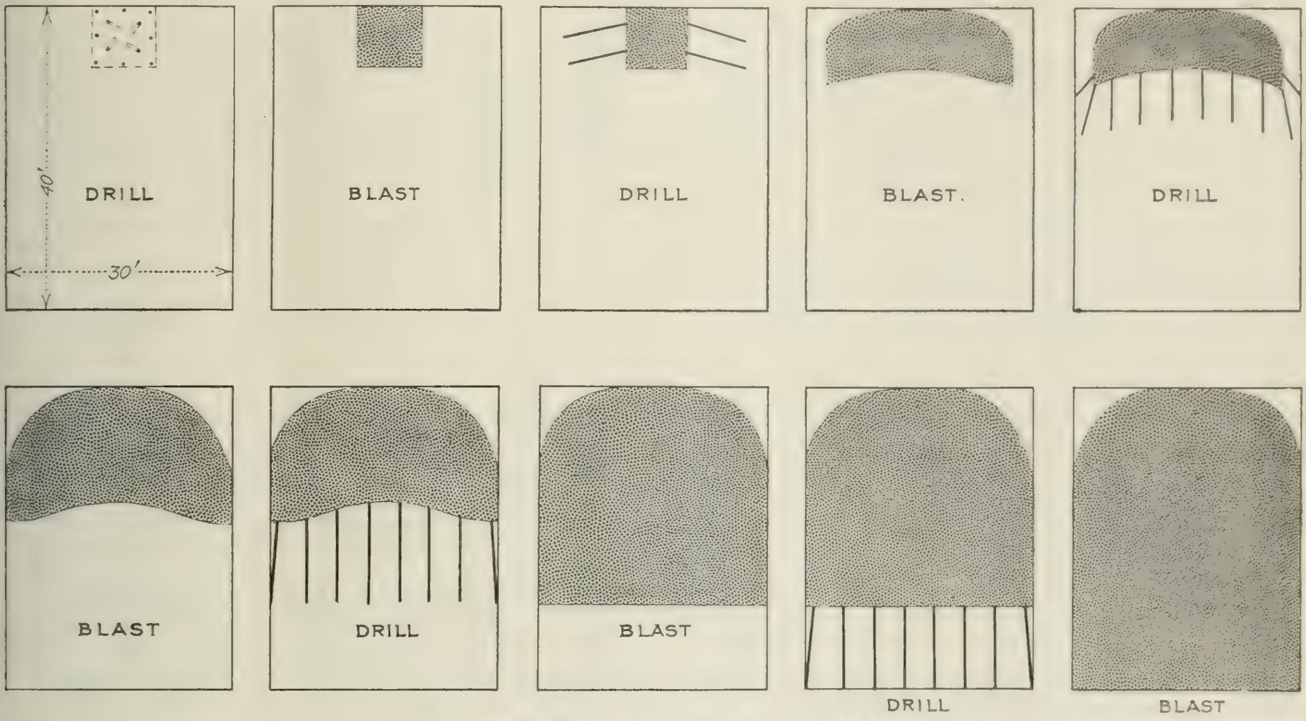
The actual shaft sinking was started early in September, 1916, with a 65-ft. wood headframe, a 12-in. x 18-in. single 5-ft.-drum Lambert hoist, and a 1100 cu.ft. per min. Ingersoll-Rand imperial-type compressor. Three shifts, each of 13 men, worked below ground. Bed rock was encountered at about 12 ft., but the concrete shaft collar was extended to a depth of 36 ft. and the work carried forward at the rate of about 100 ft. per month through comparatively easy-working shale rock to a depth of 840 ft., where a seam of carboniferous shale was reached, and with it a big flow of methane gas. The natural ventilation was not sufficient to take care of the large volume of gas encountered, so work at the bottom had to be suspended in July, 1917, while a 20-in. steel pipe was lowered down the shaft and a gas pump installed. In the meantime the wood headframe was replaced with the first half of a permanent steel tower; and the final double drum, single-clutched, Vulcan electric hoist set up in the newly erected drum house.



ARRANGEMENT OF CRUSHER, BIN, SKIP AND GRIZZLY

Even with the improved ventilation system, it was impossible to take care of the gas, so grouting had to be adopted. This was accomplished in the following manner: First a 7-in. churn-drill hole was put down about 12 ft. from the shaft to relieve the pressure of the gas, and then 2-in. holes were drilled every 2 ft. around the outside of the shaft (at the bottom) into the gas fissure, and successively grouted with a thin paste of cement and water. The grouting was done with a grouting gun made of a length of extra heavy 10-in. pipe with caps at both ends, bored and tapped for a

2-in. pipe. First a short length of 2-in. pipe, tapered at one end, was driven tightly into the drill hole, and the gun was connected to this by suspending it with rope and tackle in the shaft with a valve between the gun and the grout tube. Next the gun was filled with water by opening it at the top, and a bag of cement dumped in. To get a good mixture, compressed air was forced in at the bottom of the gun and allowed to bubble up. When everything was ready to force the charge, the cap at the top was replaced and the 2-in. pipe connected to the water pipe leading down the shaft, and the gate valves in both the grout and the water line were opened. In this way the grout was forced in with the 300-lb. pump pressure at the surface, plus the static head of the water column down the shaft, giving a total pressure of about 700 lb. The valve at the bottom of the gun used for admitting compressed air for mixing the paste served a double purpose, for, while the grout was being forced in, this valve was left slightly open to indicate, by the presence of clear water, when the whole charge had been delivered. When completed, the valve in the grout tube was closed, so as to hold the charge in, and the gun moved over to the next tube.



SYSTEM FOR WORKING OUT GANGWAYS

By grouting about forty holes the gas was effectively isolated and shaft sinking continued without further difficulty. The effectiveness of the operation was admirably illustrated when the shaft was cut through the gas-bearing fissure, which was found completely filled with concrete across the entire section. The cement must have penetrated at least 12 ft. beyond the shaft, for it came out into the churn-drill hole and set so hard that the hole had to be reamed out before it could be carried down. Following about 80 ft. of carboniferous shale, which was really a low grade of coal (about 50% carbon), hard limestone was encountered, and the jackhamers for drilling had to be replaced with Leyner drills. On Jan. 1, 1918, the shaft had reached a depth of 1150 feet.

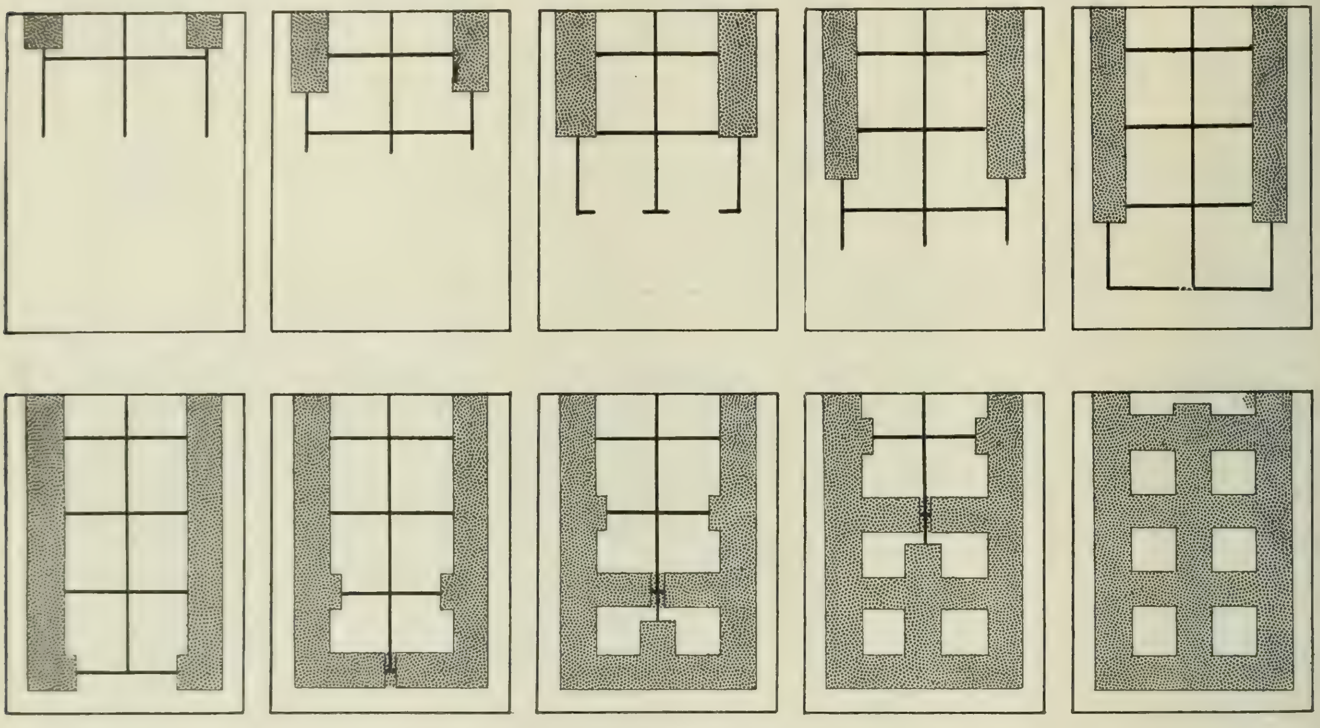
With regard to outside developments, it may be added that in the autumn of 1916 the company erected a 40 x 60 ft. stucco-tile repair shop, and equipped it with lathe, shaper, pipe machine, drill presses, grinders, and drill sharpener. This was followed by the erection of a 30-room boarding house and a well-equipped "dry" for the miners; also a large, double tenant house. The following spring a drum house was erected similar in size and construction to the repair shop, and grading was started for railroad tracks and the reinforced breaker building. During the latter part of last summer the foundations for the breaker building were laid, and at the first of the year it was nearly half finished. The breaker building will be of fire-proof, reinforced-concrete construction throughout, and will cover an area 90 x 120 ft, the average height being about 100 ft. The steel headframe is incorporated with the breaker and has a total height of 150 ft. Three loading switches will be carried under the breaker for loading bulk salt and one switch along the east side for package salt. With this arrangement the company hopes to be able to load from 60 to 100 cars per day. The breaker building incorporates not only the crushing and screening machinery but also storage for 20,000 tons of prepared sizes of salt.

The character and nature of the salt deposit offer unusually favorable features for large-scale mining; for it is not only homogeneous, but can be mined in large chambers without timbering. With this in view, the company has purchased a large electrically operated Thew shovel, with a 1½-yd. dipper for loading the salt into the cars after it has been blasted from the face. There is also a smaller shovel of the same type, which is being used on the surface at present, but which will be sent underground when the mine is opened. Mechanical-shovel operation has led to the development of a rather original system of mining, so as to work out large gangways and at the same time get adequate ventilation, especially after blasts. The entire output of the mine depends upon one or two large shovels, which will necessarily have to stand idle while powder gases are clearing from the workings. The system contemplated calls for taking out 40% of the salt in gangways 30 ft. wide and 40 ft. high, the remainder being left in the form of square columns 40 x 40 ft. for roof support.

To open the working face, an 8 x 8 ft. tunnel is driven ahead of the gangway, and later enlarged crescent shaped so as to open a regular bench system of quarry blasting, and also form an arched roof which can be readily trimmed without the use of stagings. Jackhamers can be employed to drill vertical holes 4 or 5 ft. from the face, and the salt blasted down directly in front of the shovel. This 8 x 8 ft. drift or tunnel serves a secondary purpose as a means of ventilation. The gangways are started 140 ft. apart, with an 8 x 8 ft. ventilation drift half way between them, which is connected with the down-cast part of the shaft. Every 70 ft., cross drifts are carried out at right angles to this ventilation tunnel, until they meet the drifts ahead of the gangways. Thus fresh air is carried from the ventilation fan down the shaft, through the center tunnel between the gangways, across to the drifts ahead of the gangways, and thence back directly into the working face. The foul air ahead is driven through the mine workings and up the shaft. As each succeeding cross drift is completed, the previously used one is bratticed up so as to force the air around through the new drift, thus always keeping it coming in from the front of the working face, instead of along the side.

When a gangway is completed as far as the property line, work is started on the last cross drift, and, when this is completed, back on the center air tunnel. This does not affect the ventilation system, for the fresh air is still coming directly into the face of the working; but it does reclaim the drifts, which have thus far been used only as a means of ventilation. It also possesses the advantage of a robbing-back system in which the men are always working under the heavily supported portions, instead of where the full amount of salt has been worked out. When completed, all the airways have been used as a means of working out a quarry face, and nothing is left but 40 x 40 ft. salt columns to support the roof.

The salt, after being blasted down from the working face, is shoveled into 6-ton dump-bottom cars, and hauled by electric locomotives to the foot of the shaft, where it is dumped on a grizzly. The oversize passes through a pair of 40 x 36-in. crushing rolls, which reduce the product to 4 in., and is stored in a 5000-ton skip pocket beneath. Thence it is spouted into 5-ton self-dumping skips and hoisted to the surface, where it goes through the breaker. Here it is reduced to 1 in. and screened for the four commercial grades—⅜ in., ¼ in., ⅛ in., and common fine. The oversize passes through another set of crushing rolls, which reduce it to ⅜ in., and over a second set of shaking screens. The entire breaker equipment is laid out in duplicate, and, with the exception of the distribution over the bins, the material is carried through by gravity.



PILLAR AND BLOCK SYSTEM OF MINING SALT

The hoisting equipment consists of a double drum 7 ft. diam. 4 ft. face single-clutched Vulcan hoist, equipped for shaft sinking, with double reduction gearing, and driven by a 100 hp. 550-volt alternating-current motor. With the completion of the shaft, the second set of reduction gears will be removed and the 100 hp. motor replaced with a magnetically controlled 500 hp. 2200-volt alternating-current motor. The hoist is equipped with automatic air brakes and all the latest safety devices for the prevention of overwind, overspeed, and reversal in case of failure of power. The 100 hp. motor taken from the Vulcan hoist will be used to convert the Lambert steam hoist, on the man cage, to an electric hoist; but the steam rigging will be kept intact and boilers will be kept ready, so that the men can be taken out of of the mine in case of failure of the electric current.

Power is purchased from the Cayuga Power Corporation, received under a potential of 11,000 volts and transformed to 2200 for the large hoist and 550 for the smaller motors. Electric service for the mine will be carried down the bore hole as 550-volt, alternating current, and converted into 250-volt, direct current, at a substation below ground. All electrical equipment has been furnished by the General Electric Company.

The ultimate capacity of the plant will be 2000 tons of prepared sizes of salt per 10-hr. day, and it will have shipping capacity for twice that amount. Shipments may be made either in bulk or package, and by freight or water via New York State barge canal. The erection of the plant is under the general supervision of M. E. Calkins, A. S. M. E.; engineering design and purchasing, J. B. Calkins, M. E.; concrete construction, Alexander Shumway & Utz Co.; and steel work, Seneca Engineering Company.

Manganese Mining in the Magdalena Mining District, New Mexico

By R. H. West*

The Magdalena Mountains of New Mexico are being prospected for manganese, and shipments have been made recently to the East by the Water Canyon Manganese Co., a local corporation, which has a manganese property in Water Canyon and offices in New York. The mine is situated 300 ft. up the east side of the canyon and is reached by wagon road. Entry to the mine is by tunnel, 125 ft. below the top of the canyon, which cuts a rhyolite flow that extends through four claims. The mine is equipped with track, cars and bins, and the principal ore produced is wad, an average sample of which runs 43% metallic manganese, 5.1% silica, with 0.025% phosphorus, the material making an ideal furnace ore. The wad is fine in texture and is shipped in canvas sacks, which average about 53 lb. each. At other mines in the district the ore is principally pyrolusite.

The workings from which the wad is mined show the mineral to be the filling of a natural cave, occurring in an extensive fractured zone in the rhyolite. The cave is 52 ft. across, 75 ft. high and 56 ft. long; and 28 cars of over 40% manganese have already been shipped. There is no waste to handle, no blasting is required, and the wad, after being dug out and shoveled into cars, is trammed to the bins for sacking. Cracks and fissures, varying in size from a few inches to three and four feet wide, extend in several directions from the cave, and in following these undoubtedly other caves will be encountered.

In prospecting the property, the locator followed the outcrop on an incline and struck the cave at about 18 ft. The soft, sooty material was not identified by him, so he threw it on the dump and was ready to quit before he was enlightened as to the value of the wad. After drifting 50 ft. in wad, he started a tunnel 80 ft. below the outcrop and to the south of the cave, ran east 50 ft., then turned north and struck the lower floor of the cave in 40 ft. This made it possible to remove the ore without hoisting and also open up bodies of milling ore. The headings and drifts are all in a fractured zone which shows mineralization, the milling ore running 20% metallic manganese, the remainder being silica and barium carbonate. The main drift on this level is over 150 ft. long, and three headings have been driven 50 ft. west, and raises 65 ft. high have been put up. Little work has been done to the east, although the east side of the main drift shows the fractured formation thickly coated with manganese. On the main level and east of the cave a 50-ft. winze has been sunk and shows the same conditions as the drift. The two drifts at the bottom, one going west and the other south, show evidences of other caves, especially as the manganese is of the wad character.

Extensive milling tests have been made of the low-grade ore, and experiments are being conducted to determine the best method of separation. Though there is an abundance of water on the claims, the experiments and tests show that the ore can be most efficiently concentrated by a magnetic process, although the manganese is of low magnetic quality. The Magdalena range is worthy of more attention, for it extends over 100 miles, with manganese showing in many places.

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*Mining engineer, Carthage, New Mexico.

China's Effort To Combat Shortage of Silver

The scarcity of silver has been the subject of negotiations between the Chinese General Chamber of Commerce and the Shanghai General Chamber of Commerce, states a consular report. The foreign banks were of the opinion that there need be no anxiety, as the local holdings of silver on Feb. 13, 1917, were 22,000,000 taels and 15,000,000 Mexican pesos, and assured the native merchants that nothing will be done that will injure the local money market, and that no efflux of silver from China will take place, if the Chinese themselves will refrain from gambling on exchange.

New coins of 50, 20, and 10c. denominations were reported to have been put into circulation during the year, and they were to be accepted by all government offices at their full value, no discount being allowed. They were to be distributed through the Bank of China for circulation in Chihli, Shantung, and Honan, but should be accepted anywhere in China. They were, however, not seen to any extent in Shanghai, and it is doubtful whether the local exchange shops would accept them, as it would practically do away with their means of livelihood. In this connection it may be stated that for one Mexican peso the exchange is generally 112 to 114c. small coin in Shanghai.

A petition was submitted to the Taoyin of Shanghai and the Special Envoy for Foreign Affairs in May, requesting that an embargo be placed on the export of silver, as the continual outward shipment of silver seriously affected the tea and silk trades. It also requested that the mint at Nanking should turn out more silver dollars, and suggested that at least $4,200,000 should be minted at once, monthly, so that by the beginning of July the merchants would have enough silver to make their purchases.

The Blast-Furnace Charge at the Bunker Hill Smeltery*

BY C. T. RICE

This paper, the second article of the series, describes the composition of the charge and the handling of the various materials comprising it. A detailed description of the sampling plant and method of operation is followed by an account of the mechanical contrivances installed and other provisions made to insure accurate proportioning.

AN IMPORTANT change in the operation of the Bunker Hill smeltery resulted from the decision to obtain limestone for flux from a quarry opened by the company near the plant, and not to buy it already crushed from the source originally contemplated. As considerably more coarse ore has been received at the works than was anticipated, and as the matte return has been higher than it would have been if Bunker Hill & Sullivan low-zinc concentrates were the main source of the lead, a crushing and screening plant for breaking down the limestone is being installed alongside the sampling mill; and this will also serve for the coarse breaking of crude ore and matte before it goes to the sampling mill.

The material now treated at the Bunker Hill smeltery consists mainly of concentrates from the Bunker Hill and the Hecla mills, but some crude ore comes from the Hecla, as well as from the Sierra Nevada and the Caledonia mines. The supply is practically all sulphide ore or concentrates, and so has to be roasted. Oxidized ore, amounting to from 10 to 15% of the total, is received from the Caledonia mine. All ores, limestone, and coke for the smeltery are delivered at the top of the plant, where the supply warehouse is placed. The receiving bins are under the main tracks and alongside the primary ore bins in the gulch to the east of the works and at the top of the sampling mill. (See Fig. 1.) There are four receiving and eight primary ore bins, all of wood, and having a capacity of 250 tons each. At present the coke used at the plant comes from Utah. The current supply of ore is dumped into wooden bins on the west side of the

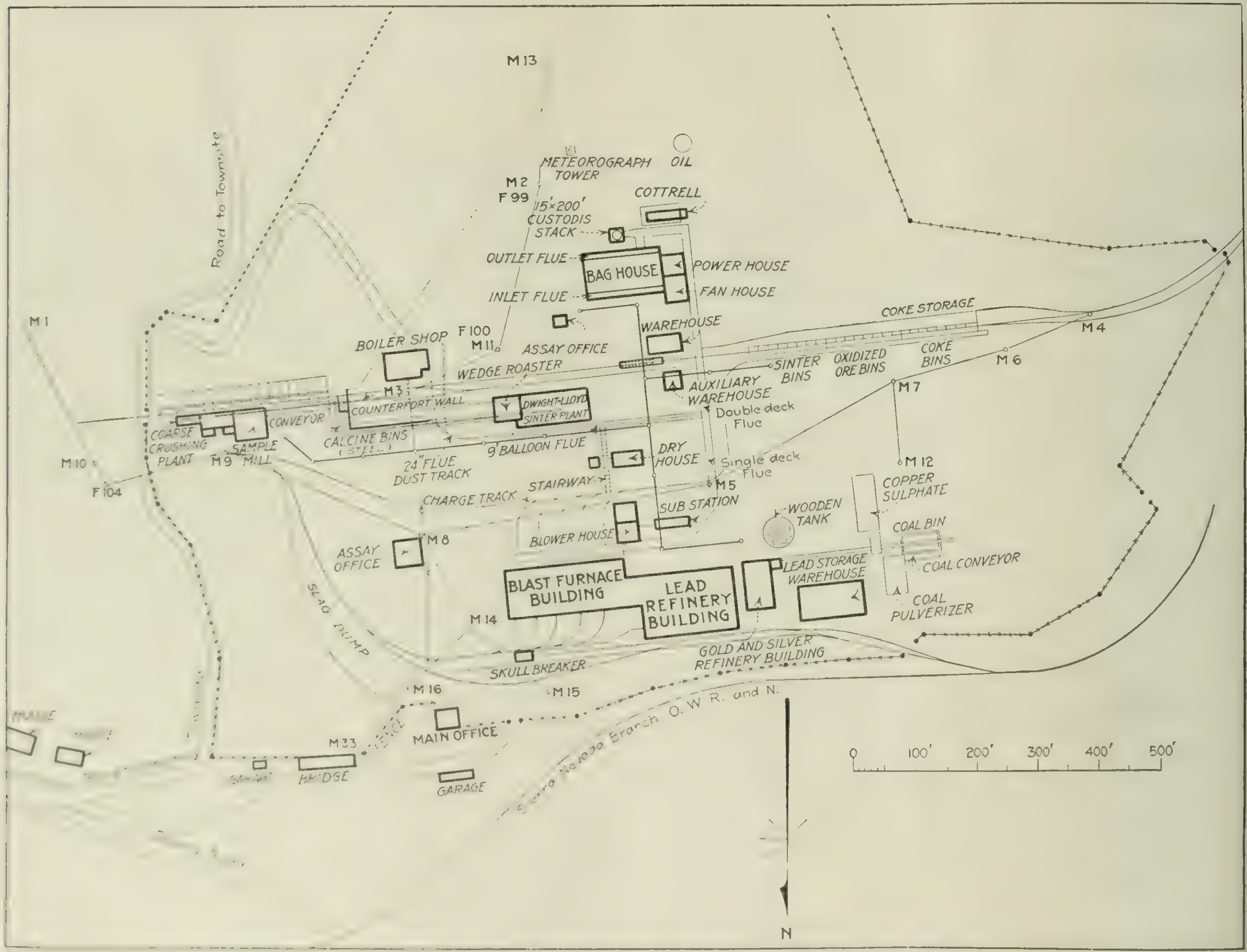

FIG. 1. ARRANGEMENT OF BUNKER HILL SMELTERY AND REFINERY

plant, where the blast-furnace charge is made up. The lime rock, which comes from the company's quarry near Ione, Wash., 200 miles from the plant, is also stored there. The necessity for procuring barren limestone for flux is one of the unavoidable drawbacks of the site, for the ores of the district contain practically no lime. As no ores with limestone gangue have been developed in nearby territory, this handicap will probably be a permanent one. Pyrite-magnetite gold concentrates come from the Alaska-Juneau mine, in Alaska; and these, together with old scrap iron from the mine and mill, contribute a considerable part of the iron needed as flux in the charge, although by far the greater part of the iron comes from Bunker Hill jig middlings, which material ranges in size from 15 mm. down, and so helps in keeping the sinter porous on the Dwight & Lloyd machines.

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*The second of the series of articles on the design and operation of the Bunker Hill & Sullivan Smelting and Refining plant which began in the July 13 issue.

The ore as it comes to the plant is unloaded into one of four receiving bins, and from there goes to the sampling mill. Each bin has two mouths, closed with slats above and arc gates below. From the bins the ore is fed to a conveyor belt by a traveling apron feeder of rather novel design, which will be described more fully on another occasion. This conveyor is stopped and started by a switch from alongside the crusher, and by varying the throw on an eccentric the speed of feed is changed. It is, therefore, possible for one man to feed the ore from the receiving bins, and also to attend to the crusher.

SAMPLING THE ORE

From the crusher, which is of the Blake type and breaks to 1½ in., the ore is elevated to the top of the plant, where, if it is oxidized, it is sent to the first Vezin sampler, which takes out a one-tenth cut. The sample goes down through the other samplers, just as in the case of sulphide ore, but the rejects from this first sampler go to an elevator, which discharges to a conveyor belt. This belt then takes the oxidized ore without further crushing to a car on the tracks outside, whence it is switched to the charge bins on the other side of the plant.

The sulphide ores are by-passed around this first sampler and go, instead, to a 4-mm. trommel, the oversize from which, after being crushed in rolls, is reëlevated to the same trommel, so that the circuit is closed. As the undersize discharges from the chute lips of this trommel, a Vezin sampler takes out a one-twentieth cut. The reject from this sampler is elevated to a conveyor belt and discharged by a Stephens-Adamson tripper into the primary ore bin selected to receive that shipment. The first twentieth cut then goes to sample rolls that crush to ⅛ in. From this pair of rolls the sample is fed by shaking feeder to another Vezin sampler that takes a one-twentieth cut. The reject from this sampling also goes to the conveyor belt and is taken to the primary bin to which the shipment is being sent; and the sample is reduced in bulk by being passed through Jones splits and then taken to the bucking room of the assay office for final crushing.

More coarse ore and matte has to be crushed at present in the sampling mill than was originally intended. An 18 x 30-in. crusher is therefore being installed just east of the sampling mill to do the preliminary breaking before the ore is taken by bucket elevator to the sampling mill. In this way the burden now thrown on the sampling mill will be relieved.

The success of any smelting operation depends largely upon the way in which the different ores are mixed at each step in the process. The mixing of the roaster charge at the Bunker Hill smeltery is accomplished in a somewhat similar manner as at the Tooele and the Northport smelteries, except that it is done more systematically and with better mechanical development of the same general scheme. The first mixing of the ores and calcines takes place on the conveyors in front of the primary and calcine bins. The roaster charge then gets a thorough mixing in the hoppers and pug mills of the Dwight & Lloyd machines; but previously, the high-sulphur ore and matte receive a preliminary mix as they are being fed over the conveyor system to the Wedge furnace for a preliminary roast.

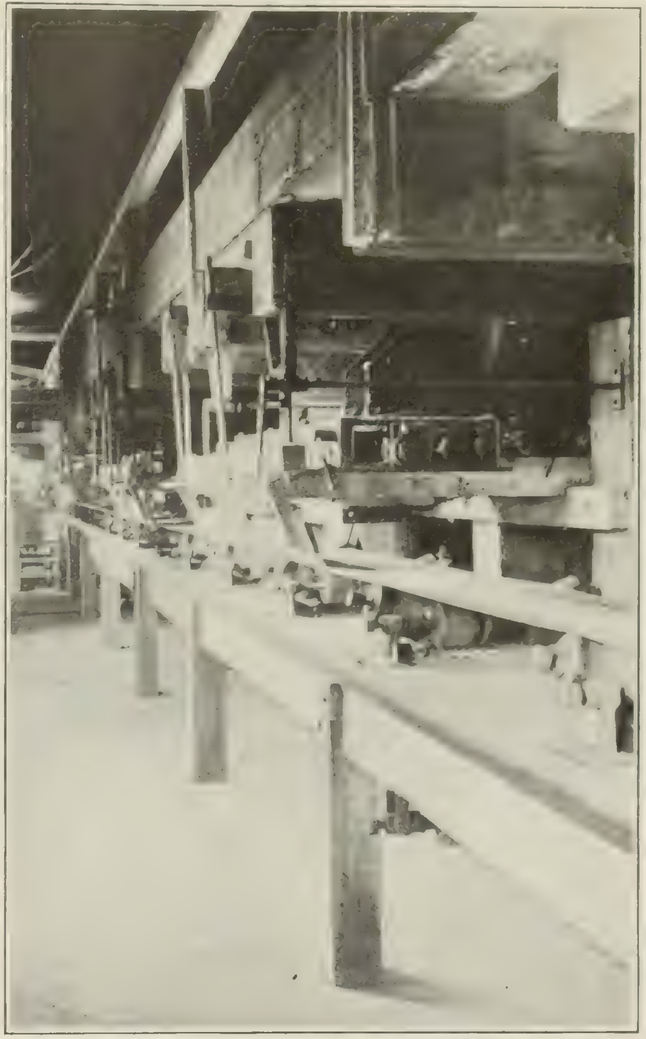
FIG. 2. BELT FEEDERS AT PRIMARY ORE BINS

Finally, at the secondary bins, a thorough mixing of the blast-furnace feed is obtained while the various parts of the charge are being weighed out and bedded in the hopper of the charge cars. In this way a well-mixed and easily variable charge is obtained for the blast furnaces with a minimum of labor. As wages will probably remain higher than at other plants, such as at Salt Lake City, where a supply of smeltery labor is always available, any saving in this direction is important.

In order that the roaster charge may be proportioned accurately on the belts, it is necessary that the feeders at the different bins shall be capable of close adjustment. Each primary and calcine bin is provided with two belt feeders (see Fig. 2), one as a standby. Each feeder is driven independently by its own clutch from the feeder line shaft. The belt speed is kept constant for all feeders, and the amount of material from each bin is controlled by a handwheel and lever system which raises and lowers a vertical slidegate. As the sulphide ore is all crushed to a maximum size of 4 mm. in the sampling mill, close regulation is thus obtained.

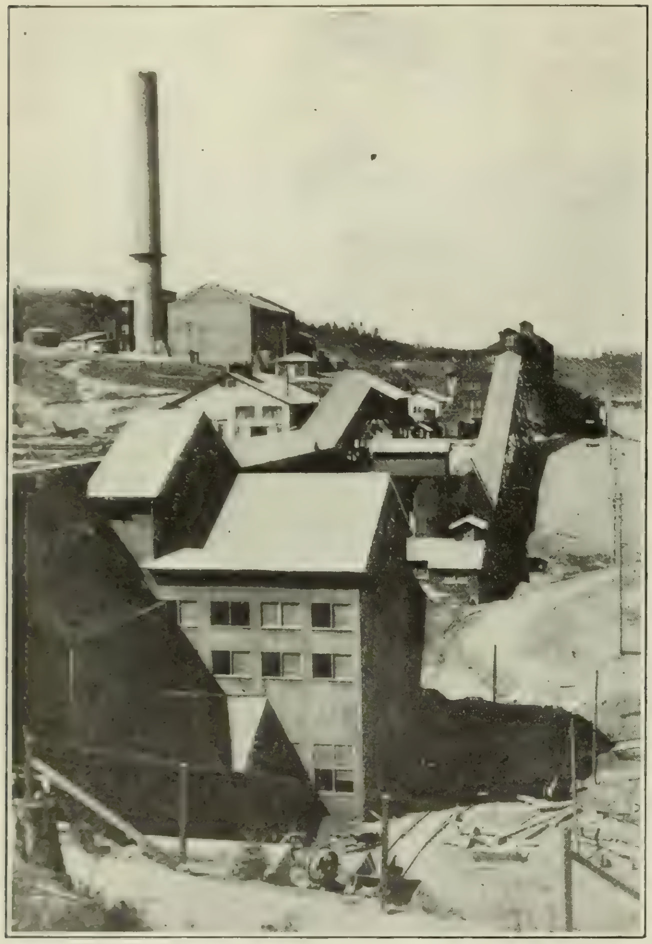

FIG. 3. SAMPLING MILL PRIMARY ORE BINS AND CALCINE BINS

The conveyor receiving the feed from the primary-ore bins delivers to a cross belt that takes the ore to the incline belt which goes to the top of the roaster building (see Fig. 3). Upon this cross belt the calcines are added to the roaster charge. These calcines are of two classes, and are stored in separate steel bins 10 ft. in diameter and 20 ft. high. The high-sulphur ores and concentrates that have been given a pre-roast in the Wedge furnace go to one tank bin. The clean-ups from around the Dwight & Lloyd machines and the different flues go to the other. Each bin is served with two belt feeders, similar in design to those used at the other bins, except that a longer and stronger lever is needed in order to enable the control screws to be placed over the discharge end of the feed belt. The adjustment screws should be arranged so that they can be operated from alongside the conveyor, both at the ore bins and the calcine bins, in order that the quantity of feed which comes from each bin can be easily and quickly changed. In setting these feeders so that they will take the exact amount of ore and calcines needed, the discharge from each belt feeder is caught in a box and weighed on a small platform scale. To enable the setting to be done easily and conveniently by one man, the unit selected in determining the different bin discharges is 20 lb. of feed to the belt in 15 seconds. Even when several units must be fed to the belt the weight of sample is small enough to be handled conveniently by one man. The analysis of the contents of the various ore and calcine bins being known, the charge sent to the roasters is easily fixed by determining the number of unitary quantities of feed to be taken from the various bins. As the roaster charge is revolved twice before it reaches the main incline conveyor, it is well mixed by the time it comes to the hoppers. The charge is weighed by a Merrick automatic belt scale en route.

Mexico Modifies Rules on Payment Of Overdue Mine Taxes

Ambassador Fletcher has recently transmitted a copy of a Mexican decree of July 19, published in the *Diario Oficial* of July 26, making certain modifications in the requirements for the payment of overdue taxes on Mexican mining property, according to *Commerce Reports*. The purpose of the present decree is to amend the decree of Apr. 26, one article of which provided that back taxes would be collected in installments of one-third, beginning with the second four-month period of 1918, at the same time as the current taxes. Failure to make the required payments would result in cancellation of the concession.

In place of the collection of one-third of the arrears, a new schedule is published providing for payments of smaller proportions varying according to the number of tercios (four-month periods) for which the taxes are due. The arrears of longest standing are subject to the smallest percentage of payment. The schedule follows: On three to five tercios, 25%; on six to eight tercios, 20%; on nine to eleven tercios, 15%; on twelve to fourteen tercios, 10%; and on fifteen tercios and over 5 per cent.

Further requirements are that payments for the current tercio, with the required surcharge, be made before Sept. 1, and that the mining claims to which the payments apply be actually worked before Dec. 31, 1918. Proof of compliance with this ruling must be submitted to the Treasury Department, supported by affidavit from the local authorities and confirmed by the Department of Industry, Commerce and Labor.

Mexican Currency.—It is proposed to authorize the circulation of American gold and silver as legal tender in the states of Sonora and Sinaloa until such time as the old mint at Culiacan, capital of the latter state, can be put into operation, states the *Mining Journal*. The plant is now in preparation, and the bullion produced in the rich mines of that portion of the republic will be coined and put into circulation with as little delay as possible.

The Position of the Quicksilver Producers In California

Quicksilver producers and miners in California appeared at a conference held in San Francisco on June 26 before U. S. Tariff Commissioner William S. Culbertson and Guy C. Riddell, the consulting metallurgical engineer of the commission. The meeting was attended by 41 representatives of quicksilver producers, allied industries and Government bureaus. H. W. Gould, general superintendent of the New Idria Quicksilver Mining Co. and the Sulphur Bank Association, was spokesman for the quicksilver producers represented. The conference, which assumed a discursive form, was participated in by Edmund Jussen, of the New Almaden; Murray Inness, of Oceanic and Oat Hill; H. C. Davey, of Guadalupe; Earl B. Crane, of Black Butte; Clifford G. Dennis, of St. Johns and Nevada Mercury; Andrew Rocca, Jr., of the Great Western Mercury Co.; Dr. H. L. Duschak, of the U. S. Bureau of Mines; F. L. Ransome, of the U. S. Geological Survey, and Walter W. Bradley, of the California State Mining Bureau. The report that follows is substantially in the language of Mr. Gould and includes answers to questions and important suggestions made by those present. The position taken by the producers was that an adequate tariff on quicksilver importations is vital if domestic production is to be maintained. Very low-grade ores and increase in operating costs are the two factors that make the future of quicksilver mining uncertain.

AT AN informal meeting of quicksilver producers I was asked to present to the conference the necessity for a tariff on quicksilver after the war and to state the amount that would be necessary to protect the industry—assuming that our costs remain as they are at the present; and it is hardly possible they will be as low. But, assuming that the post-war costs are the same as now, it is the opinion of the majority of the producers represented here that a protective tariff of at least $35 a flask, in addition to the present 10% *ad valorem*, will be necessary to protect the American producer from foreign competition and to keep the production where it is today. This does not mean that some companies cannot otherwise work at a profit. Some of them will drag along for a long time, providing the operating costs are reduced and the price of quicksilver does not come down as quickly. It does mean that the domestic production will fall below the low level of 1914 in California.

The estimate of a $35 tariff is based on a $70 to $75 cost per flask in this country as compared with the price at which Spain lands quicksilver in New York, or $40 a flask. Immediately after the war little decrease in the Spanish price is to be expected. What Spain can then produce it for, we do not know. But we do know that if we had their orebody over here we would produce quicksilver profitably at $10 a flask. There is no question that they can do the same, with their cheap labor. It is a question whether they will or not. According to their contract, the Rothschilds must sell quicksilver for $35 per flask and no less. The difference between $35 and $70 is the amount of protection necessary for the American producer; but this would leave him no profit at present. The Government price is now $105 per flask. What it is in the outside market I do not know. In 1914 the price was $41.

The average cost of production and net prices received during the last 10 years (1908-1917) are given in Table I. The industry continued during that period, but production was greatly reduced. The quicksilver mines will not be able to produce after the war at these or any other prices near them, on account of the added cost of production and because the mines will have been depleted during the period of the war.

TABLE I.—AVERAGE CALIFORNIA COST OF PRODUCTION AND NET PRICES RECEIVED FOR QUICKSILVER, 1908-1917

Year	Cost, Per Flask	Selling Price, Per Flask
1908	$25.91	$40.42
1909	27.53	40.04
1910	25.58	43.29
1911	26.53	41.65
1912	31.64	38.69
1913	30.72	36.58
1914	51.96	41.00
1915	55.51	74.21
1916	47.50	89.54
1917	68.66	92.70

It is hardly necessary to review the history of the quicksilver industry prior to the outbreak of the European war, although it is well known that the United States dropped from the leading producer of the world in 1904 to a poor fourth in 1914, and were it not for the war the industry would probably now be defunct, as our low-grade ores could not be expected to compete with the high-grade ores and cheap labor of Spain, Italy and Austria. With the advent of the war, the advance in the price of the metal stimulated production, which in 1917 reached a total more than twice that of 1914. This took place in spite of wide price fluctuations that discouraged producers from prospecting.

Probably over 90% of this increased production was made from mines that were in operation before the war and a few new mines and prospects that have been opened since. Very few of the quicksilver mining companies launched since 1914 have been financially successful. The increased production has been made from a gradually diminishing grade of ore and at a continually increasing cost. The present cost of $70 to $75 per flask is still increasing at an alarming rate.

The Tariff Commission has probably at hand an article written by Dr. Ranier in 1914, and describing the status of the quicksilver industry in Europe at that time. The Almaden mines, in Spain, owned by the government, were at that time producing quicksilver from 11% ore at a cost of less than $16 per flask. The mines were operated from October to May each year, and by the crudest methods produced 30,000 to 42,000 flasks per year.

The contract of the Spanish government, sole owner of the Almaden mines, with the Rothschilds dates from Jan. 1, 1912, and is effective for 10 years. Of the total annual production, 500 flasks are reserved for the national industries of Spain. All other production is included in the contract. The contractor binds himself to sell, in London, the greatest possible amount of mercury, at a price exceeding £7 per flask. In return he receives a commission of 1.25% of the net value of the sales; 6s. for each flask transported to London, and 10% of the sales price above £8 2s. on any sales above this price. This information was obtained in a personal communication from Señor Don Manuel Albacete, sub-director of the Almaden mine.

According to this, the world prices are not fixed. The London market is considered the standard; but the prices on that market affect the American price only in proportion to the imports. I do not know, and do not think any one else can state positively, whether any of the Italian product reaches London. Early in 1916, during the high prices caused by the shortage of metal in this country, much quicksilver was imported from Italy and some from London. Prior to the war the Italian quicksilver mines were controlled by Germans. Whether most of the quicksilver went to Germany is not known, nor is it known what has happened to those mines since the outbreak of the war. We know that the metallurgical methods in Italy and Austria were far ahead of ours at the beginning of the war. And we understand that in Austria, as in Spain, the mines were worked directly by the government, and the industry was fostered in every way. The methods of production both in Italy and Austria were efficient. In Spain they were very inefficient, but they had high-grade ore there, which, on account of cheap labor, was worked at a low cost in spite of the crudest of methods. The furnaces used at the Almaden mines were invented in Peru in 1634 and introduced into Spain in 1646. The original furnace erected in 1646 at Almaden was in operation in August, 1914.

This indicates that their cost of production must have been relatively high, but even with these inefficient methods they were producing at a cost of less than $16 a flask prior to the war. It also shows how much lower in cost they could have produced quicksilver with greater efficiency in their operations. Besides that, Dr. Ranier, in describing the orebodies, states that ore has been developed that will produce an annual output of 1000 tons of quicksilver for 40 years. This is equivalent to 30,000 of our 75-lb. flasks per year for 40 years. The Almaden mines have been producing for more than 2000 years. The deposits are apparently inexhaustible. Dr. Ranier says that the orebodies are better at the present depth than in previous years at places nearer the surface. The main orebody has an average assay value of 14 to 15% mercury, and the two northerly orebodies, which are not so large, carry a lower grade of ore, the assay indicating as low as 2.5% mercury. I do not think there is a gentleman in the room that knows what 2.5% ore is. I am sure I do not. The Spanish production during recent years has equalled 11% mercury recovery.

In comparing the European mines with the American mines prior to the war, the average mercury content of the Spanish ore was 11%; Italian ore, 1.0%; Austrian, 0.85%. In America the probable average was 0.40%. The Austrian ore is about twice our grade and the Italian a little more than twice. To put it another way, the Italian and the Austrian ores contain about 17 lb. mercury per ton, against about the 6- or 8-lb. content of the ores of the United States. In Italy, although the average ore is about 1%, operators have large orebodies that average 30%, and most of their production comes from the high-grade ores.

Dr. Ranier gives no cost-per-flask figures for Italy or Austria. Although the ore in these countries is lower grade than the Spanish ores, the superior methods practiced in Italy and Austria give producers there a much lower cost than we can hope to attain in America. Though we do not know what the conditions will be in Italy and Austria after the war, it is reasonable to suppose that Spain can and will, if allowed, deliver quicksilver in the United States at less than $40 a flask. The Spanish producers have every advantage. They have large orebodies, described as being 8 to 14 m. (20 to 40 ft.) wide. There are few orebodies in this country that are being worked to that width. They have cheap transportation, cheap labor, and their timber costs are practically nil. The ore is soft enough to break well, and the walls are hard enough to be self-supporting.

The only advantage we have is in more efficient methods of reduction. There is no doubt that the stimulus of increased price in the last four years has greatly increased the production in Spain, and possibly the costs are greatly reduced. There is no reason why they should not be. Both Italy and Austria had efficient reduction methods, though we believe Italy to be in advance of Austria. The mines in both countries were operated in accordance with German methods. A new furnace was being installed in Austria in 1914 with a capacity of 140 tons a day. It was twice as large as any furnace in operation at that time and would greatly decrease operating cost. As a rule, our methods were far behind the practices in both Italy and Austria before the war.

COMPARATIVE COSTS AT NEW IDRIA MINE

The New Idria summary of comparative statements for 1914 and 1917 is presented in four tables: Table II, production and sales; III, tons treated, costs and prices; IV income and costs, and V, comparative prices of supplies.

TABLE II.—NEW IDRIA QUICKSILVER PRODUCTION AND SALES, 1914 AND 1917

	1914
Production, flasks	6,550
Sales, flasks	6,725
Average price	$41.00
Net proceeds of sales	$275,629.12
Net loss	45,010.28

	1917
Production, flasks	11.000
Sales, flasks	11,435
Net proceeds of sales	$1,059,919.55

The charge of $1.50 per ton for depletion in 1917 is decided upon in the Eastern office of this company. As I understand, it is for the depletion of the mine. I think that it is based on an assumption of 10 years' life of the property. We could charge that off in one year, and the next year probably we would not be operating. The condition of quicksilver mining in this country has been such that the feeling is that as soon as the war is ended we will be through. The depreciation charge is for new equipment and was initiated in 1916. In that year we made several new installations, and at the time started a depreciation charge, which amounted to less than $15,000, as shown in the figures for 1917. The overhead charge includes certain taxes and salaries, as well as the general expenses of the Eastern office. I think that it does not include interest on investment. The interest charge is interest on balances in the bank and overdrafts. We are not always on the right side of the ledger. In fact, being on the wrong side of the ledger is a chronic condition with a quicksilver mine.

TABLE III.—TONS TREATED, COSTS AND PRICES, 1914 AND 1917

	1914	1917
Tons treated	62,578	125,445
Flasks produced	6,550	11,000
Pounds produced per ton of ore	7.8	6.58
Cost per flask	$51.96	$68.66
Cost per ton treated	5.44	4.50
Price received per flask	41.00	92.70
Price quoted	48.31	106.30
Difference in price	7.31	13.60

Prospecting is charged to operation account. In quicksilver mining there is continual prospecting. It is not like a gold mine, where a large shaft is sunk that can be charged to the plant account. In 1914 from 25 to 33⅓% of the New Idria cost was for prospecting. Extensive prospecting has been carried on year after year. Except in long tunnels and deep shafts, this cost should be charged to operation. The condition in the quicksilver industry which justifies this charge is the nature of the deposits. The ore is found in small pockets and small orebodies, as a rule. All the mines spend a large amount each year in prospecting. Perhaps in the last year or two some of the mines spent much more than they did before the war. In our case, instead of trying to find new orebodies, we made an attempt to profitably work the low-grade ore by increasing our tonnage.

TABLE IV.—INCOME AND COSTS, 1914 AND 1917

1914		
Gross income		$298,567.57
Labor, commission, etc.	$229,499.42	
Repairs	25,741.28	
Fuel, power, light, etc.	18,443.18	
Supplies	40,893.97	
Overhead	20,000.00	343,577.85
Net loss		$45,010.28
1917		
Gross income		$1,062,778.59
Labor, commission, etc.	$363,157.94	
Repairs	49,250.06	
Fuel, power, light, etc.	35,000.00	
Supplies	165,668.50	
Depletion	188,167.50	
Interest paid	1,513.59	
Overhead	25,000.00	
Depreciation	14,344.72	847,602.31
Net profit		$215,176.28
Federal income taxes for year 1916		7,414.54
Balance		$207,761.74
Reserve for federal taxes, 1917		60,991.18
Net income, 1917		$146,770.56

TABLE V—COMPARATIVE PRICES OF SUPPLIES, 1914 AND 1917

Supplies:	1914	1917	Increase, Per Cent.
Fuel oil (f.o.b. wells) per bbl.	$ .37	$ 1.65	35
Lumber (f.o.b. cars) per M.	13.25	26.00	98
Iron and steel	....	....	85
Hardware	....	....	50
Explosives, powder, per 100 lb.	11.00	21.00	90
Manganese steel, per lb.	.10	.22½	100
Mining machinery	....	....	75
Pipe, etc.	....	....	100
Cable	....	....	85
Labor (common), per day	2.00	6.50	225

The report of the Sulphur Bank Association, submitted to the commission, shows that this property, in Lake County, was leased in May, 1917. A camp was established in July and production began in September. The production in 1917 amounted to 342 flasks, and for the first half of 1918 amounted to 660 flasks, a total of 1002 flasks. The tonnage treated in 1917 is not reported; but in the six months of 1918 the total material treated was 39,262 tons, producing 1.26 lb. mercury per ton. This is the lowest-grade ore handled in the United States, or probably in the world, at the present time. The operating account in 1917 covering the production of 342 flasks amounted to a total of $26,445.08, or a per-flask cost for operation of $77.325.

The construction account for 1917 includes the following: Construction of mill, $12,405.71; retorts, $6599.03; kiln, $2020.93; miscellaneous, $5699.07; motor truck, $4111.45; steam shovel installation, $1745; total, $32,581.19. The maintenance account for the same period was $1509, making an aggregate cost of operation, construction and maintenance of $60,535.27. Additional construction in 1918 brought the total plant investment to $71,022.90 by July 1, 1918.

The financial statement from May 9, 1917, to Jan. 31, 1918, shows quicksilver amounting to 275 flasks (on hand and unaccounted for) out of a total production of 517 flasks. The sale of 242 flasks was made for a total sum of $24,521.90, or an average price of $101.33 per flask.

The labor cost at the Sulphur Bank is probably a little lower than at the New Idria, as the large part of the cost is for steam shoveling, motor-truck hauling, etc. Labor costs are figured on tonnage of ore rather than per flask of metal produced. Taking the total costs at 100%, the cost of labor in 1917 would be about 43% of the whole. This includes superintendents and all other salaries at the mines. I have no estimate of the labor costs per flask in Spain or Italy.

CONCENTRATION AT SULPHUR BANK

The Sulphur Bank mine is equipped with a 500-ton concentrating plant. The ore is mined by steam shovel and hauled to the plant by motor truck a distance of one-fourth to one-half mile. The concentrate is roasted in two Johnson-McKay 12-pipe and one set of 5-D retorts. A rotary furnace is under construction and two more are contemplated for directly retorting the ore. The mine has large bodies of very low-grade ore containing 0.05%, or one pound of quicksilver per ton. It is capable of large production provided an expensive plant of sufficient size is installed and the price obtained for quicksilver will cover production. The present milling plant is successful as a sizing plant, and, as shown by my report to the company in February, the mill recovery ranged from 30 to 50%. The tailings are stacked and will be later roasted in a furnace. The retort plant is satisfactory as far as it goes, but it was evident from the start that a larger retort capacity would be needed.

On account of the free sulphur contained in the ore, a Scott furnace is unsatisfactory. For this reason a small rotary-kiln type of furnace was designed and is now being installed. It is probable that a larger furnace will be necessary to get results. Much depends on the rotary kiln now being tried at the New Idria and the small one at the Sulphur Bank. If these kilns are unsuccessful, we will have to improve our milling methods, retort the concentrate and repair one of the old Scott furnaces to burn the tailings and trommel reject.

The grade of the ore is better than expected, and the metallurgical problems so far are not insurmountable. The development on a large scale will depend primarily upon the operating equipment. The Sulphur Bank deposit cannot be compared to any other deposit in the country; it is entirely on the surface, and consists largely of dumps of material that had been mined years ago and then discarded as waste. It carries a large amount of sulphur. The recovery is low, amounting to 1.29 lb. per ton. The cost last year was $193 per flask, including the cost of installation and operation.

FURNACE TONNAGES AND NEW INSTALLATIONS

The largest tonnage treated in a Scott furnace, so far as I know, is about 75 tons. It can treat a larger tonnage, but we have not tested it. Few mines in this country would be able to stand a larger tonnage. Prior to the war any one who had the money to buy a Scott furnace larger than 75 tons did not have a mine that would support it. At present, on the low-grade ores, if we were sure of the price of quicksilver, we could afford to build larger installations. We are building at New Idria a larger installation of a different type of furnace, a rotary revolving furnace following in design the type used in the cement industry. We have one in operation and are building several more. It is at present regarded as promising, but time will tell. We may get a lower cost. The labor cost at least will be lower, but fuel will be high, because oil must be used. Fuel-oil prices have increased from 37c. to $1.65 per bbl., which makes a large difference between the before-the-war period and the present.

The new installations include the completion of the Idria tramway, five rotary kilns with condensing system, and electric power line and electric motors, three belt conveyor systems, and thirteen surface buildings.

FUTURE OF CONCENTRATION METHODS

I do not see any future for the concentration of quicksilver ore. I may be wrong. There have been probably 12 plants built since the war started, but of that number I think the New Idria and the Sulphur Bank are the only ones that are now running. I do not consider them a success, except that it is possible to get larger production right now if recoveries are not considered. The recovery in the concentration of quicksilver ore is low. Sometimes at the Sulphur Bank we were not making a 50% recovery. Our recoveries ranged from 30% to 50%. The concentrate can be treated in a Scott furnace by retorting a very low-grade concentrate mixed with the ore. It is so fine that we can retort only a certain amount at a certain time. We cannot retort very fine ore in a Scott furnace. In the event of successful concentration, it would not necessarily mean the adoption of retorts, but rather the adoption of a type of furnace different from the Scott.

I do not know of any high-grade ores in this country that are now inaccessible, but that would be available for mining after the war, in case prices are maintained at a profitable level. Since the war, the production has come almost entirely from the old mines. I know of few new prospects that look favorable and, so far as my knowledge goes, there is no inexhaustible supply of low-grade ore. I think the New Idria has the largest deposits of low-grade ore that are developed; whether we can work the amount of low-grade ore developed or not depends upon the price of the metal. The estimate last year showed our average ore reserves to be about 5.5 lb. per ton. At present it would be difficult to work profitably 5.5 ore. Whether there is a possibility of a permanent quicksilver industry in the United States, cannot be easily answered after examining all of the facts. So far as I know, there are no large reserves of ore that would insure production for any period of years under any circumstances. We could for a period of two or three years make even an increased production, if absolutely necessary, regardless of costs; but beyond that it would not be safe to make an estimate.

AFTER THE WAR

I do not say there will be no quicksilver production in this country after the war, but it will be small and below the 1914 level if producers receive anything like the 1914 prices. This will be due not to the 1913 tariff, but primarily to the decrease in the grades of ore in California. In 1914 the production in this state was 11,000 flasks, 6550 flasks of that amount coming from the New Idria. That company lost $45,000 in the year. During the period of the war we are going to exhaust our mines as far as possible, working them to an extent they have never been worked before. We have increased production, and high prices have warranted working the low-grade ores. After the war, if prices drop and costs do not decrease, it is easy to see where we stand, without an adequate protective tariff. The grade of ore will be on the average about one-half the average of that before the war.

Mine Foreman's Relation to Employees

BY A. L. H. STREET*

In a suit brought to recover damages for injuries to plaintiff, who was injured by a fall of rock in defendant's mine while operating a compressed-air drill after having been assured by a shift boss that the place was safe, it was claimed by the defendant that the shift boss and plaintiff were fellow servants within the rule of law, still applicable in many jurisdictions, that an employer is not liable for injury to an employee, resulting from carelessness of a fellow servant, excepting where it is shown that by reason of known incompetence or habitual negligence of such fellow servant the employer may be found to have been negligent in retaining him. But the U. S. Circuit Court of Appeals, Ninth Court, overruled this claim, holding that the shift boss must be regarded as the representative or alter ego of the employer, especially in view of an intention to make him the arbiter of the safety of working places manifested by a rule adopted by defendant mining company to the effect that each miner must assure himself of the safety of his working places, notifying the foreman or shift boss, if necessary, to remove the danger arising from any unsafe condition found. (Anderson *vs.* Federal Mining and Smelting Co., 247 *Federal Reporter*, 472.)

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Recovery of Selenium and Tellurium In Copper Refining

BY M. H. MERRISS* AND H. T. BINDER†

Methods of recovering selenium and tellurium from electrolytic slimes are suggested, and flow sheets are given showing the various sources of these two products. The precipitation of tellurium oxide is accomplished by sulphuric acid and the oxide is produced by carbon. Selenium is precipitated from solution by acid in the presence of sulphur dioxide. Preparation of commercial forms of selenium and tellurium.

MOST of the commercial crude copper bullions now being produced contain selenium and tellurium in quantities varying from minute traces to two-tenths and three-tenths of 1% and upward. In melting the pigs of crude copper and the subsequent casting into anodes, little of the selenium and tellurium is driven off. In the electrolytic tankroom operations, none of the selenium or tellurium is acted upon, and, in common with the gold, silver, etc., it drops to the bottom of the tanks, so that for all practical purposes it may be considered that all the selenium and tellurium entering a refinery in the copper are concentrated in the electrolytic slimes.

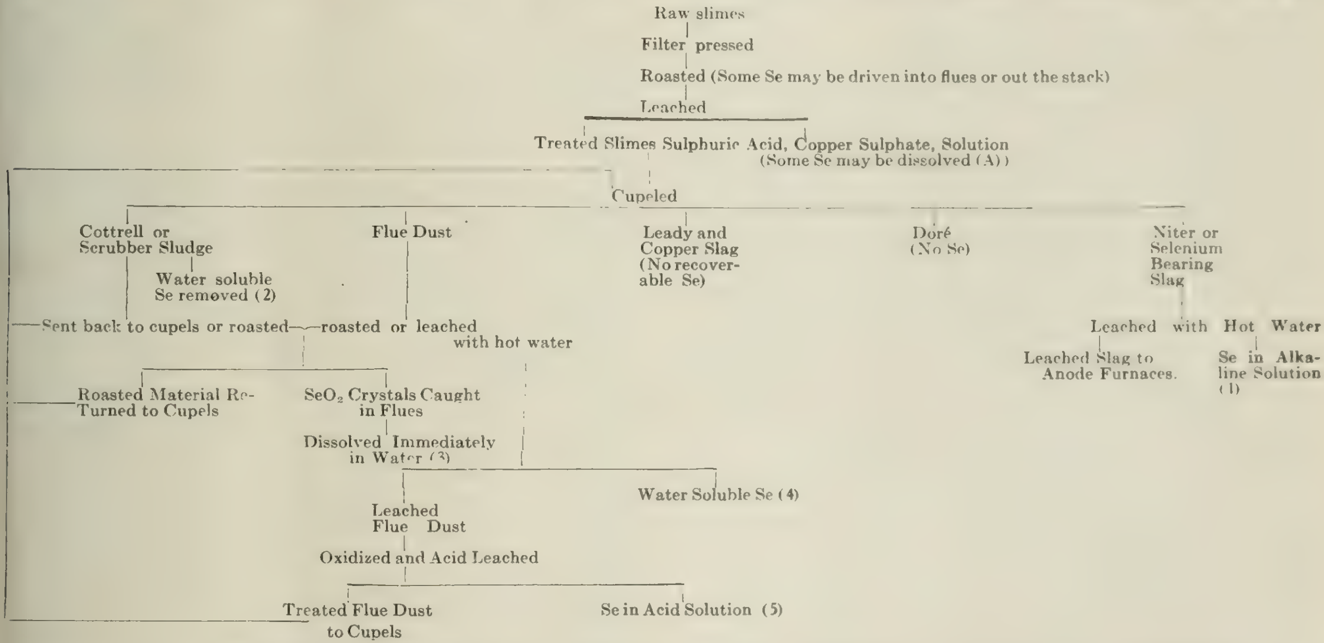
Raw slimes
Filter pressed
Roasted (Some Se may be driven into flues or out the stack)
Leached
Treated Slimes
Sulphuric Acid, Copper Sulphate, Solution (Some Se may be dissolved (A))
Cupeled
Cottrell or Scrubber Sludge
Water soluble Se removed (2)
Flue Dust
Leady and Copper Slag (No recoverable Se)
Doré (No Se)
Niter or Selenium Bearing Slag
Sent back to cupels or roasted
roasted or leached with hot water
Leached with Hot Water
Leached Slag to Anode Furnaces.
Se in Alkaline Solution (1)
Roasted Material Returned to Cupels
SeO₂ Crystals Caught in Flues
Dissolved Immediately in Water (3)
Water Soluble Se (4)
Leached Flue Dust
Oxidized and Acid Leached
Treated Flue Dust to Cupels
Se in Acid Solution (5)

FIG. 1. TREATMENT OF COPPER REFINERY SLIMES, WITH SPECIAL REFERENCE TO SELENIUM AND TELLURIUM

NOTE.—The copper-acid solution at (A) containing Se must be completely freed from this element by boiling with copper scrap, scale, shot, etc., before it can be returned to the tank room for further use in copper refining. If the Se is not removed all the copper in the tank room immediately becomes extremely rough and impossible to refine economically.

The methods for working up slimes vary somewhat in the different refineries, so that the accompanying flow sheet (Fig. 1) has been made up as a sort of composite of all methods, with special reference to the manner of getting the selenium and tellurium in condition for recovery in each method. For "selenium and tellurium" the word "selenium" alone has been substituted in the flow sheet for brevity. Each important source of selenium and tellurium is numbered, to be taken up in more detail subsequently, the less important sources being merely indicated on the flow sheet and not used commercially as far as is known. At present they are sources of selenium loss, as indicated.

Referring to the flow sheet, Source 1 is shown as coming from "niter slag." The object of cupeling the treated slimes is to obtain the elimination of practically all the elements from the slimes except gold, silver, platinum, palladium and a little copper, which are produced in the form of doré for further refining and separation. This elimination is accomplished by first liquating off a leady and antimonial slag. Then by blowing air through the charge, "flapping" with rabbles, and often by the addition of sand and lime to the charge, a second slag is formed carrying the bulk of the copper, together with a large proportion of the remaining impurities, but most of the selenium still remains with the noble metals. Sodium nitrate and sodium carbonate are then added, and the blowing is continued, resulting in the formation of a "niter slag," containing the selenium, largely in the form of sodium selenite. This slag is skimmed off, cooled, and easily broken up into small lumps, and leached with hot water either in an iron or concrete tank, the sodium selenite going readily into solution. The solution is decanted or filtered off and the leached slag put back into the anode furnaces or in some other way treated to get its high silver content back into the process.

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Tellurium accompanies selenium in all these steps, also concentrating in the "niter slag." The hot-water leaching of this slag tends to dissolve the selenium rather more rapidly than the tellurium, so that a rough preliminary separation of the two elements can be made at this point. Further, it is more difficult to get all the tellurium in such a slag in the water-soluble form, so that usually from 15 to 35% of the tellurium is returned to the anode furnaces unleached.

Source 2 is shown as coming from the "Cottrell" or "scrubber sludge." Most slime refineries are now equipped with scrubbers for washing the gases after they have passed through the flue system from the cupels. Some of them also have Cottrell apparatus installed for the same purpose. In either case it is usually necessary thoroughly to saturate the gases with water, the recovered wet and sloppy sludge being later filter pressed. The water which has thus been in intimate contact with the hot gases and with the sludges, thoroughly leaches out the water-soluble selenium, and in an ideal plant the same water would be circulated over and over again through the washing apparatus, so as to keep concentrating in selenium. As will be shown, this is a cheap source of the metal and should not be overlooked by allowing these waters to run to waste. Little, if any, tellurium can thus be obtained.

Recovery From Roasted Sludge or Flue Dust

Source 3 is quite generally used. Both the regular flue dust and the filter-pressed sludge can be roasted at a low heat, driving off selenium, which can easily be condensed in suitable chambers, as practically pure crystals of selenious oxide (SeO_2). These crystals can then be collected and are almost completely soluble in water, if care is taken to treat them while fresh and not allow them to stand around. If they are stored, there is some reduction to metallic selenium, which is insoluble. In Case 3, again, this source does not apply to tellurium, as little tellurium gets into the flue system at all. Instead of roasting the flue dust, the water-soluble selenium in it may be extracted by leaching with hot water, forming Source 4.

There is usually present in the flue dust a good deal of non-water-soluble selenium. This may be extracted by oxidizing it and leaching out with acid, forming Source 5. In this process strong sulphuric acid is added to the wet water-leached flue dust. Then the oxidizing material, such as sodium chlorate or chloride of lime, is added, a little at a time, until the selenium has been oxidized. This must be done carefully to avoid excessive amounts of chlorine gas being given off. The selenium then goes into solution in the sulphuric acid, and the clear solution is either decanted or filtered off, the leached flue dust being returned to the cupels.

In case the source of commercial selenium recovery at any plant is either 2, 3, 4, or 5 or any combination of these, there is usually no necessity of a tellurium separation, inasmuch as there will be little tellurium present. All that is necessary is to pass a current of sulphur dioxide gas through the solution, bringing down the selenium as a red powder, which may be dried and prepared for shipment as subsequently described. In most cases, however, Case 1 is the main source of selenium, and here a separation from tellurium must be made (see flow sheet, Fig. 2). This is done by adding sulphuric acid to the strongly alkaline sodium selenite and sodium tellurite solution, causing the precipation of white tellurous oxide (TeO_2).

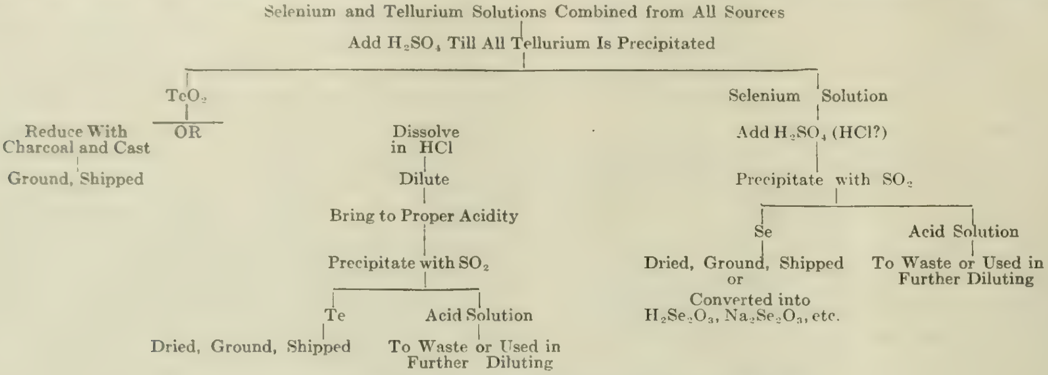

Selenium and Tellurium Solutions Combined from All Sources
Add H_2SO_4 Till All Tellurium Is Precipitated
TeO_2
Reduce With Charcoal and Cast
OR
Ground, Shipped
Dissolve in HCl
Dilute
Bring to Proper Acidity
Precipitate with SO_2
Te
Acid Solution
Dried, Ground, Shipped
To Waste or Used in Further Diluting
Selenium Solution
Add H_2SO_4 (HCl?)
Precipitate with SO_2
Se
Acid Solution
Dried, Ground, Shipped or Converted into $H_2Se_2O_3$, $Na_2Se_2O_3$, etc.
To Waste or Used in Further Diluting

FIG. 2. SEPARATION OF SELENIUM AND TELLURIUM

Reaction: $Na_2TeO_3 + H_2SO_4 = Na_2SO_4 + TeO_2 + H_2O$. Generally all or some of the other methods of getting selenium are also practiced. All of these except Source 3 contain sulphuric acid in varying amounts, so that if these solutions are combined with the alkaline sodium selenite solution, a considerable economy results, part of the neutralization being effected by the acid solutions. During the precipitation, which may be conducted in any lead-lined tank, the solution is kept boiling and agitated with air. The hot solution causes better settling later. The acid is added, carefully toward the last, as long as any TeO_2 comes down. An excess of acid will redissolve TeO_2; also, if the reaction is allowed to proceed too rapidly, the tank will boil over violently. After the acid is all in, the contents of the tank are allowed to settle, and the clear solution is withdrawn, filtered and led to the selenium-precipitating tank. The tellurous oxide is washed on a filter and either thrown away in case tellurium is not being sought, or treated for tellurium as described later.

The precipitation of selenium is effected by passing a current of sulphur-dioxide gas through the selenium solution in a lead-lined precipitating tank, which is preferably made fairly deep for more thorough utilization of the gas.

Reaction: $Na_2SeO_3 + 2SO_2 + H_2O + H_2SO_4 = Se + Na_2SO_4 + 2H_2SO_4$.

In order to obtain a satisfactory and economical precipitation, it is necessary to have at least 10% of free sulphuric acid present, and in some cases also a small amount of hydrochloric acid. As fast as the sulphur dioxide is passed through, selenium comes down in the form of a red slimy powder, and after complete saturation of the solution at least 98% of the total selenium has been precipitated. Any of the common kinds of sulphur burners now on the market may be used for making the sulphur dioxide, but it is essential that an efficient scrubbing device be connected up to the burner to keep sublimed sulphur out of the distributing system. In some cases a pressure pump is used for drawing the gas through the scrubber and forcing it through the precipitating tanks. The sulphur dioxide, further freed from moisture and other solids by a separator also introduced into the line, is led into the precipitating tanks either by means of perforated lead pipes near the bottom of the tanks, or through glass tubing.

The time required for precipitating is dependent upon the speed with which the sulphur is burned, the absorbing power of the solution, and the strength of the solution in selenium, and it varies widely. The theoretical amount of sulphur required is 64 lb. per 79 lb. of selenium, but in practice from 1 to 2 lb. of sulphur is used per pound of selenium. The precipitated selenium is removed to a lead-lined wash tank and washed by decantation or on a filter until free from sulphuric acid. The water must be filtered to keep out iron rust and other sediment. Then the selenium is thoroughly boiled, which changes it to a granular black mass. This is transferred into lead trays, which are placed on shelves in a steam drying oven. The dried, black selenium is then ground to such fineness as desired and sold in this condition. Sometimes orders are received for cake or stick selenium, in which case the black selenium is melted direct into the desired form.

PREPARATION FOR COMMERCE

Purchasers sometimes ask for red selenium. In that case the red precipitate, after thorough washing, must be separated from the surplus water by some form of press. The semi-dry cake of material must then be broken and dried in the dark by means of a current of cool, dry air. Light, and even summer heat, will darken it while any moisture remains. After thorough drying it may be packed in dark, air-tight containers and should be kept in a cool place.

Some purchasers desire sodium selenite (Na_2SeO_3) and there is also a limited demand for selenious acid (H_2SeO_3). In either of these cases black powdered selenium is converted into the salt specified by a suitable chemical process. The starting point for both is a strong selenious acid solution, which is made by treating the selenium with concentrated nitric acid. Selenious acid crystals are obtained by evaporating this solution, and sodium selenite crystals are made by neutralizing it with caustic soda, and evaporating the solution formed. In either case the process, through simple chemically, involves considerable manipulative difficulty, and each of the successive evaporations and dryings must be carried out with precise attention to detail in order to obtain a marketable product.

The starting point in the manufacture of tellurium is the tellurous oxide obtained by precipitation from the sodium selenite and sodium tellurite solution. As shown on the flow sheet, tellurium may be made either by the dry or by the wet method. Taking up the dry method first, the tellurous oxide is carefully dried and intimately mixed with a pulverized reducing agent, as lamp black or ground charcoal, and subjected to a low heat in a suitable furnace, ranging from the small crucible type to a large tilting retort type. All possible precautions must be taken to avoid loss of tellurium, as the high losses are the great disadvantage of this method, even under the best conditions. The tellurium mixture must be kept carefully covered, and a low and well-regulated heat maintained. The proper temperature is about 900-1000°F. The tellurium recovery varies from 50 to 95%. The proper proportion of reducing agent to crude tellurous oxide by weight is from 3 to 5%. The reduced tellurium is cast into any rough form and can easily be ground to powder for shipment, or, if desired, remelted and cast into cake or stick form.

If the wet method is to be used, the tellurous oxide is dissolved in strong hydrochloric acid, about 4 lb. of commercial acid being required per pound of dry tellurous oxide. If sulphur dioxide is passed through this strong solution, however, only a small portion of the tellurium will be precipitated, so it becomes necessary to dilute. Great care must be taken not to reprecipitate tellurous oxide, which can be held in suspension if the proper acid conditions are maintained. The solution of tellurous oxide in hydrochloric acid is treated in exactly the same manner as the tellurium-free selenium solution and in the same or similar apparatus; sulphur-dioxide gas is passed through it, precipitating the tellurium as a blackish-gray powder, which is then washed free from acid solution, dried and ground for shipment, or else cast into ordered forms.

The dry method is quicker and more direct, but the loss is great and the fumes are objectionable. The cost of oil, charcoal, crucible or retorts, and grinding for the dry method about balances the cost for acid, excess handling, and sulphur dioxide for the wet method, though on the question of purity of product there is little to choose between the two processes.

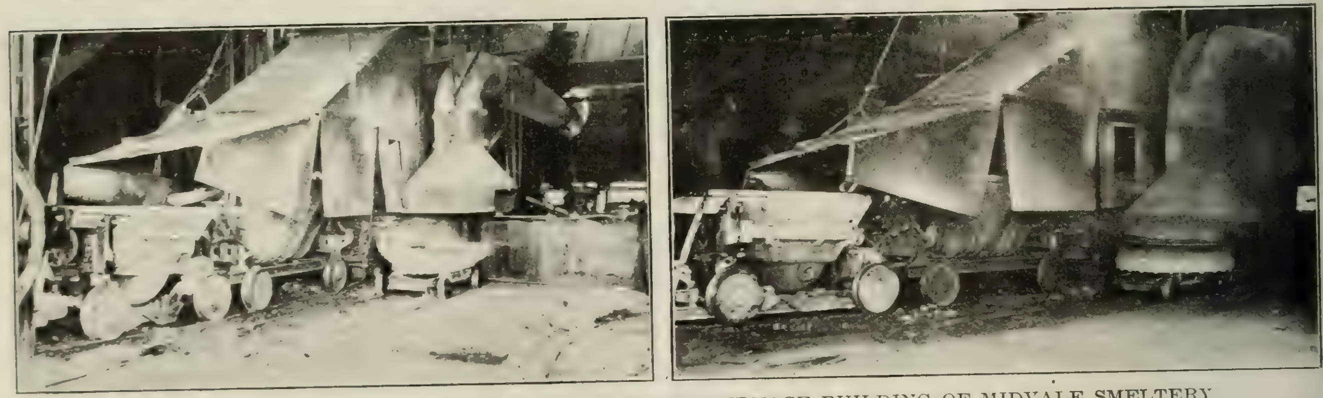
Wolfram Ore in Swatow District, China

Wolfram ore has been found in the districts of Haifeng, Lufeng, P'u-ning, Kityang, and Wuhua, in China, at first in small quantities here and there on the surface of the ground, but recently in vein deposits, writes Consul M. S. Myers in *Commerce Reports*. The Wuhua district (old name Changlok) appears to contain the largest deposits of this mineral. A group of villages about Tung-ling-hsia, among which are Chiu-lung and Ho-tung, is the principal center of production. This particular area is said to cover six or seven square miles, and it is here that the ore is found in large veins. It is claimed that over 2000 booths have been erected as shelter for the people who have flocked there in search of "black gold," as it is commonly called by the natives. This area is about 50 miles northward from Hopo. Other centers of production are Hei-lin, in Wuhua district, and Tai-yong, in Kityang district. A large market center for wolfram ore is Waichow, and there is little doubt that much of the ore mined in this district reaches that place. With the development of the Wuhua and Kityang fields, Swatow's importance as a market will increase, as it is the natural place of export for these districts.

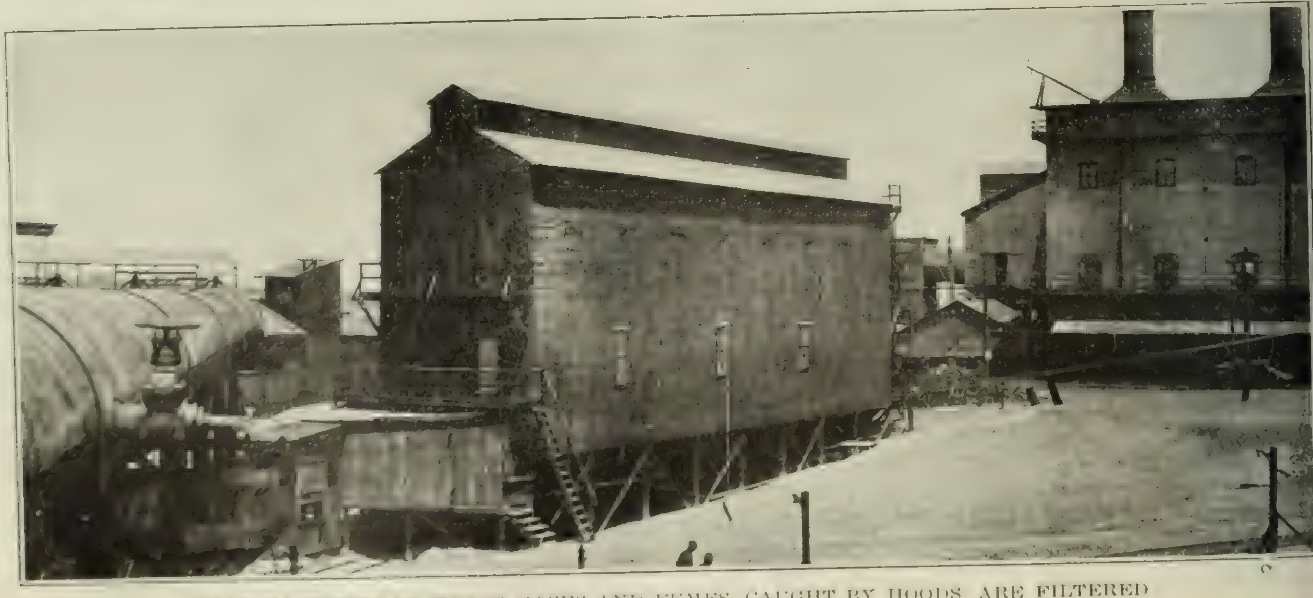
Smeltery Treatment of Fume and Smoke

SMELTERY OF UNITED STATES SMELTING, REFINING AND MINING CO., MIDVALE, UTAH, IN OPERATION

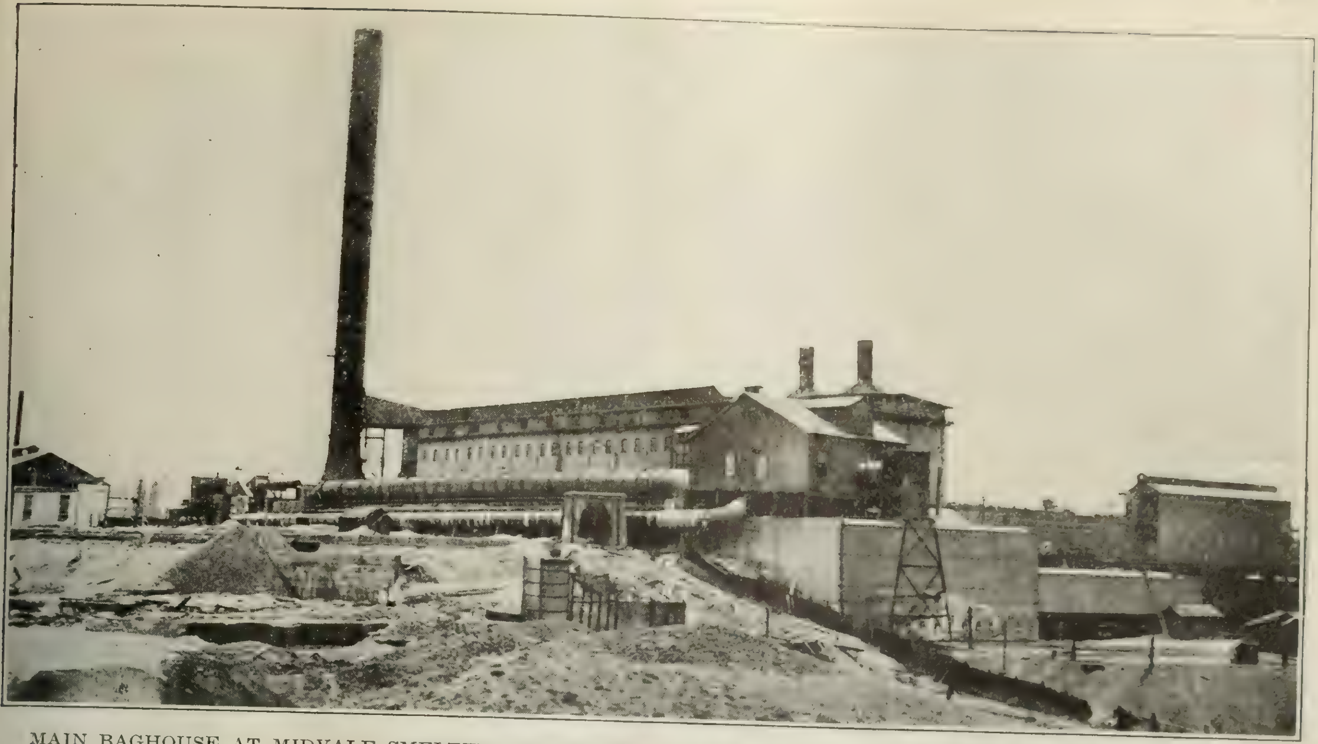
For years the Midvale Smeltery has been foremost in the prevention of damage done to vegetation from smeltery fumes and gases. The Sprague process for neutralizing sulphur trioxide by means of finely powdered basic oxides was developed here and has since been used at several other plants. Zinc oxide was originally added almost exclusively, although now finely powdered hydrated lime is mainly used, owing to the high cost of the zinc oxide. The smeltery gases discharge from the stack carrying only about one-third of 1 per cent. sulphur dioxide



HOODS OVER SETTLERS AND MATTE CAR IN BLAST-FURNACE BUILDING OF MIDVALE SMELTERY



HOOD BAGHOUSE IN WHICH GASES AND FUMES, CAUGHT BY HOODS, ARE FILTERED

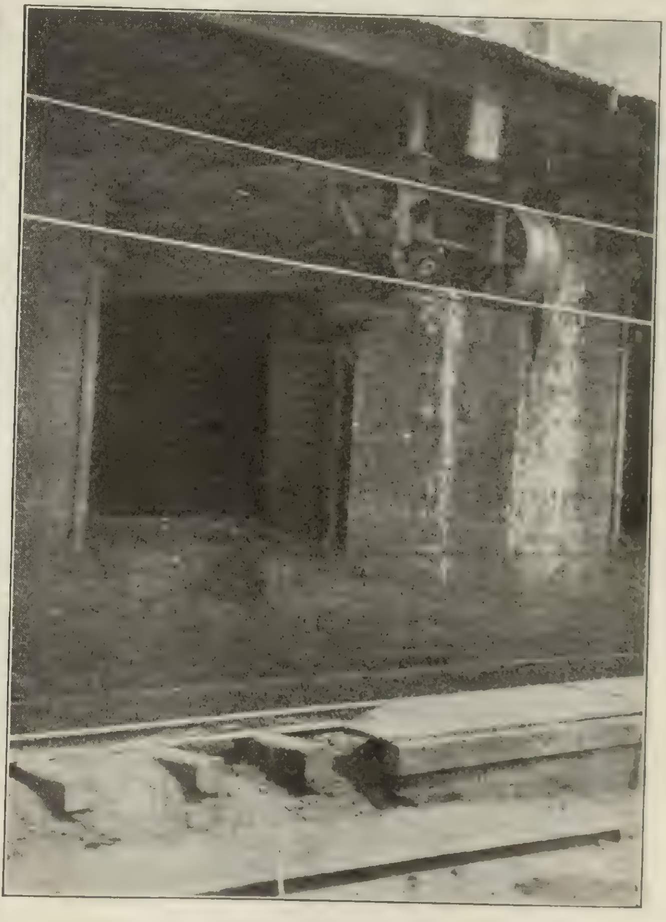


MAIN BAGHOUSE AT MIDVALE SMELTERY OF UNITED STATES SMELTING, REFINING AND MINING COMPANY

The baghouse sections serving the Dwight & Lloyd sintering machines and the Wedge furnaces are at the stack end; at the blast furnace end are the sections which serve the blast furnace. To the side and in front of the baghouse are shown the fan house and the settling chamber. Woolen bags are used in the roaster sections, cotton bags in the blast furnace sections. The blast-furnace sections discharge the filtered gases, consisting mainly of carbon dioxide, into the air from low chimneys, whereas the roaster sections connect with the main stack itself.

HOODS FOR DWIGHT & LLOYD SINTERING MACHINES

Hoods are provided at the Dwight & Lloyd sintering machines to prevent fumes and sulphur smoke from escaping while the fine ore is being sintered. One large hood is provided at the discharge end and two small ones are at the fire-box end.



SCREW CONVEYORS USED TO CLEAN FUME

Bags in the main baghouse are cleaned by deflation by means of an auxiliary fan, one section being deflated at a time. Deflation is a quicker method and causes less deterioration of the bags than mechanical or hand shaking.

A New Timber Set for Inclined Shafts

By JAMES E. HARDING[*]

The theoretical advantages of inclined over vertical shafts are too obvious to merit discussion, it would seem. The inclined shaft is able to follow a vein on its dip, remaining at a proper distance for skip pockets and crosscuts to the vein, but the vertical shaft gets further and further from the vein as depth is attained, thus necessitating more expense for development.

Nevertheless, the general practice is in favor of vertical shafts, for the reason that they are maintained more cheaply, require fewer repairs and altogether tend to more efficient and better operating conditions. In common with many others, I have, at various times, encountered a few inclines with their attendant troubles, but, in spite of this, my personal preference favors the incline, because I believe the difficulties connected with it can be overcome.

FAILURE OF THE OLD METHOD ON THE COMSTOCK

An incline set designed to overcome the weakness of the old method was worked out and installed, and is illustrated in the accompanying sketch. The new design was a result of observations of four different inclines at the south end of the Comstock Lode, in each of which the timbering had loosened and slid to the bottom of the shaft in a hopeless tangle. In each case the timbers were of hard pine, 12 x 12 in. square, framed as an ordinary drift set, with the posts placed perpendicularly to the plane of the dip of the incline. The ground in which the shafts were sunk was hard but swelling, and it is assumed that the timbers were blocked as carefully as possible. The result was the same in all cases. Owing to weight and friction, the timbers on the foot wall remained stationary, and because of their own weight and the pressure of the ground behind them, the timbers on the hanging wall had moved along the line of least resistance, namely, down the incline. This movement was not uniform in all sets, some being held more firmly than others or subjected to less pressure, so that in some cases a set would pull away from the one above it, making a gap, which permitted the upper set to fall as soon as it started moving. The final result of this action was the collapse of the entire timbering.

MINE TIMBERS ALWAYS COMPRESSION MEMBERS

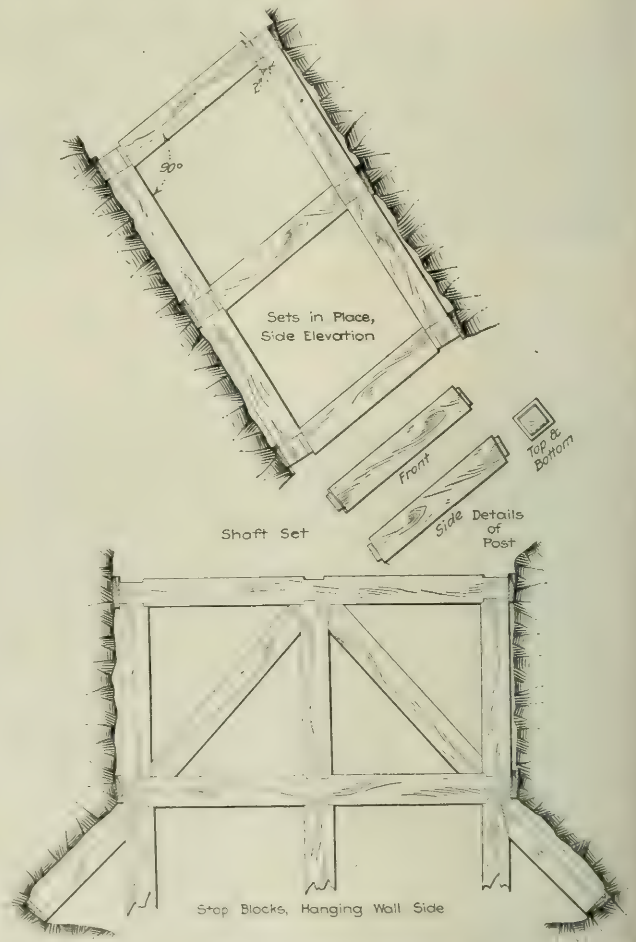
Perhaps this is an opportune time to point out that mine supports, except in the newer steel construction, are entirely composed of compression members, and that no matter whether the member is simply a stull or a seven-piece set, such as is used in the Overman mine at Gold Hill, Nev., all timbers must be compression members, if they are to stay in place. When by chance a timber becomes a tension member, it simply loosens and falls out of place.

As stated, all incline timbering had failed along the southern part of the Comstock, and when it became necessary to retimber one of these inclines, I began to study the matter with the view of designing a set which would not be subject to the catastrophies which had overtaken the former work.

By resolving into vectors the various forces involved in incline shaft timbering, and solving for their component, then placing the component in its proper relation to the former timbering, it was found that any opposition to the component made an angle of nearly 60° to that component, which clearly was contrary to correct mechanical principles.

THE NEW SET WEDGES ITSELF AS IT TAKES WEIGHT

Following this idea, sets were constructed with the post occupying the position of the component vector. This resulted in a weird-looking affair for a set, with posts nearly 16 ft. long to give the desired room in the compartments. The posts required sharp bevels and met the caps and girts at very acute angles; they were difficult to place and immediately showed their improper design by promptly buckling as soon as they took any weight, but they buckled up the incline instead of down.



DETAILS OF THE HARDING TIMBER SET FOR INCLINED SHAFTS

From this fact it was seen that there must be some common point between these two extreme types of set that would give the maximum of strength. Finally, the set illustrated in the accompanying sketch was designed and installed. It is really very simple, and departs but slightly from the original standard; the only difference is in the posts, the caps and girts remaining the same as in the original sets.

A formula could be worked out for the bevels on the posts, but there seems to be no necessity for it. To make the original pattern for the posts, the bevel is merely adjusted so that when the post is in place its top is higher up the incline than its bottom, and when the top starts moving down, with the bottom remaining in place, the post becomes the radius of a circle and tends to describe an arc along the hanging wall. Starting in with the original position of the post, a chord of this circle should be 2 in. away from the circumference of the circle at its greatest distance. This point is illustrated in the sketch.

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[*] Care of American Smelting and Refining Co., Casilla 49 D, Santiago, Chile.

The advantage of this design is that, while the timber moves, it becomes tighter and tighter, and the caps cut into the blocks or the posts will break. A set does not depend upon any other for its supports, and each set becomes the key of an arch. In all cases the resistance increases as the pressure increases, and this was the result desired.

Since the original installation of this timbering I have had occasion to use it in one other inclined shaft, with satisfactory results. Sets of the new design cost no more to cut or install, and seem to be several times more efficient than the old.

Sulphur in Jemez Canyon, New Mexico

By Philip S. Smith*

Small deposits of sulphur have for some time been locally known in Jemez Canyon, Sandoval County, New Mexico. The deposits occur in two places, one in the Canyon de San Diego Grant, about five miles above Jemez Springs, nearly three-fourths of a mile below the forks of the creek, and the other at Sulphur Springs, in the Baca location, about 14 miles above Jemez Springs. The nearest railroad points are Bernalillo and Albuquerque, on the Atchison, Topeka & Santa Fe R.R., about 45 and 60 miles, respectively, south of Jemez Springs by the wagon road. The road for much of the way is heavy with sand.

The sulphur ore at the deposit first named, which may be called the San Diego deposit, consists of residual material from carboniferous limestone leached by acidulated waters and permeated by sulphurous vapors, which have deposited free sulphur in the crevices and pores of the upper few feet of rock. The deposit at Sulphur Springs is similar except that it occurs in rhyolite. About two miles above Sulphur Springs, and at several places in Jemez Canyon between Sulphur Springs and the lower deposit, hot springs or leached rocks indicate similarly active waters and vapors on a smaller scale. Hot sulphuretted water also occurs at Jemez Springs. These phenomena occur in a zone more than 15 miles in length along the general line of Jemez Canyon and suggest the occurrence of a deep fracture or group of fractures in the earth's crust along which acidulated waters and sulphurous vapors have risen and deposited sulphur.

The San Diego deposit is about 700 ft. long and 150 ft. wide, comprising a lenticular area including about one acre. Two smaller areas, 50 ft. or less in diameter, were noted in branches of a small tributary canyon about three-fourths of a mile to the northwest. The sulphur is irregularly deposited and is relatively thin, measuring only 2 ft. 4 in. to 3 ft. 4 in. in thickness in four cuts in the more promising parts of the area. In one cut the deposit was not penetrated at a depth of 4 ft. 2 in. The sulphur ore contains from 15 to 39% of free sulphur mixed with sulphate. The rock under the ore contains no free sulphur, but carries about the same percentage of sulphur combined as sulphate.

The deposit at Sulphur Springs occupies about nine acres in a small basin eroded in rhyolite. All the sulphur at Sulphur Springs was apparently deposited in vents, cracks, and pores within a few feet or a few inches of the surface. The available sulphur in this area is not large and is irregularly distributed. Sixteen years ago M. S. Otero built at Sulphur Springs a mill equipped with a boiler, engine, pump and two retorts of about one ton capacity each, for producing sulphur. The retorts were filled with ore, and steam under pressure of about 30 lb. was led into them and the melted sulphur drawn off below. According to A. T. Otero, the ore treated ran about 60% sulphur, and the total production amounted to about 200,000 lb., of which 150,000 lb. was sold at Albuquerque, the rest being disposed of in small lots to local purchasers.

Examination led to the conclusion that the quantity of available sulphur in the Jemez Canyon deposits is too small to be of commercial importance, especially in view of their inaccessibility.

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*Acting director, U. S. Geological Survey.

The Cloncurry Copper District Of Queensland

By W. H. Corbould*

The township of Cloncurry is 482 miles from Townsville, to which it is connected by a 3 ft. 6 in.-gage railway. The copper belt is approximately 250 miles in length by 40 miles wide. The rock formation is quartzite, altered porphyry, granular felspathic rock, diorite, and granite. The copper lodes exist in all these formations, with the exception of the granite, and also occur as contact lodes.

The district has been known for about 50 years. Among the early pioneers were Ernest Henry, A. Kennedy, and F. Gibson. Henry disposed of a group of mines 30 years or so ago for about £30,000 cash, but the foreign company which operated them stated that the distance from railway communication crippled the undertaking. Kennedy and Henry later sold another mine for £15,000 cash, and Gibson disposed of his mining interest to the same Victoria group. The venture has since become a great financial success.

About 12 years ago two American engineers visited the field and were offered a well-known property for £8000 cash, but they declined the offer. The property has since paid over £400,000 in dividends.

Knowing something of American mines and the system of handling large propositions, this district impresses me on account of its potentialities. Up to the end of February, 1918, it has produced 80,950 tons of copper from ore averaging from 8% to 20%. So far it has been worked as a high-grade field; and unless high-grade copper ore is showing in the outcrop no one attempts to work the lode. When lodes are exploited, work is confined mostly to high-grade ore. Lodes may exist in the granite, as in Butte, Mont., but no one here would attempt to prospect unless the ore was showing at grass roots.

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*Consulting engineer, Selwyn, North Queensland.

At no distant date the life of the field will depend on the medium and low-grade ores. Of the three important groups operating in the field two are owned in Melbourne; the other is controlled from London and Paris. Each has its own smelting and converting plant. The treatment capacity of the plants is limited to a certain tonnage of high-grade ore, and mining is confined therefore, in most cases, to the search for this class of material. The tendency is to make a known so-called wall a boundary of the ore channel; and if crosscuts are extended out and encounter low-grade ore, it is considered valueless.

The method outlined compels the conclusion that a treatment proposition laid out for the handling of poor quality ore has a distinct advantage, because, in development work, low-grade material, which may not give a profit, still may yield sufficient return to cut down part of the development costs.

The Mount Elliott group of mines comprises the following:

1. Mount Elliott Mine—The lode at the 400-ft. level is about 250 ft. wide, and contains about 3% copper.

2. Consols Mine—The lode at the 480-ft. level is about 100 ft. wide, carrying about 4% copper.

3. Dobbin—At the 330-ft. level the ore channel is about 50 ft. wide, but work is confined to a width of 5 to 20 ft., with about 7% copper.

4. Great Australia Mine—The dolomite lode at the 300-ft. level is from 15 to 115 ft. wide and assays about 2½% copper. The siliceous lode on the surface is about 60 ft. wide, is being open cut, and shows a content of 4 to 5% copper.

5. Argylla Mine—With the exception of small prospecting shafts, the mine has only had the surface scratched, but from the appearance over a width of 100 ft. the whole of the outcrop could be handled as a low-grade proposition by steam shovels. A cross-cut at the 100-ft. level shows about 24 ft. width of 6% ore, and four feet width of 18% ore.

6. Mount Oxide Mine—At about 270 ft. below the outcrop shows 5 to 20 ft. width of 20% copper, and a large width of low-grade ore. It is estimated that there is approximately 250,000 tons of 10% ore available in the mine.

It is safe to say that the Elliott group has several million tons of 3 to 4% ore that could be made available, given adequate railway communication and a plant to treat a large tonnage of low-grade ore. To give an idea of production costs in the past, I may say that the Mount Elliott mine, on a 11 to 12% ore, produced, up to September, 1913, 17,269 tons of blister copper and delivered this f.o.b. Townsville at a cost of £31 ($147.25) per ton. Since then, however, costs have crept up considerably.

The climatic conditions are good. The three hot months are December, January and February. The altitude of the district is 600 to 1400 ft. above sea level, with an average rainfall of about 20 in. per annum. As to water for treatment works, it is only a question of money to conserve large supplies.

Rates of wages paid in this district, 44 hours per week, with time and a half for overtime, are as follows:

Mining or Smelting Section: From £4 4s. 4d. ($20.20) for a general laborer to £5 9s. 1d. ($26.15) a week for a shift boss. Other occupations in proportion.

Surface and General Section: Blacksmiths, £5 9s. 1d. ($26.15) per week. Engine drivers from £4 12s. 7d. ($22.20) to £5 14s. 7d. ($27.45). Fireman from £4 9s. 1d. ($21.35) to £4 15s. 4d. ($22.85). Mechanics, £5 15s. 6d. ($27.70). As in other parts of the world, all wages are on the increase.

Powdered Coal as a Fuel

The essentials of good combustion are complete oxidation of all combustibles in the coal, to avoid loss in the ash and up the stack; control of both combustion and air; control of flame length; a flexibility in the fuel feed which will permit of variation in heat input; control of the nature of the combustion, and one-stage combustion. These points were emphasized at a meeting of the American Chemical Society by W. G. Wilcox, who urged the use of powdered coal as a means of offsetting the fuel shortage.

Mr. Wilcox stated, in referring to oxidation of all combustibles possible in actual practice, that in tests at a plant using 100 carloads of coal per day and employing fuel containing 5½% sulphur, 34% volatile matter, 40% fixed carbon and 18½% ash, the loss with overfeed stokers was 25% unburned carbon in the ash and 4.6% actual coal; with chain grate stokers, 35% and 6.5%, and with the hand-fired type 35% and over, and 6.5%. These losses are not encountered, it is inferred, in powdered-coal combustion.

Regarding the combustion of coal as a reaction between solid fuel and oxygen, he asserts that the velocity of the reaction and its completeness depend upon the surface exposed by the solid, the pressure of the reacting gas and the intimacy of the mixture. A 1-in. cube of coal, ground to pass 85% through a 200-mesh screen, he estimates, increases the surface of fuel exposed from 6 to 1800 sq.in., or 300 fold. The rate of combustion can be proportionately speeded up and the velocity of combustion doubled with each rise of 10° C., due to greater surface exposure.

The use of the helical screw-feed controller and of variable air pressure for blowing the powdered coal into the combustion chamber are specified as giving the necessary flexibility of control of combustion, which, in the opinion of Mr. Wilcox, makes powdered fuel an ideal combustible.

A Transparent Liquid in Which an Ordinary Stone Will Easily Float can be made by the alternate solution of iodide of mercury and iodide of potassium in water. It is known as Sonsted's solution, after the inventor, and the peculiar phenomenon observable during its manufacture is that, whereas saturation point is reached several times with each particular salt at each phase of the process, the solution is able to take up still more after absorbing the other salt. Potassium iodide is therefore added till saturation point is reached, then mercuric iodide. The solution is then in a position to take up more potassium iodide, and so on. The final weight of the solution may be over three times the weight of a corresponding volume of water. It is expensive to prepare and exceedingly poisonous. The specific gravity may be reduced if necessary by the simple addition of water. Such solutions are used in connection with the preliminary research work on metalliferous ores, which are ground and then shaken up with the solution, whose specific gravity has been adjusted to requirements and is of a density that wil permit the heavier minerals to sink, whereas the gangue or stony portion of the ore, floats or remains suspended to permit of examination.

Correspondence and Discussion

Grinding Ore in Ball Mills

The article by Algernon Del Mar in the *Journal* of July 6 is, I believe, subject to some corrections. It is not my purpose to discuss the merits or demerits of a mill in which I am interested, and the same thing applies to mills of other manufacture mentioned in this article.

The principle of a low pulp line in a tube mill was pointed out in a paper by F. L. Bosqui, in Volume 53 of the A. I. M. E. Mr. Bosqui discussed this subject at considerable length in this article, under the head of "Metallurgical Practice in the Witwatersrand District of South Africa." From this all-sliming cyanide work he showed that "the weight of pebble load would be decreased 25% without affecting the crushing efficiency, with about 10% decrease in power consumption, the mechanical efficiency showing a corresponding increase."

In the development of ball mills I have found that Mr. Bosqui's statements are correct, but instead of using pebbles, as in the South African practice, I have confined my experiments entirely to the use of steel balls.

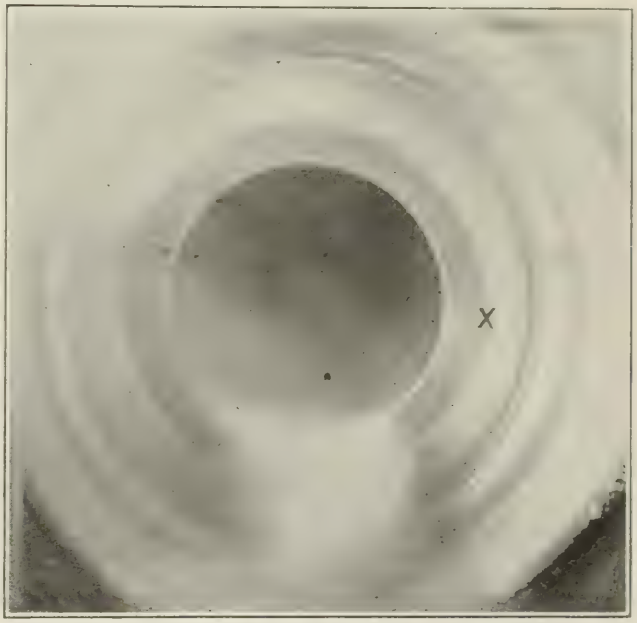
Our mills I have found to be more efficient when short, on all classes of feed, and consequently later developments have been in making the Marcy ball mill shorter than the diameter, as the length of the mill has nothing to do with the fineness of the finished product when operated in closed circuit with a mechanical classifier. The classifier determines the size of the product, but the rapid change of the mill contents is necessary for high efficiency.

In Mr. Del Mar's article he includes my mill in the quick-discharge class, and makes a number of statements and inferences which are not correct. Of the many he makes, I will mention seven.

1. With classified feed, he says there is no advantage in the quick discharge, and it may cut down the capacity. This may be true of such mills as are not properly designed, or not operated correctly; but such conditions are hardly open for discussion. There are a large number of low-pulp-line mills that are operated on fine feed, which are giving big capacity and satisfaction. Careful experiments have been made to determine the difference between the overflow mill and the grate mill. In the grate mill, the relative gravity of the balls is increased, owing to the non-buoyant action of the pulp, and the balls becoming coated with sand, due to the much thicker pulp that can be maintained with the grate mill. The results of our own experiments and others' on both coarse and fine feed have more than confirmed Mr. Bosqui's statement. The conclusions following an elaborate test along these lines will be published soon.

2. Mr. Del Mar states that there is excessive wear on liners and balls. The published statements of large mill plants such as Inspiration, Kennecott, and Arizona Copper Co., when crushing for flotation, show this statement is not a fact.

3. The diagram given, which purports to show the pulp level or flow of pulp, is not correct. I know nothing about and have no quick-discharge devices, but the pulp line that is away from the influence of the balls is nearly a straight line over the entire length of the mill, regardless of whether the mill crushes coarse or fine feed. The discharge of the pulp into the grates takes place along this line and section, but also on the section represented by the ball area against the grates. Large quantities of sand and water are carried up by the balls. The photograph accompanying this article shows my open-end rod mill with practically the entire end open. This mill is filled with rods within 6 in. of the feed-end opening. The discharge of the pulp is as shown, i. e., the rods carry up the pulp, and the discharge is as shown in this photograph, which was taken while the mill was in operation. Open discharge ball mills with grates show the same conditions indicated in this photograph, and the discharge is not as represented by Mr. Del Mar's diagram.



DISCHARGE END, MARCY ROD MILL

4. Mr. Del Mar states that the liner wear is greater at the discharge end than at the feed end. At Inspiration, where there is being ground 18,000 to 20,000 tons per day in ball mills for flotation, no such wear takes place. The actual abrasion per pound of steel for each ton crushed is practically no more on one end than on the other, when the same material is used for liners.

5. He also states that with fine feed the sands are at the feed end of the mill, and that the balls and liners wore more at the discharge end, because of the fact of there being no pulp at that end. An examination of the inside after stopping shows that the sands are dis-

tributed over the entire length. The loss by abrasion of balls and liners per revolution, if there were no feed or sand in the mill, would be less than if there were rock or sand in the mill. Sand acts as an abrasive—it is like emery—and if any one has actually found that the wear was greater with a long mill at the discharge end, it was due to the finer sand having a greater abrasive action than the coarser sand at the feed end.

6. Pebbles never are used in the Marcy mill.

7. The quotations that Mr. Del Mar makes, and the milling plants cited, do not have mills of my design, as his statements and the mention of my name infer.

Mr. Del Mar in his book has emphatically recommended the overflow type of mill, and his article in the *Journal* of July 6 confirms this recommendation. Mill practice and mill design change, and change quickly. Mills that are of good design today may become obsolete at any time.

The subject of crushing ores is most important, and represents one of the big items of expense in ore dressing. •A correct analysis of the means used for crushing is necessary for our advancement. F. E. **Marcy.**

Salt Lake City, Aug. 16, 1918.

[Rand practice is not "all-sliming." The tube mills are used to regrind the battery tailings, so that the greater proportion of final product is sand, and suitable for leaching. In making any comparison between short-length ball mill operation and the experiments referred to by our correspondent, it should not be overlooked that the mill used in the South African tests was abnormally long, the feed was a comparatively fine sand, and the "pebbles" used were probably rough, unshaped chert.—EDITOR.]

German Influence in Australia Does Not Apply at Broken Hill

I note that in a recent issue of the *Journal*, in an article which is headed "Germany Controlled Australian Mines," Mr. Hughes is reported to have said, in a speech before the Harvard Club: "Our mines, which are extensive, were entirely under the control of German capital. . . . But, to be fair, the German energy and capital were very beneficial to us. After we took over the mines ourselves, we found the plants and organizations so excellent that we were able to begin at once the making of munitions."

I cannot help thinking that Mr. Hughes must have been incorrectly reported, for, as a matter of actual fact, there are no mines—centainly none of the zinc-lead mines at Broken Hill—which were controlled in any way by Germans or by German capital. Among the shareholders of these companies there was never more than a small percentage of Germans. The plants and organizations of which Mr. Hughes speaks as being "so excellent" were solely the creation of British capital and British organization, and I desire to remove any impression to the contrary that may have been created by the statement reported to have been made by Mr. Hughes.

Any German influence was strictly limited to certain contracts for the purchase of the raw material produced, in consequence of the non-existence of British smelteries in which the material could be treated, and refers to almost the whole of the zinc concentrates and a small proportion of the lead concentrates. This, no doubt, helped to build up German control of these metals and their markets; but the reported statement, as it stands, is entirely incorrect, because these mines were not under the control of German capital, nor was their organization or development due in any shape or form to German brains.

Zinc Corporation, Limited,

London, E. C., July 26, 1918. F. A. Govett, Chairman.

Crisis in Gold Mining as Viewed By a Montana Miner

I agree with the editor of the *Journal* that the crisis is reached and that gold properties will suspend operations one by one, according to the grade of ore, until gold will be produced only as a byproduct. Gold mining is the only business that is operating at a real loss on account of the depreciation of the purchasing power of the product. A remedy for the existing conditions must show itself as soon as the war is over, if not before. We have been loading high prices, high wages, and inflated values on one side of the scales in our mad rush to get increased production, which has greatly overbalanced the gold reserve. It really does not mean a great deal to the producer, as we are simply depreciating the value of the American dollar.

When the war is over the balance must be struck; we must take off from one side of the scales or increase on the other. A world effort to liquidate is out of the question, as it would cause panic and revolution both here and abroad. To increase the gold output under present abnormal conditions is also out of the question; even under pre-war conditions the gold production was on the wane. Only one solution of the problem remains: gold will be at a premium, not 50% in five years after the war, but 100% and even more six months after peace is declared.

The suggestions offered for the relief of the gold miner are inadequate and unjust; the excess-profit tax law must fall on all classes of business alike. Gold mining cannot be classed as a war industry, although it will be of vital importance in the adjustment of conditions after the war. The remitting of freight rates is not tolerable in dealing justice to all. To make employees of gold mines immune from draft is not requested and would be an unpatriotic action.

The gold miner does not want to be placed in the special privilege class, nor does he want his business subsidized; he simply wants justice under the present inflated conditions governed by the law of supply and demand. If our Government and the governments of the rest of the world promise to pay, they must have some world standard to pay with: the re-standardization of gold is an absolute necessity for the world's business; and as England practically controls the gold output of the world, it is up to her to take the first step.

If our Government wishes to do justice to the gold miner at the present time and encourage gold mining, the mints should credit the producer at $40 per oz. instead of $20.67 for all gold produced within our borders during the period of the war.

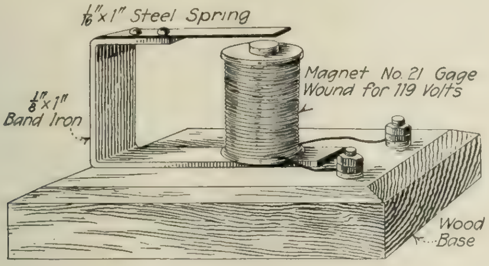
Maiden, Mont., July 25, 1918 E. B. **Coolidge.**

Details of Practical Mining

Anaconda Company's Bell and Buzzer Signal System

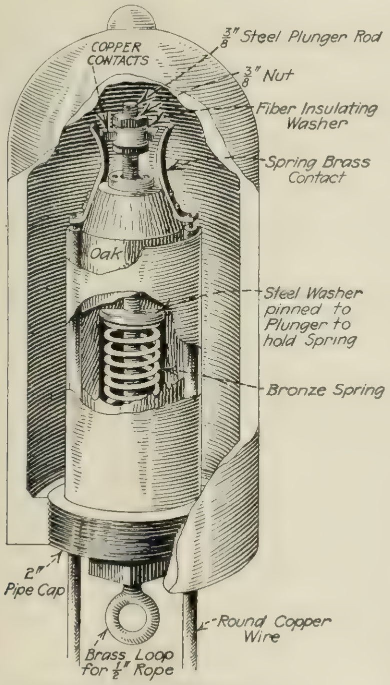
By R. H. Richards

The buzzer signal system is used at Anaconda, signaling between levels; the buzzers are connected so that if the switch is closed they operate on all levels. The signal for each mine level is governed by state law.



MINE SIGNAL BUZZER

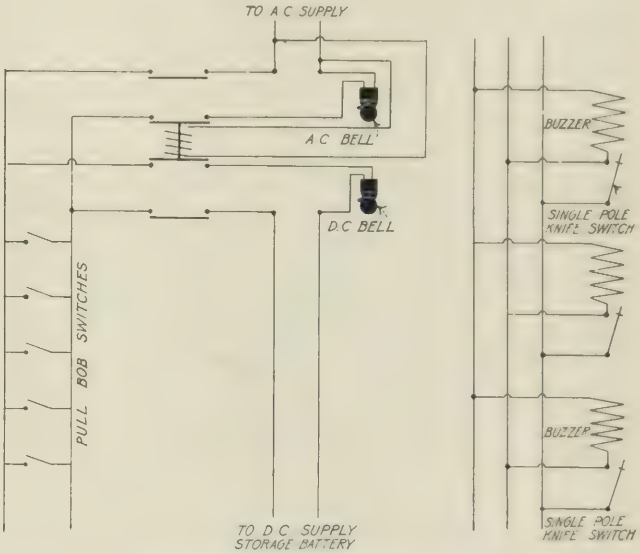
The cage tender answers the person signaling, with one flash; the person signaling back answers with one flash to go to a higher level or two flashes to go to a lower level, and gives no answer if rock or material is to be taken away from the station. The buzzer and switch are placed in a dry position on the station. The switch is a single-pole knife switch. Lead cable is used throughout, and brought out to a terminal box at each level.



PULL-BOB SWITCH

The bell signal system is used to signal the engineer to operate the mine hoist, and the cage tender is only allowed to give signals. The pull-bob switch is mounted inside the shaft, the switch being operated with a rope about 5 or 6 ft. long at each station. The signal is not given until after the cage doors are closed, the cage tender holding the rope until the cage starts. The pull-bob switch is simple in design but strong in construction. It is mounted on a 2-in. pipe cap and screwed into a heavy cast-iron cylinder mounted in the shaft. This protects the switch from water or falling rock. The switches at the stations require about 17 lb. pressure to operate.

In addition to the station switches, pull-bob switches are placed every 200 ft. in the shaft and are operated with the same length of ½-in. rope. These switches have a stronger spring and require 50 lb. pressure. All bells and buzzers operate on 110-volt, alternating current. The bell system has an automatic auxiliary connection to a direct-current storage battery. The alternating-current coil holds contacts to alternating-current mains, so that if current is cut off the contacts close by gravity. This requires a separate direct-current bell. The state law also requires a hand-operated bell rope the full length of the shaft.



WIRING DIAGRAM OF SIGNAL SYSTEMS
Left, Bell. Right, Buzzer

Drawings showing the construction of switches and buzzers, all of which are made in the Anaconda Copper Mining Co.'s electric shops, are shown herewith. A wiring diagram is also given.

Converting Scrap Into a Sinking Hoist

When the Hecla Mining Co. decided in the spring of 1917 to sink its shaft 500 ft. deeper, difficulty was found in getting delivery upon a large enough 2200-volt electric hoist having the requisite speed. It was deemed necessary to have a hoisting speed of 1000 ft. per minute, as the shaft at the time was sumped 100 ft. below the

1600-ft. level; and it was desired to conduct sinking operations from the 1200-ft. station, which would mean hoisting from a depth of 1000 ft. below the 1200-ft. level by the time the shaft was again bottomed.

Rather than take a slower hoist, the master mechanic, J. B. Sloan, after looking around the camp, decided to build a sinking hoist at the shop. An old motor, controller and connecting coupling from a worn-out electric pump were in the shop, and he could get, at scrap price, a second-motion steam hoist, one of the oldest in the district and no longer used, that had served the Tiger shaft, near by. The motor was rated at only 75 hp., and the starting load would require about 150 hp. As Mr. Sloan could not get a new 150-hp. motor, it was decided to use the old one, as it was in fair condition, and not being rated as closely to capacity as are the motors of today, and not having to hoist continuously throughout the day, he believed that it would stand the initial short overload.

The Tiger hoist was a 40-in. double-drum second-motion steam hoisting engine, with an old-fashioned horizontally traveling indicator. Mr. Sloan had to cut down the frame to carry only one drum, and to rig up a new indicator of the dial type. This was done at the mine machine shop, which possesses only the ordinary equipment of a shop at a mine producing 1000 tons a day. The motor and the drum, with their separate bases, were then mounted properly on a concrete base block on the 1200-ft. station. Using the original gears on the hoist, and connecting the motor to the driving pinion through the flexible mine-pump coupling, and fitting an extra foot brake to the hoist by putting a band brake around the collar of the coupling, the hoist was connected to the old street-car type of controller which came with the pump.

Trouble was experienced until the hoistmen understood the way to get up speed under such an overload; but after a few days they had learned the hoist and easily worked it up to a speed of 1000 ft. per minute within a reasonable distance. The shaft was sunk with this scrap hoist without trouble, and the company is not only ahead by a good part of the first cost of a new hoist, but it was also able to sink the shaft without delay. A good master mechanic can save a mining company many dollars and much time if he be imaginative and ingenious.

Electric Buzzer for Raises

By C. T. Rice

When a raise reaches any great distance above the level, there is difficulty in signaling. The men can rap on an air pipe, but that is unsatisfactory, and often the signal is misunderstood. At the Hecla mine, Burke, Idaho, where the raises driven through from level to level are of at least 300 ft., electric buzzers are installed for signaling. A similar system is also used where hoisting of timber is frequent, for the noise of the hoist makes pipe signaling uncertain and unsatisfactory. Included in the buzzer box is an electric lamp that flashes simultaneously with the signaling of the buzzer, so that the hoistman can perceive the signal in case the hoist is running and he fails to hear the buzzer.

The system is housed in a gable-roofed sheet-iron box, which is closed in front but open at the back and bottom, that the wiring may be easily accessible, although the apparatus is protected from drip in wet places. This housing is screwed to a three-inch board on a post near the hoist, insulators being used around the lag screws, so that, should insulation on the wires break down, no one will get a shock from the post.

The electrical equipment consists of a 4-in. Benjamin mine buzzer, an Edison plug cut-out, a porcelain wall socket and four porcelain bushings for insulating the wires where they pass through the box. The buzzer is bolted to the front of the box under the projecting roof, and a sounding board effect is thus obtained and the loudness of the signal is increased. The plug cut-out and the wall socket are screwed to a ½-in. board inside the box. This board is fastened to the side of the box, but is placed a quarter of an inch from the front, as otherwise it would vitiate the effectiveness of the front of the box as a sounding board. Sleeves are soldered to the box for carrying the porcelain bushings, and there is a small iron strap across the bottom to strengthen the sides. All parts, with the exception of the electrical equipment, are coated with asphalt paint to protect the box from the water, and a 40-watt lamp is placed in the lamp socket.

In the raise the miners use an ordinary electric push button for signaling. Insulated wires extend up the manway on insulators placed in a wooden box made by nailing two 1 x 1½-in. strips to a 4 x 1½-in. piece as a bottom, which protects the wires. Little trouble is experienced from injury to the wires, and the convenience of the signaling greatly expedites the landing of timbers and other material in the raise.

Don'ts for Pump Runners

The following "don'ts" for pump runners appeared in *Coal Age* and may be found useful, as they seem to cover all ordinary operating points:

Do not run a pump without water.

The numerous bushings and sealing rings on the inside of a pump depend on water for lubrication, and if the pump is run without being first filled with water these parts will get hot and "freeze," doing great damage to the pump.

Do not run without oil in all the bearings.

Do not run with dirty oil in the bearings.

Do not let water get into the bearings.

Before starting up, see that the bearings are full of clean engine oil and that there is no water in the boxes. This can be done by loosening the drain plug on the bottom of the box to see if clean oil comes out and by measuring the depth of oil in the box. Do not rely altogether on the oil-level gage, as this sometimes gets choked up. To keep the bearings clean, drain all oil out of the boxes once a week and thoroughly wash out with two or three bucketfuls of water. The old oil should be filtered and used over again if it is not too gummy.

Do not run the stuffing-box glands tight.

This produces unnecessary friction, causing the boxes to heat up and the packing to burn out. Having the glands loose and allowing them to leak a little keeps the packing lubricated and the stuffing-boxes cool.

Do not run with leaky joints around pump.

This is unnecessary, and if not stopped in time will ruin the joint faces.

Do not allow water to collect around the motor.

Do not run a pump or motor that vibrates excessively.

This is caused by the machines not being in balance or line. It should be reported at once.

Do not run unless you are satisfied that all parts are in good condition.

Do not allow oil, grease or dirt to accumulate anywhere in the pumproom.

Events and Economics of the War

Under constant pressure from the Allied forces, the Germans are continuing their retreat toward their positions held last March, where it is expected they will endeavor to stand; Roye and Noyon have fallen to the French and Bapaume and Péronne to the British; the latter also broke through the Queant-Drocourt line on a six-mile front to a depth of four miles. In Siberia, an attempt by General Horvath to assume control of all Russian forces there was frustrated by the Allies and speedily collapsed. The Bolshevik leader, Lenine, is reported to have been shot in Moscow on Aug. 30 by a revolutionist.

At Washington, the Man-Power Bill was signed on Aug. 31, and Sept. 12 was set by the President for the registration of men affected by the new law. Motorists throughout the country have been called upon by the Fuel Administration voluntarily to stop the unnecessary consumption of gasoline on Sundays. I. W. W. leaders recently found guilty of attempting to frustrate the country's war program were sentenced in Chicago on Aug. 30 by Judge Landis, the leaders each receiving 20 years in prison and a $20,000 fine. On the same day, the Director of the Mint ordered the U. S. Assay Office in New York to discontinue the sale of gold for commercial purposes; this was later revoked.

How Will the New Draft Ages Affect Industry?

Probably before this item is published the new draft law will have been passed and signed by the President. Under it all men between the ages of 18 and 45 not now in military service will be subject to call. The selective principle is retained, but the law itself says nothing about classes to be exempted.

The prospective passage of the law has stirred industry as has nothing since the war began. How will the selective principle be applied? Evidently the line will be drawn tighter than ever between the essential and non-essential industry. In other words, the "work-or-fight" principle will apply, but in the essential industries themselves what effort will the Government make to protect itself by retaining in the industries the men who are carrying the burdens of those industries—who furnish the executive brains, the energy and the enthusiasm? A great many of these men are between 35 and 45. At the same time, their abilities have enabled them to accumulate enough to have sufficient independent income if they have no dependents. Needless to say, withdrawal of these men would be a calamity. It is hard now to keep the industries going; nothing less than stoppage would result if the mainsprings, the active managers, were taken. With the decline of these industries would go not only the destruction of our industrial war program but also the net income of these companies and the consequent ability to pay taxes and buy Liberty bonds.

Certain it is that our industrial structure, under the easiest conditions, must suffer a very considerable alteration. This is to be expected. But the country would be the better off if business men can be informed quickly of the Government's policy. Certainty should succeed uncertainty as quickly as possible. Only so can preparations be made for taking care of our industrial enterprises. The time for adjustment is all too short in any event.

A general policy should be declared. If interpretation is left to the local draft boards, the results to the industries and the Government may be serious. So far the Government has applied the selective draft principle intelligently. The confidence created in the Government and in the Secretary of War should be retained by a frank declaration from the Secretary to the business men of the country at once.

Miners Urged To Seek Deferred Class

Realizing the danger of further depletion in man power in mines and oil fields from the new draft law, the American Mining Congress has interviewed General Crowder and Chairman Neave of the Man-Power Committee of the U. S. Employment Service, in whose hands is placed jurisdiction over problems involved in the new draft. The Provost Marshall General is determined to place all physically capable men from 19 to 36 into military service at once, except those shown to be absolutely necessary to production in the industries. It is essential that the operators assist in placing valuable men in deferred classes.

The U. S. Employment Service, through Felix Frankfurter, chairman of the War Labor Policies Board of the Labor Department, plans a campaign, backed by a declaration of President Wilson, to urge all men engaged in necessary work in mines, oil fields, and industries producing raw or manufactured materials to ask for deferred classification. A special committee to handle "man-power" problems has been named, with Charles Neave, a New York attorney, chairman.

Aluminum Production Increase Insured By Canadian Coöperation

A gratifying example of the coöperation between Canada and the United States in the matter of mutual stimulation of war industries is afforded by an incident which occurred at a recent sitting of the international commission on boundary waterways, held at Atlantic City. The Canadian attorneys, in support of national interests, had blocked action for a suspension of regulations which would have permitted the American Aluminum Co. to build an ice barrier on the south branch of the St. Lawrence River at Massena, N. Y., insuring work throughout the winter, and resulting in the addition of 6,000,000 lb. of aluminum to its normal output. On being advised of the shortage of aluminum for the manufacture of American battle planes, the Canadian government's special counsel immediately waived all objections, adding that the plans of the two countries for winning the war were interdependent and identical, and that Canada would coöperate in every way possible to insure the earliest and most complete success to the plans of the U. S. War Department.

Ryan and Crowell Promoted

John D. Ryan has been appointed Second Assistant Secretary of War in place of Edward R. Stettinius, who is now in France, it was announced on Aug. 27. Mr. Ryan, who has been directing the production of aircraft for the Army since the last of April, is now designated director of air service and is charged "with the responsibility of procuring and furnishing to the Army in the field the material and personnel required for the air service, and is given supervision, control, and direction over the Bureau of Aircraft Production and the Bureau of Military Aëronautics, with full power completely to coördinate their activities and to develop and carry out the air program." He will select a new head for the Bureau of Aircraft Production.

Benedict C. Crowell, First Assistant Secretary of War, has been specially entrusted with the responsibility for the munitions program, and as director of munitions has been given the necessary power to see that the munitions required for military operations are procured and furnished to the Army in the field.

Shaping New Preference List

The new list of preferred industries that is being formulated by the War Industries Board will be about twice as long as the one issued last April, which contained about 32 classes. The amplification is due to the widely expanded war needs and to allow for pressing demands of civilian origin.

The preference list is a key to the relative importance of all of the country's manifold industrial enterprises. The values are established by surveys as to national needs, and, once established, the list is maintained by a system of priority in determining the use of the six basic elements of industry, which are, (1) material; (2) facilities; (3) fuel; (4) transportation; (5) labor, and (6) capital. A point of interest lies in the fact that in the preference list is to be found an indication of what constitutes war work.

German Ore Imports After the War

No shortage of iron after the war is feared by German ore importers, according to an article in *Iron and Coal Trades Review*, and the German government has no intention of controlling this branch. Polish ores promise little in view of past experience. The Ukraine, on the other hand, may be relied on to yield valuable iron ores, especially for the Upper Silesian blast furnaces, provided that normal conditions are restored in transport. As for Swedish iron ores, much will depend on whether the Swedish government succeeds in its efforts to attract sufficient capital for smelting in Sweden itself. Moreover, it must not be overlooked that the favorable trade balance of Sweden rests largely on the export of iron ore. Even if there is no intention of regulating the import of iron ore in the transition period, the tonnage situation will have no small influence on the solution of the whole problem of ore imports.

The only state import organization which has come into being is for pyrite, of which German industry requires considerable quantities. As regards copper ores, Germany, of course, needed these in the first instance, and she has been deprived of the copper ore of the countries where she satisfied her requirements before the war. The various companies which are now completely under British influence have made mutual agreements for years to come, so that there is little chance of Germany obtaining the ores directly. Her principal sources of supply will now have to be Turkey and the Caucasus, but these deposits are little developed, and German companies will have many difficulties to overcome in Turkey, where the inhabitants are anything but friendly.

The German government has not sanctioned the foundation of a special copper-importing company, for experience has shown that after the war untrammeled trade will be in a better position than the government to obtain in the world market the copper required by German industry. The same authority also holds that Germany can no longer count on the lead and zinc ores which before the war were imported by a ring of German firms from Australia, and made up 90% of the total imports of these metals. In this case also Turkey may be helpful.

Manganese Prices in California

The War Industries Board has received an appeal from the Chamber of Commerce of San Francisco, representing the manganese producers of California, protesting against the prices recently fixed on agreement between the board and the American Iron and Steel Institute. It was later ascertained, with regard to manganese ore produced, sold, and consumed in the State of California, that the official schedule of prices could be disregarded. This phase of the question is therefore settled, and local conditions will remain undisturbed.

The following freight rates on manganese ore were authorized on Aug. 17 by Director General McAdoo:

RATES ON MANGANESE ORE, CAR LOTS, TON OF 2000 LB. MINIMUM CARLOAD WEIGHT, 60,000 LB.

From Stations in—	Group D(a)	Group 2(b)	Group B and C(c)	Group A(d)
Oregon	$11.00	$12.50	$12.50	$15.50
Washington	11.00	12.50	12.50	13.50
California	11.00	12.00	12.50	13.50
Montana	8.00	9.50	9.50	10.50
Arizona	9.00	9.00	10.50	11.50
Colorado	7.00	7.00	8.50	9.50
Nevada	10.00	11.00	11.50	12.50
Utah	9.00	10.00	10.50	11.50
New Mexico	7.00	7.00	8.50	9.50

a Group D: Chicago, Indiana Harbor, and Erie.
b Group 2: Points in Alabama and Tennessee taking Group C rates.
c Group B and C: Youngstown, Pittsburgh, Buffalo, and points in Ohio.
d Group A: Points in Seaboard territory, including Goshen, Va., Graham Va., Reusens, Va., and Roanoke, Va.

These rates are much lower than those prevailing in current tariffs and will tend to place Eastern and Western producers on a basis more nearly equal.

The American Tin Plate Co., a subsidiary of the United States Steel Corporation, will add 24 tin mills to its plant at Gary, Ind., according to a recent announcement. The extension, which will cost about $10,000,000, is made necessary by the extraordinary demand.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Application of Fixed Prices Defined

For the purpose of additional clearness and to prevent constant repetition, the price-fixing committee of the War Industries Board has adopted a resolution to the effect that where prices are stated to be fixed for the U. S. Government, the governments associated with it in this war, and the public (or primary civilian sales), the said prices are to extend to the Government and civilians of the United States (including civilians of its territories and insular possessions) and to the governments of Great Britain, France, Italy, Belgium and Japan. Furthermore, these maximum prices are not to extend to purchases made by the civilians of the latter mentioned Allied nations nor to the governments or civilians of nations other than those above enumerated.

Henderson Redrafts War-Minerals Bill

By a unanimous vote the Senate Committee on Mines and Mining accepted Senator Henderson's draft of the War Minerals Bill last week. The bill was formally reported to the Senate on Sept. 2, accompanied by a report written by Senator Henderson, who is chairman of the committee. The bill, as drawn by Senator Henderson, has the approval of the President, of the Secretary of the Interior and of the chairman of the War Industries Board.

As the discussion of the bill took up all of the time of the committee, the matter of gold production was not considered. Senator Henderson expects to call the committee together next week for a conference on that subject.

There will be no discussion of the subject of gold production by the Committee on Mines and Mining of the House until the results of the investigation of the Jennings committee are available.

May Ask Money for Potash Research

With the need for potash becoming greater, an effort will be made at this session of Congress to obtain an appropriation providing for experiments looking to the recovery of potash as a byproduct from blast furnaces and cement plants and to the investigation of potash-bearing silicate rocks.

The domestic production of potash during 1918 is estimated by the U. S. Geological Survey as 60,000 tons. This is 25% of pre-war importations. Some progress in its recovery is being made by cement companies. At the end of 1918 twelve of them will be recovering potash as a byproduct.

Blast-furnace operators are not inclined to undertake the recovery of potash in the face of pending revenue legislation. If they were allowed to amortize the cost of the potash equipment before being subject to a profits tax, it is believed that interest in the matter would be stimulated. This certainly would be the case, it is declared, if anti-dumping legislation were enacted.

All Steel for War Purposes

Any non-war use of steel is out of the question. A statement to this effect comes from Bernard Baruch, chairman of the War Industries Board, after the thorough survey of industries which has been made in connection with the adoption of the 64 groups of prime essential industries. Mr. Baruch also is making a determined drive on the high cost of living. He has begun with the shoe manufacturers. It is understood that those manufacturers have agreed to the standardization of their output in a limited number of fashions and that they have agreed to a price-fixing program.

Standardization and price-fixing may be expected to follow in numerous industries, as it is believed to be Mr. Baruch's intention to take active steps to reduce living costs or at least limit any further advances of materials that are essential for the use of the civilian population.

Chilean Nitrate in Demand

The War Industries Board and the War Department have notified the Department of Agriculture that the demand for Chilean nitrate in the manufacture of munitions will exceed the supply arranged for, and that farmers will in future probably have to do without nitrate as a fertilizer.

Suspension of work on the hydro-electric plant being built on the Tennessee River in no way affects the production of nitrates at Muscle Shoals, the Ordnance Department announces. As five years will be required to complete the large power plant, it must wait so as to release labor and materials for more urgent work. The Muscle Shoals plants are being rushed to completion. Over 20,000 men are now employed there. Prior to the completion of the large waterpower plant, power will be purchased from the Alabama Power Co. and will also be generated at a Government steam electric plant for operating the new project.

Gold Producers Slow in Replying

It is Senator Henderson's intention to call a meeting of the Committee on Mines and Mining this week to discuss the gold situation. The committee in each house is being flooded with requests that action be taken and with suggestions as to how the situation may be remedied.

While a study of the question will be started immediately, it is probable that the committees will await the results of the investigation now being made by a committee headed by Hennen Jennings. This body, however, is being retarded in its efforts by the failure of gold producers to reply to a questionnaire sent them recently. Before intelligent action can be taken, Mr. Jennings believes that it is absolutely necessary to have at hand certain late data which can be furnished only by the producers themselves.

Cousin Jack Speaks for the 27th

I 'as 'eld up my h 'own on a muck-stick,
An' I naws 'ow to crib up a raise;
An' all other phases of minin'
I've done well, for I naw that it pays.

In 'andlin' a jack or a burley,
Or in cuttin' a post for a set,
You'll find that I naws all about it,
For 'twas minin' come first, you can bet.

Then the war, with its fright and its 'orrors
Come along. An' they sent out their call
For miners. There's no doubt about it
They was needed—we h 'answered—that's all.

Hard work ahead for the mining regiment. Dig from sunup until sundown and then some. Harder than the work they left at the call to the colors, as Cousin Jack describes above. While they are digging down, let us follow suit, with the Comfort Fund in mind all the time. Send in your check today.

HOW THE COMFORT FUND STANDS

Prevously acknowledged	$14,436.50
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Horace B. Small	10.00
[illegible] C. Porter	10.00
[illegible] F. Taggart	10.00
G. E. Farish	25.00
H. K. [illegible]	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
P. M. Arnold	10.00
W. A. Wolf	5.00
Employees of Utah Leasing Co., Newhouse, Utah	20.50
Employees of Braden Copper Co.	112.50
Charles A. Mitke (second contribution)	10.00
Total	$16,342.61

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Memory of Dr. Douglas Honored

Owing to the late arrival at Colorado Springs on Sept. 3 of the members of the American Institute of Mining Engineers, the memorial service for Dr. James Douglas, which was on the program for the forenoon, was postponed until 2 o'clock. President Sidney J. Jennings opened the service with a brief review of Dr. Douglas' openhandedness toward the Institute, and was followed by E. P. Mathewson, representing the Canadian Mining Institute, who told of the generosity of the late philanthropist in matters affecting Canadian scientific work. Dr. Douglas was portrayed as the publisher and farsighted champion of free interchange of technical information by W. R. Ingalls. T. H. O'Brien, in behalf of the Phelps Dodge Corporation, then sketched the career of the company's late president as a captain of industry, laying stress upon the kindness of Dr. Douglas to his fellow-workers, high and low.

The memorial service was followed by motion pictures loaned by the Canadian government, depicting various methods used in preparing crippled soldiers for industrial usefulness. Other pictures showed the mining and milling operations of the New Cornelia Copper Co., at Ajo, Ariz. Dr. Louis D. Ricketts, who had loaned the films, explained the different features of the work.

Cleveland-Cliffs Iron Co. Holds Annual First-Aid Contest

The sixth annual first-aid contest of the Cleveland-Cliffs Iron Co. was held at Ishpeming, Mich., on Aug. 14, and was participated in by nine teams, one each from the Holmes, Negaunee-Athens, Gwinn-Francis, Lake-Salisbury, Morris-Lloyd, Republic, Gardner-Mackinaw, Maas and Cliffs Shaft mines. The Lake-Salisbury team, composed of W. Jenkins (captain), A. Nault, T. Paul, F. J. Chynoweth, and J. Coad, won first honors, with a score of 98 points. The Republic team was given second place and the Holmes and Cliffs Shaft tied for third place.

The judges were Drs. V. H. Vandevender, G. G. Burnett and H. B. Hayes. The problems were as follows: One-man event—treat a wound of the index finger of the right hand. Three-men event—treat a compound fracture of left forearm and a left ear torn off. Team event—treat a compound fracture in the right thigh and a lacerated wound of the forehead. Team event—a man is found unconscious from gas in face of drift; rescue, using one-man carry, and treat (Schaffer method).

Manganese in Newfoundland

Any important increase in the production of manganese ore in Newfoundland is unlikely, owing to th thinness of the higher-grade beds, the amount of barre material to be moved and to shipping and labor condi tions, in the opinion of Frank H. Probert, who has jus returned from Newfoundland and Nova Scotia. M Probert is a mining engineer assisting in the wa minerals investigation being conducted by the U. S Bureau of Mines. He speaks favorably of the man ganese deposits in Lunenberg County, Nova Scoti as a potential source of small quantities of high-grad chemical ore.

August Mining Dividends

Dividends disbursed in August, 1918, by 21 United States mining and metallurgical companies making public reports amounted to $10,320,109, compared with $13,456,756, distributed by 34 companies in August, 1917. Canadian, Mexican and South American companies paid $2,989,637, as compared with $1,771,051 a year ago, the increase being due to the large disbursement by Cerro de Pasco, which paid in August this year, whereas last year its quarterly dividend came in September.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead & Sm., pfd	U. S.	$1.50	$120,810
Anaconda, c.s.z	Mont.	2.00	4,662,500
Arizona Cop	Ariz.	.36	554,000
Barnes King, c.g	Mont.	.10	40,000
Caledonia, l.s	Ida.	.03	78,150
Champion, c	Mich.	6.40	640,000
Chief Cons., l.s	Utah	.12½	110,527
Cresson Cons., g	Colo.	.10	122,000
First Nat., c	Calif.	.15	90,000
Golden Cycle, g	Colo.	.03	45,000
Homestake, g	S. D.	.50	125,580
Internat. Nickel, pfd	U. S.-Can.	1.50	133,689
Iron Cap, c	Ariz.	.25	36,203
Jim Butler, g	Nev.	.07	120,261
Miami, c	Ariz.	1.00	747,114
Mohawk, c	Mich.	2.00	200,000
New Jersey Zinc	U. S.	4.00	1,400,000
Tamarack & Custer, l.s	Ida.	.06	106,575
United Eastern, g	Ariz.	.05	68,150
United Verde Ex., c	Ariz.	.75	787,500
Utah Apex, c	Utah	.25	132,050

Canadian, Mexican and South American Companies	Situation	Per Share	Total
Amparo, g	Mex.	$0.05	$100,000
Asbestos Corpn., pfd	Que.	1.25	50,000
Cerro de Pasco, c	So. Am.	1.25	1,009,474
Coniagas, s	Ont.	.12½	100,000
Esperanza, g.s	Mex.	.24	109,200
Granby Cons., c	B. C.	2.50	374,963
Greene Cananea, c	Mex.	2.00	1,000,000
Hollinger, g	Ont.	.05	246,000

Holding Companies	Situation	Per Share	Tota
Calif. Explor	Calif.	$0.12	$28,139
St. Mary's Min. Land	Mich.	2.00	320,000
White Knob Cop., pfd	Calif.	.05	10,000

The totals for the first eight months of the year are as follows: Mining and metallurgical companies, $105,975,152; holding companies, $1,435,005; Canadian, Mexican, Central and South American mines, $12,745,090. The table shows details of the month's payments.

The Colorado Meeting of the A.I.M.E.

Denver Correspondence

More than 350 members of the American Institute of Mining Engineers registered at the Brown Palace Hotel, Denver, on Sunday, Sept. 1, and over 500 members are expected to attend at Colorado Springs. On Sunday afternoon the party visited the City Park Museum at Denver, where the great collection of native gold is exhibited, and later, by courtesy of Mayor Mills, attended an organ recital at the Denver Auditorium. On Sunday evening, the members attended a band concert at City Park. The first technical session on metallurgy was held at the Brown Palace Hotel on Monday morning, when several papers were read by title and discussed briefly. The subject of electrolytic precipitation appears to have awakened intense interest and will be discussed fully at a later special session. Later the party visited ferro-alloy plants and witnessed the manufacture of ferromanganese and ferrochrome. At a luncheon, which was held at the Denver Club instead of at Hosea Lodge, more than 200 guests enjoyed the club's hospitality. After luncheon members of the party took an automobile trip to Lookout Mountain, Colorado Point and Gennessee Mountain, followed by a visit to the Herold pottery plant, at Golden. Monday evening 400 members attended a dinner at the Denver County Club, where local members entertained the guests with music and the usual Western freedom and good fellowship. Colonel Burbridge presided. Interesting and entertaining speeches were made by Mrs. Stearns, who reviewed the work of the local branch of the Woman's Auxiliary of the A. I. M. E., and by E. P. Mathewson, H. Foster Bain, C. W. Goodale, Thomas B. Stearns and H. V. Winchell. The party entrained for Colorado Springs Tuesday morning.

Metallurgical Board Created

In order to assure more complete coördination of the various activities of the Ordnance Department along metallurgical lines, it has been decided to establish a board on metallurgical matters, the personnel of which is as follows: Dr. G. W. Sargent, Engineering Division, chairman; Lieut. Col. W. P. Barba, Production Division; Major A. E. White, Inspection Division, representing the Ordnance Department; Lieut. Col. F. B. Richards, of the office of the Assistant Secretary of War; L. L. Summers, representing the War Industries Board; and William H. Smith, representing manufacturers.

Gasoline Conservation Urged

The urgent need of conservation of gasoline, to prevent the necessity of putting the nation on oil rations, has led to the following suggestions from the bureau of oil conservation of the U. S. Fuel Administration:

Leaks and spilling must be eliminated, and evaporation by leaving tanks and cans open must be stopped.

Motorists must not use gasoline for washing their cars, clothes, or hands; they must cease racing their motors, and must stop their engines when cars are not in motion, such as when waiting at railroad crossings and on similar occasions.

Truck operators will be required to conserve gasoline by the adoption of every means that will increase their mileage.

The oil drained from crank cases, differential and transmission, possesses commercial value and must not be thrown away. Even the residual oil used in cleaning must be saved for reclaiming.

Carburetors should be adjusted to operate on the thinnest possible mixture. Cut-off cocks should be installed in the gasoline line next to the carburetor, with control on the cowl of the car, so that the supply of gasoline may be entirely shut off when coasting. The saving such a device will effect will be great and soon would more than offset the cost of making such an addition to the car.

Tungsten Production in China

Mining has become a more important industry as a result of the discovery of wolfram about Swabue during the summer of 1917, according to a consular report. Since then wolfram ore has been found in other parts of the district, and now many thousands of Chinese are digging for this valuable mineral, which undoubtedly exists in large quantities. Much of the output has been sent to Canton, via Waichow, for export, but its free movement is now being interfered with by recently established official restrictions. The people of this region are beginning to display an interest in their mineral resources, and it is hoped that the development of other valuable deposits which are known to exist in this region will result.

Editorials

The Treasury on Profiteering

NOT long ago the Secretary of the Treasury, and through him the President, intimated that they had in the income-tax returns for 1917 evidences of profiteering by corporations and others. This led the Senate, in its resolution No. 253, to call upon the Secretary to submit to it a list of the corporations which in 1917 earned in excess of 15% upon their capital stock. The Secretary responded to this with a bulky report, which is printed as Senate Document No. 259. It is clear from the letter of transmittal that the Secretary did not comply exactly with the Senate's request. The Senate asked for a list of *all* corporations earning in excess of 15%, while the Secretary submitted a list of 31,500 out of a total of 55,000. This leaves us in doubt as to whether the Secretary intended to select a list of "horrible examples" or what he intended to do.

However, the printed report served the purpose of confirming the previous statements and convincing the thoughtless that there had indeed been unconscionable profiteering. Few senators, and much less will Tom, Dick and Harry, either have the knowledge or the inclination to examine critically this mass of figures. They will be more apt to say simply that here is proof positive that there are corporations that earned more than 100% on their capital in 1917, and therefore they should be taxed more heavily. Incidentally, we may remark that we have been informed from Washington that this report is very hard to get. We shall confine our comments upon its figures to those which pertain to the mining and metallurgical industry.

We find first, on p. 129, that under the caption of concerns "smelting and refining copper, lead, zinc, etc.," there are 18 listed. One of these had a capital stock of $3,100,000 and an invested capital of $3,525,262; another had a capital stock of $686,800 and an invested capital of $3,467,256; a third had a capital stock of $1,500,000 and an invested capital of $2,224,428; and a fourth had a capital stock of $150,000 and an invested capital of $1,394,779. These were all of the 18 that were in the million-dollar class, considering both capital stock and invested capital. The rest ranged down to concerns of the $4000 size, there being three whose invested capital was less than $10,213. And this is the presentation of our great metallurgical industry! It looks as if the Treasury experts had been simply summarizing the returns of the junk smelters.

However, on p. 372 we find two more concerns listed under this caption. One of them had a capital stock of $2,500,000 and an invested capital of $4,068,371, on which it earned 26.33%. The other had a capital stock of $50,747,200, on which it earned 26.99%. These two concerns are of fair size, one of them indeed large, but they are very far from representing the metallurgical industry of the country.

Under "mining, copper—Michigan," three large concerns are listed. Under "copper—Montana (Butte)," there is given one concern of $100,000, on which it earned 198.49%. Under "copper—Utah, Arizona, New Mexico," there is one concern given, it having a capital stock of $525,000 and an invested capital of $4,669,662. Manifestly, this is not Utah, Chino, Ray, Miami, Inspiration or Copper Queen. Under "copper—miscellaneous localities," is given one company, possessing a capital stock of $9,997,285, on which it earned 53.92%. We did not need to retain Sherlock Holmes to detect for us that this is Nevada Consolidated. And, knowing that, we are aware that while Nevada was originally capitalized at $10,000,000, increase in the value of the mine long before 1914 had caused its shares to have an aggregate market value of $40,000,000. Investors who purchased those shares around $20, and who did not enter upon any reckless speculation in so doing, will not easily be convinced that they are profiteers owing to their company earning about 13½% on their purchase price.

Among gold, silver, lead and zinc mines there was one that earned the scandalous profit of 468.29% on its capital stock, but the latter was only $60,000. This was the only concern in this list. Its percentage of earnings was, however, paltry in comparison with that of the solitary representative of "mining: gold, silver, lead, zinc, etc., complex ores—Western," which earned 551.13% on its capital stock, but, alas! the latter was only $3000. We thought this was going some, until we turned to the next page and found a caption of "mining: lead and zinc," under which were listed six companies, one possessing a capital stock of $35,000,000, on which it earned 71.6%, but among the five other companies there was one that earned 2573%; one that earned 4087%; and one that earned 4741%. Verily, those are the right kinds of mines for anybody to have his money in, even if their capital stocks were only $8000, $8000 and $5000 respectively!

We hesitate to draw any sweeping conclusions, for, as we have said previously, we do not know whether the Treasury experts selected out of the 55,000 corporations what they deemed to be the most horrible examples, or what reason they had for not reporting the figures of 23,500 corporations; or, in short, what they were up to, anyhow. But the following things we may say with certainty, viz.:

1. They did not obey the Senate's instruction to report *all* corporations earning more than 15% on their capital stock in 1917.

2. They violated the terms of the income-tax law, which provide for secrecy of individual returns. For although they do not state names, but merely give symbols for the several companies, we found no difficulty in identifying the mining and metallurgical companies of importance.

3. If, as Secretary McAdoo says, the 31,500 corporations out of a total of 55,000 "are believed to be representative . . . of the business activities of the country," the conspicuous absence of the principal mining and metallurgical companies (with only a trifling number of them being recorded "present") may be taken as evidence that their earnings in 1917 were on the whole less than 15% on their capital stock.

But what a picayune business it was to list a few $5000, $10,000 and $100,000 concerns in our great industry! To exemplify copper mining at Butte by one concern of $100,000 capital and to list an aggregate of only six copper mines in the entire country! It is more than a picayune business—it is dishonest, for there is a manifest intention to create a false impression. We do not attribute any motive so mean to Mr. McAdoo, for we know very well that he is a man of multifarious responsibilities who is obliged to rely upon what his subordinates tell him. But if the whole of their summary of the income-tax returns of 1917 prepared for the honorable senators is as misleading as the figures for the mining and metallurgical industry, we can only say that the Treasury subordinates who did this work performed a job for which we should not think their superiors would thank them.

The Economics of Salt

THE catholicity of mining engineering is illustrated by the broad scope of the work; and no better example of this could be presented than the article on salt mining and dressing which we print in another part of this issue. The ubiquity of salt and its cheapness in almost all parts of the world often tend to mask the importance of the industry and the problems encountered. Shortages of salt are practically unknown, especially in the United States; and so one reason for the frequent focusing of public attention is absent. Refrigerating plants obtain their normal or abnormal supplies without trouble. The chemical industries are well cared for, even when enormous increases of sodium salts and poison gas are needed to meet the demands of the war. The extensions to equipment which resulted in an excess production a few years ago are now a valuable asset. The mine and dressing plant described in the article referred to will produce about 2000 tons of salt a day, and this will bring New York State into the front rank of salt producers in America.

Salt has figured largely in the economic history of the world. Its scarcity in olden times led to wars and diplomacy to gain possession of saline tracts. Many of the notable trade routes originated for the better distribution of salt and incense—two commodities typical of material and spiritual awakening in early times—a juxtaposition which doubtless led to the use of salt in connection with many quaint and superstitious customs. The scarcity of salt can be gaged from the fact that in parts of northern Africa it has been used as currency. Tribes and races have lived in other parts of the world without becoming acquainted with it; with the result that there is a greater craving when it is once introduced than more civilized races have for sugar. A cannibal appreciates the attractiveness of a naturally seasoned portion of missionary—a circumstance that may partly explain the frequent disasters to white people in unfrequented and unexplored places. It would, perhaps, be far fetched to attribute the elimination of cannibalism or other savage instincts entirely to salt, but there is abundant evidence to show that its introduction and extended use have been a concomitant of civilization and progress.

The uses of salt are legion, and its culinary application is, perhaps, of least importance. As a necessity it is indispensable in the fish-curing and meat-packing industries, in the preparation of leather, and for various other purposes.

Crude salt is produced by the mining and milling methods in the article under discussion; and also, and to a much larger extent in the United States, by evaporative methods from natural or artificial brine. In other countries the greater proportion comes from the mines, which, in many instances, possess beds of enormous thickness. One deposit near Berlin has been proved to persist to a depth of 4000 ft. from near the surface. Evaporative systems include the solar method, which can be worked only for part of the year in a temperate climate; steam evaporation in kettles and in what are known as grainers; evaporation in open vessels by means of heat; and vacuum-pan evaporation. All these methods are at present in use. In the dressing of the crude material to produce fine salt the crystals are washed, dried in rotary driers, and crushed between rolls. Multiple screens separate into various grades and return any oversize for further reduction.

The mining of salt has necessitated the overcoming of many special problems, particularly when water has been encountered during shaft-sinking operations, and when it has been necessary to keep the lower levels of the mine dry. Augur drills, operated by compressed air, are used extensively; and single blasts may bring down 500 tons or more of salt.

The New Draft

THE new draft law and the recently announced determination of the Administration to place an army of 5,000,000 men in the field are good news. We like the plan, even though we may have to make our sacrifices. There is nothing saved in half-way measures. We are fighting a cruel and blood-thirsty enemy, who has thrown his all into the ring. No better news for us can filter into Germany than the knowledge that we have placed our full man power, as well as our resources, in the fight.

We waste time in speculating as to when the war will be over. It will end when it ends, and it will end soonest when we have marshaled our full strength in the field. We will win the war, but it is not wise to prolong it indefinitely. Others fiddled with the Panama Canal. We built it; but we had to learn the lesson of concentrating our resources and our finances in sufficient quantity. The war is only another Panama, but a bigger one. The digging is there, but of a different kind. The engineering skill, the inventive genius, the powers of organization, the resources that accomplished the first great task, will build our ships, place our men and guns "over there," and win the war. The Administration now realizes this. Let us do our share.

Every Employer Can Help the Nation and Himself Under This Plan

ON PAGES 46 and 47 of this issue we publish the announcement of a plan in which, under an organized method, the coöperation of every employer is requested in order to help in the promotion of the Fourth Liberty Loan. That announcement is worthy of your careful and immediate attention and action.

It is certainly not difficult to see how the energetic carrying out of this plan may produce results helpful not only to the Liberty Loan but to American business. The tremendous impetus which Charles M. Schwab has given to shipbuilding has been largely achieved by making every individual engaged in the industry feel a personal responsibility for results and a personal pride in helping to make great results possible.

This spirit of accomplishment in the shipbuilding industry has been brought about by the leaders, the employers, the bosses—whatever you choose to call them—making it a business to come in personal contact with the workers and to inspire and enthuse the men with a sense of the importance of their work for victory in the war—with a sense of personal responsibility and a spirit of team-work.

The creation of that spirit among the workers of the nation in all lines of activity would be of incalculable benefit to the workers themselves, to employers, and to the nation.

Concretely stated, two of these results would be:

1. To quicken and increase the response to all war measures such as Liberty Loans—War Savings Stamps—the draft—food and fuel saving.

2. It would make the worker feel more keenly his responsibility to do his work (no matter what its character) to the very best of his ability. Make him feel the necessity of sticking closely to his job.

Employers generally should pursue with intelligent enthusiasm the plan of "Win-the-War" meetings proposed as a means to aiding the rapid flotation of the Fourth Liberty Loan. The results of such action will not only be helpful in the Loan drive, they will be permanently helpful to the nation through the development of a keener realization by the worker of the importance and dignity of his individual job and the necessity for personal responsibility and helpful team-work.

Every employer, every mining company, and every reduction company can be a leader and a center of influence in this work.

The man who operates a small business with relatively few employees may feel that his circle of influence is too small to be worthy of any effort. That is a mistake. It is the aggregate that counts, as the announcement of the plan very clearly points out.

The man who is in a relatively small circle may not hold so pretentious a meeting—it may not be formal or run under parliamentary rules—it may not be especially announced, or accompanied by music and oratory. But the man who will quietly call a dozen employees around him and informally, thoughtfully, lead discussion into win-the-war channels, pointing out the importance of the individual's doing his best in support of Liberty loans and all other war activities, can do a real service in this way. It can be so well done in no other way. And ten thousand such little meetings would produce an enormous aggregate result.

Whether his opportunity be great or small, every American business man should carry out this idea in a definite, systematic manner. The "Program" pamphlet which is mentioned in the announcement will be found tremendously helpful in its suggestions as to what should be done under any circumstances.

The War-Minerals Bill

SENATOR HENDERSON has introduced a bill, which has already been approved by the Senate Committee on Mines and Mining, as a substitute for the bill passed by the House. The latter was a clumsy, ramshackle and dangerous adaptation of the Lever bill. Senator Henderson cast it aside and drafted an entirely new one, which is infinitely a better one.

Senator Henderson limits his bill to relatively few minerals and metals. Antimony, chrome ore, fluorspar, graphite, manganese, platinum, pyrites, sulphur, tungsten and tin are the most important. The bill authorizes the President to enter into contracts for buying or selling these substances and provides a fund of $50,000,000 for the purpose. The President may designate any agency of the Government—the War Industries Board, the Department of the Interior, or any other, as he may see fit—to do this. Moreover, he is authorized to create a corporation, or corporations, to do it. The latter would manifestly be the logical thing to do, for a corporation can act with an efficiency that a Government bureau can not, as Mr. Ryan recently pointed out with so much lucidity.

Senator Henderson's bill is free from the irritating licensing provisions and the mischievous price-fixing authorizations that made the House bill so dangerous. The only things in it that we criticize are the retention of the unjust 75% payment-with-right-to-sue provision in the event that the owner of property taken over by the Government be dissatisfied with "just compensation, determined by the President." This might easily be made a form of legalized robbery. Another objectionable feature is the provision that the President, upon finding "that importation into the United States of any of the necessaries . . . is likely to result in a loss to the United States upon any necessaries which it may have acquired," may impose such an import duty as will be sufficient to protect the United States from loss. This means that the country as a whole would have to pay for errors of judgment by the Administration, which, of course, it would have to do anyhow, but under the method of recouping by import duty the people would probably have to pay many times over. It would be cheaper and more economic for the Government to pocket its loss in the first place.

The lapse of time since this war-minerals proposition was first broached, and the natural easing of tension in the meanwhile, tend to confirm our original opinion that this legislation is unnecessary; but, inasmuch as departments of the Administration have set their heart upon it, Congress is obviously bound to defer to their wishes. Senator Henderson's bill complies with those wishes and does it in a sound, businesslike way.

Remember the Comfort Fund of the 27th Engineers.

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittance are made in even dollars, we will return the excess over an order in coupons if so requested.

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(See also "Petroleum and Natural Gas")

9827—COKE—Methods for More Efficiently Utilizing Our Fuel Resources. Part XIX. By-Product Coke Ovens. E. B. Elliott. (Gen. Elec. Rev., July, 1918; 13½ pp., illus.) 20c.

9828—COKE—Some Characteristics of American Coals in By-Product Coking Practice. F. W. Sperr, Jr. (Journ. Frank Inst., Aug., 1918; 32 pp., illus.) 40c.

9829—COKE BYPRODUCTS—The Wastage of Coke Byproducts. Frederick MacCoy. (Eng. and Min. Journ., Aug. 10, 1918; 1½ pp., illus.) 20c.

9830—PEAT—L'Industrie de la Tourbe. L. Fabre. (Rev. de Chim. Ind., Apr., 1918; 3¾ pp.)

9831—PRODUCER GAS, Its Manufacture and Use. C. S. Palmer. (Proc., Engrs. Soc. W. Penn., May, 1918; 33 pp., illus.) 40c.

9832—STORED COAL—The Diffusion of Oxygen Through Stored Coal. S. H. Katz. (Tech. paper 170, U. S. Bureau of Mines, 1917; 48 pp., illus.)

MINING AND METALLURGICAL MACHINERY

9833—DRILL—Choosing the Right Rock Drill. John F. Berteling. (Mine and Quarry, July, 1918; 6 pp., illus.) 20c.

9834—WELDING—Oxy-Acetylene Welding of a Roll-Frame. O. J. Zook. (Min. and Sci. Press, Aug. 3, 1918; 1¼ pp., illus.) 20c.

INDUSTRIAL CHEMISTRY

9835—GERMANY—L'Industrie Allemande et la Guerre. R. C Jaureguy, H. B. Froment and R. E. Stephen. (Bull. Soc. d'Encour., May-June, 1918; 69 pp.) Discusses nitrogen, sulphur anc sulphuric acid, fuels, iron and other metals.

9836—PACIFIC COAST—The Future of Electrochemistry anc Metallurgy on the Pacific Coast. J. W. Beckman. (Chem. and Met. Eng., July 1, 1918; 1½ pp.) Extracts from a paper befor the Am. Inst. of Elec. Engrs.

9837—SOUTHERN CALIFORNIA—Prospects of a Chemical In dustry in Southern California. Julius Koebig. (Chem. and Met Eng., July 1, 1918; 3½ pp.) Paper before Los Angeles Sectior Am. Chem. Soc., dealing with possibilities of the development o the deposits of lignite and desert alkali into sources for th production of the fundamental chemicals.

9838—SULPHURIC ACID—Dearsenication of Sulphuric Aci H. E. J. Cory. (Chem. Tr. Journ., Feb. 2, 1918; 1½ pp.) 40c.

9839—SULPHURIC ACID—Sulphur, Pyrites and Sulphuri Acid in 1917. Philip S. Smith. (Mineral Resources of the U. S 1917—Part II; 44 pp.)

MISCELLANEOUS

9842—POWER—New Hydro-Electric Development on Dea River, Michigan. Morgan H. Wright. (Eng. and Min. Jour Aug. 17, 1918; 1¾ pp., illus.) 20c.

9843—PRICE-FIXING. Editorial. (Eng. and Min. Jour Aug. 3, 1918; 1¼ pp.) 20c.

9844—WAR—First Report of the Work of the Munition R sources Commission. (Canada Munition Resources Commissio Nov., 1915, to Feb., 1918; 27 pp.)

9845—WAR—Food for the War. H. C. Hoover. (Min. a Sci. Press, May 18, 1918; 5½ pp.) 20c.

9846—WAR—French Quarries Inspected by U. S. Enginee Robert K. Tomlin, Jr. (Eng. and Min. Journ., Apr. 6, 1918; 2 p illus.) 20c.

9847—WAR—L'Industrie Allemande et la Guerre. R. C. Jau guy, H. B. Froment and R. E. Stephen. (Bull. Soc. d'Encou May-June, 1918; 69 pp.) Discusses Germany's supply of nitrog sulphur and sulphuric acid, fuels, iron and other metals.

9848—WAR—Mining in "No Man's Land." H. D. Troun (Eng. and Min. Journ., July 27, 1918; 1⅓ pp.) 20c. A repr from "The Castle," published at Camp A. A. Humphreys, Va.

9849—WAR—Price-Bidding in War Times. Roswell C. M Crea. (Chem. and Met. Eng., July 15, 1918; 6 pp.) A discuss of the economic principles involved in public control of indus versus unrestricted competition; effect of price-bidding on la and production; experience of Great Britain.

9850—WAR—"Profiteering." Editorial Commenting on Federal Trade Commission Report to the U. S. Senate. (E and Min. Journ., July 6, 1918; 1¼ pp.) 20c.

9851—WAR— Road Builders Work Close to the Front in Am can Sector in France. Robert K. Tomlin, Jr. (Eng. and M Journ., May 25, 1918; 3½ pp., illus.) 20c.

Personal

Have You Contributed to the Association of the 27th Engineers?

A. P. Watt has gone to Newfoundland on mine-examination work for a couple of weeks.

Fred Flint, of Salt Lake City, has been examining properties in western Nevada recently.

L. S. Cates, of Ray, Ariz., general manager of the Ray Consolidated Copper Co., was in Los Angeles, Calif., recently.

Charles Henrotin, of Haileybury, Ont., is operating a fluorspar property near Madoc, Ont., and shipping to the United States.

E. Jones, chief chemist of the Oliver Iron Mining Co. at Ely, Minn., is at Crosby, Minn., where he expects to open a laboratory of his own.

Sir John W. Carson, president of the Crown Reserve Mining Co., Ltd., inspected the Alice property recently at Idaho Springs, Colorado.

C. H. Claypool has been made superintendent for the Todd Stambaugh interests, with headquarters at Hibbing, Minn., to succeed **Bruce Middlemiss**.

H. W. Aldrich arrived at Miami, Ariz., on Aug. 21, where he will be assistant general superintendent for the Inspiration Consolidated Copper Company.

A. F. Keene has given up his London practice until peace is declared. In the meantime, his temporary address is Room 1100, 42 Broadway, New York.

G. E. Pidgeon, who has been in charge of the Rival Mining Co., at Twin Peaks, N. M., resigned on Sept. 1. He will go to California to enter service with the artillery.

E. J. Wilson, of New York, has resigned as consulting engineer for the Jacobs asbestos mines, in Quebec, and will be identified with the Johnson operations in the same district.

H. V. Snell, of Globe, Ariz., has been inspecting the Ash Peak Extension mine at Duncan, Ariz., and the Atwood mine at Lordsburg, N. M., in both of which he is interested.

J. S. Stewart, exploration engineer for the Midvale Steel Co., is at present making his headquarters at Grand Rapids, Minn., where he is supervising the drilling of some newly leased property.

A. M. Yonge has been appointed general manager of the West End Furnace at Roanoke, Va. Mr. Yonge also holds the position of efficiency engineer of the American Manganese Manufacturing Company.

Herbert C. Hoover has received the Audiffret prize of $3000 awarded by the French Academy of Moral and Political Science in recognition of his services as Food Administrator in Belgium and the occupied portion of France.

R. H. Banister, vice president of the Woodward Iron Co., has been granted a year's leave of absence after 25 years' service. **Frank Crockard**, formerly president of the Nova Scotia Steel Co., has been invited to join the Woodward company. **J. J. Shannon**, general manager of the latter company, has resigned.

Todd C. Woodworth, who operated in Chihuahua and Sonora, Mexico, for several years, has enlisted in the 42nd Canadian Highlanders (Black Watch) and is now over seas. His youngest son, also in the Canadian contingent, was killed in France a few months ago.

F. N. Flynn, general superintendent of the smelting and refining departments of the Consolidated Mining and Smelting Co. of Canada, Ltd., at Trail, B. C., has resigned. Mail addressed care of the American Institute of Mining Engineers, New York, will be forwarded.

Major John C. Greenway, of Warren, Ariz., general manager of the Calumet & Arizona Mining Co., who has been with the American engineers in France since last summer, has been given the rank of lieutenant colonel and, at his own request, transferred to the infantry.

T. A. Stiles, who has been in charge of the construction of the United Verde Extension smeltery in the Verde Valley, near Jerome, Ariz., was presented by his associates with a ring and watch, prior to his departure after completing the work. In a month he expects to leave New York for Oroya, Peru, to erect a large reduction plant on an Amazon tributary, east of Lima.

Capt. John E. Orr, mining engineer with the Mt. Morgan Gold Mines, of Mt. Morgan, Queensland, Australia, passed through Montreal recently on his way home after serving nearly three years in Gallipoli and France. He enlisted in 1914, won his commission on the field at Gallipoli, was wounded in France and has received his discharge. He will resume his work with the Mt. Morgan company.

N. H. Emmons, 2nd, joined the staff of the Air Nitrates Corporation, 360 Madison Ave., New York, in January, 1918, as engineer of materials and production. In July, he was given the position of operation director of the plant at Muscle Shoals, Ala. It will be remembered that the sulphuric acid plant of the Tennessee Copper Co. at Copperhill, Tenn., was put into successful operation under the management of Mr. Emmons in 1909, 1910 and 1911. The third unit was also started in 1916 under the same management.

John D. Ryan resigned on Sept. 3 as president and director of the Anaconda Copper Mining Co. for the period of the war, on account of the necessity of devoting all of his time to the service of the Government as Director of Air Service. **C. F. Kelley**, vice president, was chosen to succeed him. Mr. Ryan is also president of the United Metals Selling Co. and the Montana Power Co. and is vice president of the Greene Cananea Copper Co. He is a director of the Mechanics and Metals National Bank of New York, of the St. Paul R. R., the American International Corporation and of the Inspiration Consolidated Copper Co. He is a trustee of the American Surety Co. and is also a director of the Emigrant Industrial Savings Bank of New York.

Obituary

Joseph Hartshorne, a consulting metallurgical engineer, died at Pottstown, Penn., on Aug. 24, aged 70 years. He was in the class of 1873 at the Massachusetts Institute of Technology.

Terrance Curran, Dominion Government mining recorder in Yukon Territory, was drowned recently, his body having been found on Aug. 15 near White Horse, Y. T. He was 45 years old.

Norman Schultz, formerly one of the owners of the Jumbo and Bonanza mines, which were sold to the Kennecott Copper Corporation, died on Aug. 21, aged 65 years. His home was in Summit, New Jersey.

Prof. Samuel W. Williston, dean of palaeontology of the University of Chicago, died in Chicago on Aug. 30, aged 66 years. Shortly before his illness he was in charge of a corps of scientists in Texas engaged in exploring the fossil fields of that state.

Joseph Storey Curtis, an American engineer who went to South Africa in 1887, died at Johannesburg during the first week in July, from a sudden attack of pneumonia. Mr. Curtis first visited the Rand on behalf of the Rothschilds. His first work of importance there was to lay out the Langlaagte Estate. He later engaged in opening up the New Rietfontein property for the Rhodes-Rudd-Caldecott interests and subsequently the Village Main Reef, which was the first deep-level mine on the Rand. Mr. Curtis was one of the ablest geologists on the Rand and an authority on borehole deflections. He took an active interest in Rand politics. At the time of his death he was engaged in preparing a history of the Witwatersrand, which he left unfinished.

Societies

Mining and Metallurgical Society of America. The New York section held its monthly meeting on Sept. 5 at the Columbia University Club, 4 West 43rd St., New York. The guest of honor, C. W. Purington, addressed those present on the "War Activities of the American Committee of Engineers in London."

Association of Iron and Steel Electrical Engineers will hold its twelfth annual convention at the Southern Hotel, Baltimore, Md., on Sept. 11 to 13. Papers to be read include the following: "Automatic Engine Stops," by Walter Greenwood, safety engineer of the Ohio Works, Carnegie Steel Co.; "Bridge-Motors for Overhead Traveling Cranes," by R. H. McLain; "Condensers and Condenser Engineering Practice," by D. D. Pendleton, of Wheeler Condenser and Engineering Co., Pittsburgh; "Standardization of Ratings of Large Rolling Mill Motors," by K. A. Pauly, General Electric Co., Schenectady, N. Y.; "Electrically Driven Mills," by J. T. Sturtevant; and "Remote Controlled Sub-Station," by W. T. Snyder, National Tube Co. Reports will also be made by the safety committee on "Rules for the Safe Operation of Electric Cranes"; by the educational committee on "Methods of Education for Electrical Employees of Iron and Steel Mills"; and by the standardization committee. The plant of the Bethlehem Steel Co. at Sparrows Point, Md., will be inspected on the afternoon of Sept. 13.

National Exposition of Chemical Industries. More than 350 companies will exhibit at the fourth exposition to be held in the Grand Central Palace, New York, during the week of Sept. 23-30. The commandeering of the building as a base hospital by the Government, as announced in the press, will not affect the plans already made for the exposition, as the space to be occupied will not be required for war purposes until later. An elaborate program has been arranged. On the opening day addresses will be made by C. H. Herty, chairman of the advisory committee; William H. Nichols, president of the American Chemical Society; F. J. Tone, president of the American Electrochemical Society; and W. G. Thompson, president of the American Institute of Chemical Engineers. Papers to be presented at the various meetings during the week include the following: "Chemical Engineering in Explosives," by A. Hough; "Development of Nitric Acid Manufacture," by E. J. Pranke; "Recovery of Potash from Kelp," by C. A. Higgins; "Recovery of Potash from Iron Blast Furnaces and Cement Kilns by Electrical Precipitation," by Linn Bradley; "Potash from Desert Lakes and Alunite," by John W. Hornsey; "Potash from Searles Lake," by H. W. Morse; "Development of Magnesium Industry," by Leonard Waldo; "Ferrocerium Pyrophoric Alloys," by Alcan Hirsch; "Ferromanganese," by Theodore Swann; and "Ferroalloys of Si. W, U, V, Mo and Ti," by Joseph W. Richards. Other papers will bear on the subjects of ceramics and industrial organic chemistry. Many motion picture films will be shown relating to industries mentioned, as well as to the oil industries, to water-power development, and to safety work. Members of the advisory committee are Charles H. Herty, chairman; Raymond F. Bacon, L. H. Baekeland, Ellwood Hendrick, Henry B. Faber, Bernard C. Hesse, A. D. Little, William H. Nichols, R. P. Perry, H. C. Parmelee, G. W. Thompson, F. J. Tone, T. B. Wagner and M. C. Whitaker.

New Patents

United States patent specification listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum—Process of Annealing—Laurence H. Whitney, Pittsfield, Mass., assignor to General Electric Co. (U. S. No. 1,273,706; July 23, 1918.)

Steel—Liquid Metal-Charging Car for Open-Hearth Furnace—Charles W. McClure and Edgar J. Reilly, Youngstown, Ohio, assignors to the William Pollock Co., Youngstown, Ohio. (U. S. No. 1,273,391; July 23, 1918.)

Aluminum Alloy with Zn, Mg and Fe.—Truman S. Fuller, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,273,762; July 23, 1918.)

Aluminum Solder with Cu, Pb, Sn and Zn.—David M. Campbell, Brooklyn, N. Y. (U. S. No. 1,273,146; July 23, 1918.)

Drill Holder, Rock.—John M. Calderwood, Spanish Fork, Utah. (U. S. No. 1,273,733; July 23, 1918.)

Platinum Extraction From Sands, Process for.—Russell Thayer, Philadelphia, Penn. (U. S. No. 1,273,202; July 23, 1918.)

Concentrating Table—Earnest L. Standley, Rush, Ark. (U. S. No. 1,273,946; July 30, 1918.)

Electric Furnace Especially Adapted for Zinc—Hans Nathusius, Friedenshütte Kreis Beuthen, Germany. (U. S. No. 1,265,485; May 7, 1918.)

Electric Furnace—Carl A. Pfanstiehl, Waukegan, Ill., assignor to Pfanstiehl Company, Inc.; North Chicago, Ill. (U. S. No. 1,273,920; July 30, 1918.)

Ferrosilicid, Manufacture of Shaped Castings of—Napoleon G. Petinot, New York, N. Y., assignor to United States Alloys Corporation, New York, N. Y. (U. S. No. 1,274,360; July 30, 1918.)

Gold, Silver, Method of Cleaning—Charles Burrows Morey and Charles Joseph Huber, Buffalo, N. Y., assignors to Larkin Co., Buffalo, N. Y. (U. S. No. 1,274,186; July 30, 1918.)

Editorial Correspondence

SAN FRANCISCO—Aug. 28

Gold Dredging in California is to be reduced one-third by the voluntary surrender by the companies of one-third of the electric power they consume, according to an announcement made recently by Power Administrator H. G. Butler. About 47 gold dredges are operating in California, 22 of them operated by two companies, the Natomas Consolidated Co. and the Consolidated Goldfields Co. Operations are confined principally to the American and Feather rivers, where the power shortage is severe. This voluntary lessening of consumption, said Mr. Butler, does not insure against a greater curtailment in the future if essential war industries demand it.

Siskiyou County Chrome Mines have attracted recent attention of the U. S. Geological Survey. John S. Diller has completed a survey of the chrome regions in that county respecting the possible and probable production and the efforts being made to mine and ship the product. From this region he went to southwestern Oregon and from there will go into Del Norte County, Calif. Taking a broad view of the chrome possibilities in what may be generally termed the Klamath River region, it will be found that the chrome-bearing formations extend along both sides of the Klamath for its entire length across the northern part of Siskiyou County and into the northern part of Humboldt County and the southwestern corner of Del Norte County, a total distance of approximately 150 sectional miles. Its course is westerly and southerly through Siskiyou, southwest and northwest through Humboldt and northwest into Del Norte. The chrome-bearing area may be broadly stated as extending from the eastern side of Siskiyou to the Pacific Ocean and from the central portion of Humboldt County to the southern part of Josephine County, Ore., an area covering 120 miles east and west and 100 miles north and south. In Siskiyou County Chrome mining began in the vicinity of Dunsmuir, on a deposit now owned by the California Chrome Co. With the exception of this property, little chrome mining was done in the county until the present war created a demand for chromium and chrome ores. In the last three years the development has extended into all parts of the county where possibility of production was apparent, and today there is active development or production at numerous points, including Dunsmuir, Gazelle, Callahan, Fort Jones, Yreka, Gottville, Hamburg, Scott Bar and Seiad. It is probable that Siskiyou is now the largest chrome producer in the state. The recent action of the Department of Agriculture upon the initiative of the War Minerals Board in starting road work on the Klamath River will result in a large increase in the Klamath region production. The recent activity extends from Yreka northwest to Preston Peak, a distance of 100 miles. At Preston Peak camps 30 men are employed. In the vicinity of Shasta River and Happy Camp and on to Beaver Creek 15 or more deposits are under development. New camps are being established in the Scott River and Hamburg and Seiad districts. The Dolbear mines employ 80 men working in two shifts. Several motor trucks are employed to haul ore along the Klamath to Hornbrook and many more have been ordered. There are approximately 300 men employed along the Klamath and toward Preston Peak at mining and hauling. Altogether, Siskiyou County is producing a large share of the chrome required by Government work in the present war, as in the early days of California gold mining this county produced a large share of the gold that helped the Government in the Civil War.

DENVER—Aug. 26

The New Revenue Bill is holding the attention of Colorado mine operators, and is creating some anxiety on account of its recent modifications. Last week an apparent agreement was reached classifying business for exemption purposes as follows: Financial and transportation, [illegible]; manufacturing and farming, 10%; mining and other kindred hazardous business, 15%. It has appeared that this classification has been dropped and a flat deduction of 10% on all business is to be adopted. It is believed that the classification should give mining a larger deduction because of the risks incident thereto. In this connection, the American Mining Congress has appealed to the committee for a personal interview with the chairman, in an attempt to correct the wrong that will be done the mines in failing to recognize the risks in the mining business. It is also urged that war profits be taken per unit, rather than on aggregate earnings, as this is the only accurate way of finding war profits in mining.

SALT LAKE CITY—Aug. 30.

Southern Utah Iron Deposits are receiving attention, and their exploitation is being considered. An immense amount of iron is being used in the progress of the war, and it is not likely that the demand will decrease with the declaration of peace. The Government shipyards on the Pacific Coast have brought an increasing demand for iron and its products further westward. There is no question of the value and extent of the Utah deposits. It has been a matter of finding a suitable market as well as of transportation. The plans for the development of Utah iron ore are said to include the building of large blast furnaces as well as the opening of coal mines in the neighborhood. Some of the owners are the Southern Utah Iron Co., the Milner Iron Co. and Walker Brothers.

Assurance That the Proposed New Railroad into the west Tintic section will be built during 1918 has been given to operators in this district. This will mean increased activity in a section which has been neglected for a long time, principally on account of heavy haulage costs. The present wagon-haul to the railroad costs about $10 per ton. Manganese ore has been opened in several places in west Tintic, but up to the present time has been little developed. The manganese showings can be traced for three miles, and in places float is found over a width of several hundred feet. There is promise that the west Tintic section may produce a considerable tonnage of manganese ore, which would be desirable at this time. Lead, silver, copper and zinc also occur here. Among the properties are the Tintic Delaware, Deseret Mountain, Scotia, O. K. Silver, Sharp, Six Mile, Utah Zinc, Imperial Lead, Utah Majestic, Copper Jack, Lucky Shepherd and Utonia.

PHOENIX, ARIZ.—Aug. 28

The University of Arizona has signed a contract with the War Department to continue training of soldiers until June 20, 1919. Special training is given in automobile and general mechanics, radio operation, electricity and surveying. The first class, consisting of 206, was graduated on Aug. 26.

The Complaint of Arizona Gold Miners is that their product remains the one thing of value that has not mounted in price during a three-year period in which copper, lead, silver and zinc have doubled in selling value and wherein labor, supplies, material and even transportation and taxes all have risen until the sum total absorbs the earnings of any gold property that is not in the bonanza class. In Arizona the wage cost is on the basis of the mining of copper and the sale of that metal at an officially fixed price designed to cover an advance of wages. Gold is mined at a tonnage cost far above that known in copper mining, and the required skilled miners are hard to secure during the sharp demand of the copper camps for bosses at high wages. Present conditions are also operating against the development of new gold mines, for prospectors or the average small development company cannot afford to sink when every foot of depth costs twice as much as it did a couple of years ago. J. A. Burgess, superintendent of the United Eastern company, has stated that he sees nothing ahead short of a bonus by the Government on gold production, based upon mint deliveries at the current value of $20.67 an ounce. He passes by as negligible suggestions that there be remission of all taxes and that the Government take over and work the gold mines. Even concerning his own suggestion he writes, "Whether gold production can be stimulated indefinitely in this way without impairing our financial structure, would require a closer analysis in the light of economic and financial science that I am prepared to give."

JOPLIN, MO.—Sept. 2

Criticism of the Allocating Committee which has charge of the distribution of the high-grade zinc ores that bring $75 per ton in this district has been made to the War Industries Board by A. N. Stanfield, operator of the Monkey Hill mine, near Rush, Ark. He telegraphed a protest, in which he charged that the committee is showing special favors, and complained that his company is not recognized "though producing higher-grade ore than any produced in the Joplin field." The "Yellville Mining Reporter" gives publicity to his protest and predicts that some "interesting developments" may come out of it. Local producers are inclined to believe the protest entirely unfounded and ill considered, and believe the allocating committee is doing a hard job with general satisfaction.

Four Acres of Ground were lowered to the 220 level of the Oronogo Circle mine by the explosion of 16,700 lb. of dynamite on Aug. 21. Part of the old mill belonging to the company dropped into the cave after the explosion, and a crusher and hoist engine were also lost, but outside of this the big blast caused no unforeseen trouble. The powder was divided among 152 holes, the largest of which contained 77 boxes. A 110-volt current was used, and the dynamite was 40%. The lowering of the ground was a part of the daylight mining project undertaken by the Connecticut Zinc Co. about two years ago, when it was decided to strip the upper surface, shoot down the workings of the mine, and handle it altogether as a steam-shovel proposition. The new 2000-ton concentrator, the largest in the district, has been completed for months, and the company will now proceed with the actual mining operations. S. L. Wilkins is superintendent and A. S. Raymond is president of the company. It is expected that the dirt will show about 2% recovery, but working three eight-hour shifts a day the mill will be able to handle from 2500 to 3000 tons per day.

The Oronogo Mutual Mill and Lease, at Oronogo, Mo., has been bought by Charles T. Orr, of Webb City, who will operate. The mine, which is a sheet-ground property and a heavy producer, was owned by the Waring family, and was managed by Guy H. Waring. The Warings took over the property in August, 1914, after it had been idle about three years. As the Judge mine, it had never been a success, but under the stimulus of the good prices of 1915, Waring made of it a profitable property. He enlarged and improved the mill, and added to the lease until the mine now rivals the locally famous Circle, now operated by the Connecticut Zinc Co. C. T. Orr, the buyer, is the head of the Athletic Mining and Smelting Co., which has a zinc smeltery at Fort Smith, Ark. For several years he has been operating the Bertha A and Wingfield mines, at Webb City. The Wingfield mill was moved to the Oklahoma field eight months ago, where it is now in operation. Orr also is operating the Athletic mine, in the Duenweg camp. C. A. Rice, who has been superintendent at the Athletic for some years, will be superintendent at the Mutual, and Ray Munson, formerly with the Continental Zinc Co., will be superintendent at the Athletic. No other changes in the officers or crew at either property are contemplated.

HOUGHTON, MICH.—Aug. 27

Copper Mine Managers in this district express themselves freely as being unopposed to the taking over of the mines by the Government if it is done on a basis that is amicable to the employees of the mines and to the shareholders of the corporations. Mine managements have generally found it profitable and pleasant to consider their duty to their employees quite as much of a business necessity as their duty to the shareholders. The situation as regards the total output of copper undoubtedly could be improved if the Government took complete control and worked the richest parts of the richest mines with the limited number of men now on duty in the mines. Such a solution may become necessary as a war measure, but it could not be brought about without an unfair deal to the shareholders of small properties, explorations and low-grade mines. There is a general belief that the continuation of the war for another six months may result in cessation of work at numerous local exploration properties that are not producing enough copper to make their operation worth while, and some of which are non-producers. As matters now stand there can be no expected increase in copper output during the war. On the other hand, there will be a decided falling off during the remainder of this year and for several months in 1919, as the new selective draft bill will take many men from this district. Even if miners are exempted from service from now until the end of the war, there can be no additions to forces. The Government regulation which insists that the interpretation of the work-or-fight order should be enforced is doing well enough here, but the ruling that is supposed to prevent employees from leaving their jobs and moving into other districts is absolutely without effect in the district. No new men are coming in, for the corporations are obeying the rules rigidly. The only hope for improvement in the situation is that relative to electric tramming, which has the handicap that electric manufacturing companies are unable to deliver locomotives on anything like reasonable schedule.

DULUTH, MINN.—Aug. 28

The Cuyuna Range was the only iron district in the Lake Superior region to show an increase of shipments in 1917 over those in 1916, and this year shipments will advance over those in 1917. More than 500,000 tons of manganiferous iron ore was shipped from the Cuyuna range last year. Before the war the greater part of this product used in the United States was imported. It is estimated that the Cuyuna will ship 2,800,000 tons of both iron and manganiferous ores this year.

SPOKANE—Aug. 26

The Gold Conference to be held in Spokane Sept. 5 and 6 under the direction of the Northwest Mining Association is causing a wide discussion. Frank A. Ross, one of the prominent mining authorities in this section, in attempting to head off radical action by the conference, gives out the following suggestions: "First, put into practical application the recognition of gold mining as a war industry, with special privileges as to taxation, priority in obtaining supplies, transportation and labor. Second, grant the immediate induction of labor, as has been done in the lumber industry. Third, build trunk-line motor-truck roads to inaccessible gold fields, precisely as the spruce forests have been made accessible by government-built railroads. Fourth, extend financial aid to such properties as may be judged by qualified Government specialists to be capable of producing metals essential to the conduct of the war. Fifth, grant a bounty on all new gold produced by the mines of the United States, the same to be paid by the Canadian government on new Canadian gold. This last suggestion concerns us most; it has divided public opinion, yet it is the most popular plan advanced. Any bounty must apply to new gold from both bona-fide gold miners and placers and also to the gold in other ores in which the gold is a byproduct. This arrangement is easily made. There is a vast difference between granting a bounty for the production of gold and decreeing an increase in the standard value of an ounce of gold. The former is a national affair and thoroughly practicable; the latter is an international problem and fraught with dangerous financial complications too vast for contemplation if used as an expedient. A bounty on gold is perfectly feasible as a war measure and certain to produce desired results. In my opinion, a bounty on gold would not cause the melting of old gold in the form of plate, jewelry and coin. In the first place, workmanship and successive profits give to gold plate and jewelry a market value considerably in excess of the value of the gold contained. A bounty would not be so high as to tempt owners of such articles to melt them down and take the chance of disposing of them contrary to such laws as could be quickly passed to cover the case if they do not already exist. There is little gold coin that would be obtainable for melting down in face of laws so drastic that few would run the risk for the sake of the bounty. The objection that bullion would come from foreign countries is groundless, for it does not enter a foreign country except in exchange for commodities and subject to the surveillance of the authorities or when specially ordered thereby. Certainly no bounty would be paid on smuggled bullion under the following plan. Let the bounty be granted on all new gold produced under these conditions: First, that gold, or doré, bullion, shall be bought only upon identification of the possessor and after explanation of the origin, purchase to be made at places to be designated by proper authorities, notably at the mint or refineries; second, in lieu of bullion, the applicant shall present certificates from the mint that bought his bullion, or from the public mill or smelter that bought his ores; third, that all such certificates from public mills or smelteries shall be officially endorsed by a Government inspector of ore shipments. Government inspection, of course, is a step toward Government regulation of public mills and smelteries, although offered solely as a war measure. I do not favor Government ownership or control of public mills and smelteries, but I am in favor of Government regulation. Only heavy shippers have been able to afford to have representatives present during the critical operations of weighing, crushing, sampling and assaying of their ores. By far the greater part of the popular distrust of public mills and smelteries, and of the bitter agitation against them, is due solely to the lack of a personal representative. It is inconceivable that mills and smelteries should offer objection to so reasonable an arrangement, in view of its justice and also of the direct benefit to themselves to be gained by a better business relation to the mining public."

VICTORIA, B. C.—Aug. 26

Consolidated Mining & Smelting Co. of Canada has announced an increase of 55c. per ton in treatment rates on all lead ores received at the Trail smeltery after Aug. 1. This increase has been made necessary by the increase in the price of coke and freight thereon, increase in wages at the smeltery and increased freight rates upon lead bullion shipped to Montreal. The circular letter containing notice of the advance is as follows: "Since Schedule B, lead ore rates, was published, we have been obliged to pay 40c. per ton more for coke to the collieries, which under that schedule amounts to an increase of 10c. per ton of ore. In addition to this, there may be an increase of freight on coke, but we are not certain yet of this, and there will be a further increase in price effective Aug. 1. We have been obliged to increase the wages at the smeltery by 30c. a shift, so that there is an increase of 45c. per ton under Schedule B on this account. Effective Aug. 1 we will, therefore, increase the base rate under Schedule B by 55c. per ton, plus 25% of the further increase in coke price and freight. Effective Aug. 12, rates on lead from Tadanac have been increased to $14.30 to Toronto and $16.50 per ton to Montreal. The increase in the freight rate from that which prevailed on Feb. 1 is, therefore, $2.30 per ton on shipments to Toronto and common points, and $4.50 per ton to Montreal and common points. Beginning with shipments received here in August, we shall be obliged to make an adjustment on account of this freight increase. As there is a considerable difference now between the Montreal and Toronto freight rates, and it is impossible to forecast the distribution owing to variations in munition demand, we therefore propose, as the simplest plan, to make this adjustment, commencing with ore received in August, by reducing the lead settlement price by the actual increase in the lead freight rates. We will advise you as soon as possible of the amount of the further increases in coke price and freight."

COBALT, ONT—Aug. 29

Delay in the Improvement of the wagon road from Elk Lake to Gowganda which was promised by the government in the spring has caused complaint on the part of the operators of the Gowganda silver district, and has deferred some projected exploration plans. Though there is only one producing mine in the district, there are a large number of explorations under way, all of which have been seriously hampered by the high cost of transportation. The lack of electric power for operations is another drawback. The Miller Lake-O'Brien has a limited power installation at the north outlet of Gowganda Lake, but this does not meet the demands of this mine alone, and it was closed recently by a break in the hydraulic machinery. The South Bay Mines Co. has made a partial installation of power at the south end of the lake, using the flow and falls of Hanging Stone Lake, but difficulties in financing have deferred completion of this installation, probably until next season. The initial power from the Hanging Stone project is only about 300 hp., which will be used by the nearby prospecting undertakings, but a proposed tunnel to divert the waters of a branch of the Montreal River will increase this several times. The labor situation in the district has improved somewhat by the influx from gold operations in northern Ontario, which have closed or been curtailed under the general policy of gold operators of the province. The principal explorations are proceeding in the vicinity of Miller Lake under the stimulus of the developments in the Miller Lake-O'Brien mine, owned by M. J. O'Brien, of Renfrew, Ontario. This mine shipped 2,000,000 oz. last year, and has a developed reserve of several million ounces. The ore was discovered at a depth of about 100 ft. in the diabase, continued up to the overlying Keewatin formation, where the silver ceased to be found in the vein, although the vein continued into the Keewatin. Most of the work by other companies is directed toward finding the extension of the Miller Lake-O'Brien vein or vein systems. So far no conclusive results have been secured on the adjoining property. The Crown Reserve Co., of Cobalt, has three claims on the Keewatin-diabase contact and is now sinking a shaft 100 ft., and drifting southeast along the vein course. The Castle property on the same contact and adjoining the Miller Lake-O'Brien property is under contract to the Trewthey Co., of Cobalt. The T. C. 177, known also as the "O'Brien Extension," is exploring claims in the Miller Lake section. The Reeve-Dobie, Crews-McFarlin and the Clevenger-Prophet companies are developing a diabase area west of the lake on the Mann Ridge. Nothing has been done on the Mann property, which now includes the Boyd-Gordon, since the negotiation with the Scottish syndicate ceased, in 1914. The property has been offered for sale for $400,000. The La Bric property, on which about $200,000 was spent, is idle. On Le Roy Lake, east of Gowganda, F. H. Collins of New York, is carrying on surface explorations and sinking. The Canadian-Gowganda, also east of Gowganda, did some drilling last winter, but no work is being done this season. The Hudson Bay Co., of Cobalt, has suspended work in Leith Township, about four miles south of Hanging Stone Lake, after doing a large amount of exploration, with reported good results. The Silverado, in the same district, is operating on a small scale. Both of these properties are hampered by difficult transportation. The general prospects for the Gowganda district are considered good, and a number of engineers have been in the district this season in connection with new negotiations and new work.

QUEBEC—Aug. 28

The East Broughton Asbestos District is actively endeavoring to meet the special demands for "paper stock" and other fibre produced by the mines in this part of the Quebec asbestos district. The Quebec Asbestos Co. has restored its mill after the fire of last spring, and is treating about 350 tons daily. The introduction of steam-shovel mining in the open pit has greatly reduced costs and simplified operating. The material is now crushed in the pit and conveyed by belts to the drier. Improved milling has increased the percentage of "paper stock" grade. The adjoining Eastern Townships property has been acquired on a contract purchase by the Asbestos and Rubber Works, of New York, and is operating. The Fraser mine, owned by the Asbestos Corporation, has completed a mill and is operating. Some "crude" is produced from this property. Extensive mining development is under way. The Montreal property to the east of the Fraser is under option to a Boston syndicate, which purposes completing the mill and getting in operation in the spring. The Boston property in the east end of the belt is idle, owing to transport difficulties from the new pit opened by the company about one mile from the mill.

MEXICO CITY, MEX.—Aug. 20

The El Bordo Mines, in the Pachuca district, have been purchased by the Santa Gertandis Co., which will operate them. The Real del Monte y Pachuca Co. is operating all of its mills to full capacity. It is expected that the Pachuca district will mill over a million tons this year. A letter of recent date from a Mexican engineer says, "Outside of the central district, Pachuca, El Oro, Tlapujahua, Guanjuato, Zacatecas, Pozos Asientos, and Angangueo, and some districts of the north, like Catorce and surroundings and the mines situated near the Laredo line in Coahuila and Nuevo Leon, all the rest of the mining sections are in bad condition, and the outlook is uncertain. It is risky to venture trips on the Central railway north of Zacatecas, although there are some mines working in Durango. In Jalisco, the Amparo is working, but it is difficult to operate in the "Horte" district. With regard to mines in the south of Mexico, operations are impossible."

The Mining News

ALABAMA

Jefferson County

NATIONAL STEEL PRODUCTS (Bessemer)—Specifications are out for a 25-ton steel castings plant, including 150 x 40 ft. building, and general steel foundry equipment. W. J. Long is president.

SLOSS-SHEFFIELD STEEL & IRON (Birmingham)—Ground broken for coke and byproducts plant and for fabricated steel works, to cost about $9,000,000.

WOODWARD IRON (Woodward)—Working on estimates for a $25,000,000 steel mill to be financed by the Government.

ARIZONA

Cochise County

NORTH TIGRE (Douglas)—Has ordered a 50-ton concentrator.

Gila County

ARIZONA COMMERCIAL (Globe)—Sulphide body has been opened up on 1500 level.

Mohave County

EMERALD ISLE (Chloride)—Additional precipitation unit to be in operation early in September and will add 2000 lb. of cathodes to present daily copper production.

TUCKAHOE (Chloride)—Has installed hoist secured from Pictured Rock shaft at Oatman.

BANNER MINES (Kingman)—Compressor plant has been installed.

CACTUS QUEEN (Kingman)—Machinery has been purchased and when installed the main shaft will be sunk to 500 ft. and crosscutting begun. H. E. Barbee is directing manager.

CEDAR MINES (Kingman)—To be reopened, and will mine silver ore.

FRISCO MINES (Kingman)—Crosscutting toward vein on 300 level. Shaft to be sunk to 500 level.

GRANNIS (Kingman)—Shaft being sunk and has reached 50 ft. below tunnel level.

HACKBERRY (Kingman)—Main shaft has reached 800 level. Flotation plant is being installed.

RED CAP (Kingman)—Reopened and is showing good gold ore. Is being developed by tunnel and a crosscut is now being driven toward the hanging wall.

YUCCA TUNGSTEN (Yucca)—Operating new 60-ton mill, and producing carload of concentrates monthly. Output taken by the Government. Flotation is to be added. Harvey Klotsch is in charge.

Pima County

DAILY ARIZONA (Catalina)—Preparing to resume work and repairing roads for use of heavy traction engine.

GUNSIGHT (Gunsight)—Stoping silver-lead ore in vein at depth of 170 ft. Other old mines are operating in same district.

Santa Cruz County

TRENCH (Patagonia)—Compressor and drill equipment has been provided to sink shaft 200 ft.

Yuma County

RED CLOUD (Yuma)—Equipped with mill and new electric pumps. To sink shaft from present 500 level.

CALIFORNIA

Amador County

GWIN (Paloma) — Mining and milling machinery, including 100-stamp mill, steel [illegible] compressors and six miles of cast iron pipe, and a sheet-iron building, have been sold and are to be converted to war use. Mine has been idle for a number of years and reopening has been discouraged because of high cost of unwatering. Large tonnage of good ore known to be undeveloped. Has record of large gold production and was the best in the Mother Lode region, to be equipped with steel hoist.

Eldorado County

INGRAHAM ([illegible])—Reopened after idleness of six months. Equipped with 10-stamp mill. Developed by [illegible] tunnel and [illegible] ft. drift.

PELICAN CHROME ([illegible])—New mill being installed to increase concentrating capacity from 50 to 100 tons. Water pumped from American River. Noble Electric Steel Co. is owner.

Lassen County

GOLD-SILVER DEPOSITS in Mountain Meadow district being prospected and 35 claims recently recorded. One group of claims is east of Goodrich ranch; the other is west of Brown ranch. Well-defined vein outcrops, which are cut by a fault at right angles with the northwest and southeast course of the formation.

Modoc County

HESS (Alturas)—Old producer, in Hayden Hill district, made recent shipment of bullion.

Nevada County

LIBERTY HILL (Washington) — Dam and by-pass under construction. Cleaning out ditches and reservoirs.

Plumas County

LIME DEPOSITS at Virgilia, on the Western Pacific, to be developed with the purpose of obtaining lime for fertilizing orchard lands in Oroville region.

San Luis Obispo County

CHROME SHIPMENTS from J. F. Beckett deposit, in Los Osos Valley, begun Aug. 12 at rate of two carloads a week. Beckett has taken lease on manganese deposit five miles southeast of San Luis Obispo.

Sierra County

HYDRAULIC MINES at Brandy City and Howland Flat being prepared for winter work. Brandy City Co. installing new restraining barrier and modern equipment for handling gravel. Loftus-Blue Lead improving and reinforcing Slate Creek dam near Howland Flat, which also holds tailings from the mines at St. Louis. Company in position to handle 10,000 cu.yd. gravel per day. Several smaller placer mines also getting ready for winter work.

Tuolumne County

OAK HILL (Cooperstown)—Lumber and machinery arrived for new plant. Development encouraging.

DUTCH-SWEENEY-APP (Jamestown)—Timber received for construction of new mill. New steel headframe will be installed at the Dutch.

Yuba County

WALKER (Spencerville) — Machinery ready for new installation.

UTAH

Box Elder County

LAKE VIEW MINING (Saline)—Some zinc ore and zinc-lead ore being produced.

Juab County

TINTIC SHIPMENTS for the week ended Aug. 24 were 158 cars.

EMPIRE MINES (Eureka) — New ore opened in drift to east on 1800 level of Lower Mammoth part of extensive holdings. Property is the consolidation of a number of holdings. Knight interests are in control.

TINTIC STANDARD (Eureka)—Shipments hampered by trouble with motor trucks.

Piute County

MINERAL PRODUCTS (Marysvale) — Experimental work recently done with view of recovering sulphuric acid, driven off in roasting alunite. Reduction plant to produce metallic aluminum from residues being considered.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Work to be done in two winzes on Silver King fissure.

PERUVIAN (Alta)—A 4000 ft., 100-ton tramway to carry ore down below the snowslide line in Superior gulch is to be completed in about three months. Loading station to be on line of railroad of Little Cottonwood Transportation Co. J. P. Clays is manager.

SOUTH HECLA (Alta) — Four stopes opened in sulphide zone to east, and old carbonate stopes in west still producing. Prospecting and development being done.

MONTANA BINGHAM (Bingham) — Tunnel cut Mayflower vein of Fortuna on dip 1300 ft. below old Mayflower workings. Upper levels produced much good chalcocite ore in Mayflower ground.

AMERICAN CONSOLIDATED (Salt Lake—Property adjoining Cardiff in south fork of Big Cottonwood being developed by tunnel, and small stringers of ore are being followed.

Summit County

DALY WEST (Park City)—Crosscutting from 1200 level of Daly Judge to Daly West shaft. Crosscut expected to be complete early in September and stations will be cut in October.

SOUTH PARK (Park City)—Has acquired three mining claims in American Fork and Snake Creek districts from Alta-Park Company.

CANADA

British Columbia

CHROME DEPOSITS in the Rossland district are being prospected and investigated by private individuals and government agents. Several locations have been made. William Thomlinson advises prospectors in this district to have their ore also tested for platinum.

DELLIE MINING AND MILLING (Ainsworth)—Organized to take over property of Silver Hoard.

EDEN AND CRESCENT (Ainsworth)—Raise completed to surface.

MOUNTAIN CHIEF (Lower Arrow Lake)—Has begun shipping and expects to ship 500 tons per month.

UTICA (Slocan)—Charles F. Caldwell again in charge and ore shipments resumed.

Ontario

WALSH (Gowganda)—Station cut at 200 level. Drifting to cut vein on 100 level.

COBALT DISTRICT SHIPMENTS for the week ended Aug. 24 were: McKinley-Darragh, 60,000 lb.; Kerr Lake, 60,227; Buffalo, 85,453; Dominion Reduction, 88,000; O'Brien, 64,010; La Rose, 78,646; Aladdin Cobalt, 64,075 lb. Total 500,411 pounds.

BEAVER (Cobalt)—High-grade ore is being taken from vein recently encountered on 300 level. Orebody containing leaf silver has been found on 500 level.

PETERSON LAKE (Cobalt)—Flotation mill treating 60 tons of tailings per day from the former Seneca-Superior property.

PROVINCIAL (Cobalt)—To install 40-ton oil-flotation plant to treat low-grade ore. An electric pumping equipment also will be installed.

BURNSIDE (Kirkland Lake — New vein, thought to be an extension of No. 12 vein of the Tough Oakes, has been cut and shows good gold content.

ELLIOTT-KIRKLAND (Kirkland Lake) —Arrangements being made for diamond drilling.

MINAKER (Kirkland Lake)—Shaft down 75 ft., but has not cut vein, as was expected. Work has been hindered by want of water.

CHARETTE CLAIM (Boston Creek)—Surface work has uncovered promising veins. Mining machinery will be installed.

MEKKS SYNDICATE (Boston Creek)—Plans completed for exploration of this property near the Miller Independence.

WHITE RESERVE (Maple Mountain)—Operations suspended owing to labor shortage.

MEXICO

Sonora

LILY (Nacozari)—Has started extensive development work on large body of low-grade copper ore.

CANDELARIA (Nogales)—To be operated by a Mexican-American company, headed by Lazaro Puente.

NORTH TIGRE (Sonora)—Has ordered 50-ton concentrating mill.

The Market Report

SILVER AND STERLING EXCHANGE

Aug.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
29	4.7550	101⅛	49½	2	4.7550	101⅛	49½
30	4.7550	101⅛	49½	3	4.7550	101⅛	49½
31	4.7550	101⅛	49½	4	4.7550	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Aug. Sept.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
29	26	†	8.05	7.75	9@9¼
30	26	†	8.05	7.75	8¾@9
31	26	†	8.05	7.75	8¾@9
2	...	....	....	....	....
3	26	†	8.05	7.75	8.75@8.80
4	26	†	8.05	7.75	8.75@8.80

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. der 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
Aug. Sept.	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
29	122	122	137	361½	361½	29½	28½	54
30	122	122	137	361½	361½	29½	28½	54
31	...	...	...	...	...	...	...	..
2	122	122	137	355½	355½	29½	28½	54
3	122	122	137	353½	353½	29½	28½	54
4	122	122	137	351½	351½	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK, Sept. 4, 1918

The week has been essentially a holiday week, and the metal market has been characterized by little activity.

Copper—There is little of interest to report. The labor situation appears to be worrying every one, and it is expected that August mine production will be less than that of July.

Copper Sheets—The base price of copper sheets is 34½c. per lb. Copper wire is quoted at 29 to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—The market is inactive, with a weaker tendency. Singapore quoted £361½, c.i.f., London, on Aug. 29; £361½ on Aug. 30; (a) on Sept. 2; £353½ on Sept. 3; £351½ on Sept. 4.

(a) No quotation received.

Lead—The situation is still tight, and there is little to report.

Zinc—There is little to record beyond the fact that the market is extremely dull and that prices have measurably weakened since our last market report.

Zinc Sheets—Unchanged at $15 per 100 lb. less usual trade discounts and extras as per list of Feb. 4.

The demand for rolled brass aggregates at present 4,685,000 lb. per day. The present production is 2,910,000 lb. per day. These facts were developed at a meeting in Washington last week between officials of the War Industries Board and representatives of the brass manufacturers. Shortage of unskilled laborers is at present causing a loss of production of 33⅓%, it was declared.

After an all-day discussion of the situation, the manufacturers agreed to stop the output of products going into non-essential uses. In the future each mill is to take its full quota of Government business. Every effort will be made on the part of manufacturers and on the part of officials to bring about conditions which will permit the speeding up of the rolled-brass mills of the country.

Other Metals

Aluminum—Unchanged.

Antimony—The market has been weaker this week. Although there is little business, the market is fundamently strong. At the close we quote spot 14@14½c. We quote futures at 13¼., c.i.f., in bond, for September shipments.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50, @ $1.75 per pound.

Nickel—Market quotation: Ingot 40c.; shot 43c.; electrolytic 45c. per pound.

Quicksilver—Stocks are not large and inquiries are good. We quote $125@130. San Francisco reports by telegraph, $120; firm.

Silver and Platinum

Silver—Owing to the fact that the price of silver has been stabilized by our Government, and that the English authorities have conformed, there is nothing new to report. London, 49½d., New York, $1.01⅛ for 999 fine, with the British government buying at $1.01½ for one month, at designated points of delivery. London shipments to Aug. 31 total 697,000 ounces.

Mexican dollars at New York: Aug. 29, 78; Aug. 30, 78; Aug. 31, 78; Sept. 3, 78; Sept. 4, 78.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 31—Blende, per ton, high, $77.60; Basis, 60% zinc, premium, $75; Class B, $65@60; Prime Western, $52.50; calamine, basis 40% zinc, $40@35. Average selling prices: blende, $54.36; calamine, $37.90; all zinc ores, $53.70.

Lead, high, $102.95; basis 80% lead, $100; average selling price, all grades of lead, $100.71 per ton.

Shipments the week: Blende, 10,973; calamine, 466; lead, 1491 tons. Value, all ores the week, $761,260.

Shipments eight months: Blende, 318,088; calamine, 13,923; lead, 50,567 tons. Value, all ores eight months, $21,325,030.

On Thursday sellers wanted $60 base, on Friday buyers offered $52.50 base Prime Western. There were few sellers until evening, but on Saturday morning many were ready to sell, and in the afternoon blende was being offered buyers, who had filled limited orders, at $50 basis.

Platteville, Wis., Aug. 31—Blende, basis 60% zinc, highest price reported, $73.50. Base price for premium grade, $75. Base price for high-lead blende, $50 to $52 per ton. Lead ore, basis 80% lead, $95 per ton. Shipments reported for the week were 2465 tons blende, 45 tons galena, and 710 tons sulphur ore. For the year to date the totals are 87,272 tons blende, 4944 tons galena and 33,143 tons sulphur ore. During the week 3114 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—The inability of the market to absorb the offerings that are coming in on a relatively large scale has produced greater dullness than last week. Ore of 40% grade is quoted nominally at $1.40 per unit. Ore of 50% grade is sold at a premium.

Manganese—Unchanged.

Molybdenum Ore—It is reported that greater quantities of ferromolybdenum are being used by the Government. As the supply of molybdenite comes from associations of mining companies, any free molybdenite is difficult to sell. The nominal quotation is $1, but there are no buyers in evidence.

Tungsten—A business in fine ores of several hundred tons was done in the last week. Most American producers are sold ahead and very little scheelite is offered. High-grade scheelite realizes $25.50 per unit. High-grade wolframite is quoted at $24.50 per unit. Lower grade ores are quoted at prices ranging from $20 to $25. according to the amount and kind of impurity

Other Minerals

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight; but no sulphur imports are being received. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines f.o.b. mines. Unchanged.

Iron Trade Review

NEW YORK—Sept. 4

The meeting of iron and steel manufacturers in New York on Aug. 28, according to "Iron Age," was occupied solely with the labor question, and the matter of possible price changes for the last quarter of the year was not touched. Leaders in the industry realize that even the present insufficient rate of production cannot be maintained unless special measures are taken in connection with the new draft. More important still is the maintenance of existing hours and the safeguarding of the industry for the period of the war against such restrictions of output as have commonly accompanied union control. Some of the recent Washington decisions of labor issues have evidently not taken into account the grave consequences to the war program which would result from a wide enforcement of such findings in the steel and metal-working trades.

The conference on iron and steel prices between the general steel committee and the War Industries Board will take place on Sept. 18 at Washington. An all-day meeting of the committee in New York on Sept. 3 will be followed by others, at which the requests of various groups of manufacturers for higher prices will be considered.

The Lake Superior ore movement in August fell 934,000 tons below that of July, owing to the diversions of vessels from ore to grain. Yet with 9,725,000 tons moved last month, against 10,659,000 tons in July, the total for the season up to Sept. 1 was the greatest on record—39,334,000 tons, against 39,215,000 tons to Sept. 1 in the previous high year, 1916. The fact that some pig-iron producers have not bought ore enough to carry them to next May, when 1919 ore comes down, indicates the beginning of calculations based on a marked change in the war situation.

PITTSBURGH—Sept. 3

Production of both pig iron and steel in August appears to have been at a slightly lower rate than in July, but in view of circumstances the output is regarded as fairly satisfactory. Strenuous efforts are now being made to increase production, the bottle neck having been shown clearly to be the supply of coal for coking, limiting the output of coke and in turn the output of pig iron and steel. The remarkable fact is shown that though since last May the weekly output of byproduct coke has increased fully 50,000 tons, the output of beehive coke has decreased nearly twice as much, and the Fuel and Railroad administrations are working hard to rectify the situation.

The increased estimates of steel requirements made by the War Industries Board, running not under 23,000,000 net tons of finished rolled steel for the half year, are due in part to increased direct war demands by reason of the offensive operations on the Western front, and in part to large railroad requirements, to put the railroads in condition for the winter. A large tonnage of rails is now being produced, shell-steel production at rail mills being reduced and overflowing into other steel-finishing departments. The Donora and Woodlawn wire mills are to be altered to roll shell rounds instead of rod billets. Ship steel now gives the mills no concern, as with proper distribution of plates to shipyards there is a sufficient supply, and many more hulls have been launched than it has been possible thus far to fit with engines, boilers and the numerous articles of equipment and furnishing required.

Few finishing departments of the steel trade are able, in making shipments, to get through with B-4 priorities, that being the grade accorded to jobbers, so that B-4 is not fully covered, in most cases, and priorities B-5 to B-8, inclusive, are left out, as well as the whole preference list, except as items on it are given priorities.

Pig Iron—Pig iron for purposes outside the preference list is absolutely unobtainable. Nearly all the pig iron is going to steel works, the tonnage of foundry iron required for war orders being relatively small. Even consumers working on orders carrying a high priority rating frequently have to secure allocations in order to get pig iron, but allocations are so restricted that they can generally be carried out promptly. An increased supply of coke is likely to result from the efforts of the Fuel and Railroad administrations, and it is probable also that several blast furnaces will be instructed to change from ferromanganese to pig iron, so that larger supplies of pig iron are in prospect, and they are badly needed, on account of the shortage in scrap supply. Reports of merchant furnaces having costs close to the set selling prices refer to particular cases, as many merchant furnaces have a comfortable spread. Set limits remain: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; gray forge, $32, f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less. W. P. Snyder & Co. report their computations of averages in August, based on actual sales, at $35.20 for bessemer and $32 for basic, as in former months.

Steel—There are practically no offerings of ordinary soft steel billets and sheet bars, and hardly any of shell-discard steel. Any surplus arising would doubtless be allocated before it could be offered in the market. Set limits remain: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys—The ferromanganese market is only moderately active, consumers being well covered for this year. Too much ferromanganese is being made, rather than too little, and the authorities may instruct some furnaces to change from ferromanganese to pig iron. Prices remain at $250 delivered, for 70% ferromanganese, and at [illegible] furnace, for 16% spiegeleisen.

Coke—Byproduct coke output continues to increase from time to time as new ovens are completed. The last report for the week ended Aug. 24 shows [illegible] net tons produced, this being [illegible] of the rated capacity of [illegible] tons, which is about as good a percentage as can be expected. Beehive coke output was 592,000 tons. Any furnace coke that can be spared from contract shipments is allocated, but as to Connellsville beehive, it is thought in some quarters too much is being offered for foundry use, on account of the higher price. Prices on Connellsville remain at $6 for furnace, $7 for foundry and $7.30 for crushed (over ⅜-in). Prepared coke over ⅜ in., from old dumps, has advanced from $6.50 to $6.75.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1916	New York 1917	New York 1918	London 1916	London 1917	London 1918
Jan	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740		32.584	50.920	...
Oct.	67.855	87.332		32.361	44.324	...
Nov	71.604	85.891		34.192	43.584	...
Dec	75.765	85.960		36.410	43.052	...
Year	65.661	81.417	...	31.315	40.851	...

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1917	New York Electrolytic 1918	London Standard 1917	London Standard 1918	London Electrolytic 1917	London Electrolytic 1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	...	117.500	...	135.250	...
Oct.	23.500	...	110.000	...	125.000	...
Nov.	23.500	...	110.000	...	125.000	...
Dec.	23.500	...	110.000		125.000	...
Year	27.180	...	124.892	...	138.401	...

Tin	New York 1917	New York 1918	London 1917	London 1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	...	244.038	...
October	61.851	...	247.467	...
November	74.740	...	274.943	...
December	87.120	...	298.556	...
Av. year	61.802	...	237.563	...

(a) No average computed.

Lead	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	...	8.611	...	30.500	...
October	6.710	...	6.650	...	30.500	
November	6.249	...	6.187	...	30.500	
December	6.375	...	6.312	...	30.500	
Year	8.787	...	8.721	...	30.500	...

Spelter	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.373	8.473	8.338	54.000	54.000
August	8.360	8.670	8.190	8.635	54.000	54.000
September	8.136	...	7.966	...	54.000	...
October	7.983		7.813	...	54.000	
November	7.847		7.672	...	54.000	...
December	7.685	...	7.510	...	54.000	...
Year	8.901	...	8.813	...	52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡ 1917	Bessemer‡ 1918	Basic‡ 1917	Basic‡ 1918	No. 2 Foundry 1917	No. 2 Foundry 1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25	...	33.95		33.95	
Year	$43.57	...	$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Sept. 3
Alaska Gold M.	3⅛
Alaska Juneau	1⅞
Am.Sm.& Ref.,com.	78⅛
Am. Sm. & Ref., pf.	104½
Am. Sm. Sec., pf., A	90½
Am. Zinc	17
Am. Zinc, pf.	51
Anaconda	68⅝
Batopilas Min	1⅛
Bethlehem Steel	86
Butte & Superior	26½
Butte Cop. & Zinc	11⅛
Cerro de Pasco	34⅞
Chile Cop.	16¾
Chino	39⅞
Colo.Fuel & Iron	49⅜
Crucible Steel	69½
Crucible Steel, pf.	90
Dome Mines	9
Federal M. & S.	12
Federal M. & S., pf.	41
Great Nor., ore ctf.	33
Greene Cananea	45¼
Gulf States Steel	84
Homestake	73
Inspiration Con.	54
International Nickel	29⅝
Kennecott	34⅛
Lackawanna Steel	86
Mexican Petrol	102
Miami Copper	28
Nat'l Lead, com.	58¼
National Lead, pf.	102
Nev. Consol	20⅞
Ontario Min	10
Ray Con	24⅛
Republic I.&S.,com.	94
Republic I. & S., pf.	102
Sloss-Sheffield	62½
Tennessee C. & C.	19
U. S. Steel, com.	115¾
U. S. Steel, pf.	111
Utah Copper	84
Va. Iron C. & C.	72

BOSTON CURB*	Sept. 3
Alaska Mines Corp.	.12
Boston Ely	.60
Boston & Mont.	.49
Butte & Lon'n Dev.	15
Calaveras	.85
Chief Con	3¼
Contact	.15
Corbin	10
Cortez	.08
Crown Reserve	.15
Crystal Cop.	.51
Eagle & Blue Bell	2¼
Houghton Copper	.75
Intermountain	‡.05
Iron Cap	19¼
Mexican Metals	.41
Mines of America	1
Mojave Tungsten	.09
Nat. Zinc & Lead	.16
Nevada-Douglas	.43
New Baltic	.80
New Cornelia	17¾
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.07
Yukon Gold	.90

SAN FRAN.*	Sept. 3
Alta	.03
Andes	.04
Best & Belcher	.02
Caledonia	.04
Challenge Con	.03
Confidence	.04
Con. Virginia	.24
Gould & Curry	‡.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.07
Mexican	.16
Occidental	.40
Ophir	.01
Overman	.01
Savage	.03
Sierra Nevada	.11
Union Con	.39
Utah Con	.01
Belmont	2.80
Jim Butler	.52
MacNamara	.31
Midway	.06
Mont.-Tonopah	.10
North Star	.05
Rescue Eula	.10
West End Con.	1.05
Atlanta	.03
Booth	.03
Comb. Frac	‡.02
Florence	.10
Jumbo Extension	.09
Kewanas	.01
Nevada Hills	.02
Nevada Packard	.26
Round Mountain	.18
Silver Pick	.04
White Caps	.16
Big Jim	‡.75
United Eastern	4.00

COLO. SPRINGS*	Sept. 3
Cresson Con.	4.68¾
Doctor Jack Pot	.03¾
Elkton Con	.04⅞
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.67
Granite	.19
Isabella	.04½
Mary McKinney	.07
Portland	.80
United Gold M.	.13
Vindicator	.38

BOSTON EXCH.*	Sept. 3
Adventure	‡.60
Ahmeek	‡75½
Algomah	‡.15
Allouez	50
Ariz. Com., ctfs.	16
Arnold	‡.20
Bingham Mines	10½
Bonanza	‡.16
Butte-Balaklava	.25
Calumet & Ariz.	69
Calumet & Hecla	455
Centennial	‡12
Copper Range	47
Daly West	2½
Davis-Daly	5⅜
East Butte	‡10
Franklin	‡3¾
Granby	81
Hancock	‡6
Hedley	‡12
Helvetia	‡.15
Indiana	‡.60
Isle Royale	‡27
Keweenaw	‡.87
Lake	5¼
La Salle	‡2½
Mason Valley	‡3½
Mass	5
Mayflower	‡2½
Michigan	‡2½
Mohawk	‡56½
New Arcadian	1⅞
New Idria	‡13
North Butte	14½
North Lake	‡.60
Ojibway	‡.65
Old Dominion	‡39½
Osceola	54
Quincy	‡69½
St. Mary's M. L.	‡50
Santa Fe	‡.60
Seneca	12¼
Shannon	‡3½
Shattuck-Ariz.	‡15½
So. Lake	‡1
So. Utah	‡.16
Superior	‡4⅜
Superior & Bost.	3½
Trinity	3¼
Tuolumne	1
U. S. Smelting	43
U. S. Smelt'g, pf.	43
Utah Apex	1 15/16
Utah Con.	10¼
Utah Metal	2
Victoria	‡2
Winona	‡1½
Wolverine	24
Wyandot	‡.50

N. Y. CURB†	Sept. 3
Big Ledge	11/16
Butte & N. Y.	‡.75
Butte Detroit	.11
Caledonia	.43
Calumet & Jerome	15/16
Can. Cop. Corpn.	1 15/16
Carlisle	‡2
Cashboy	.05
Con. Ariz. Sm.	1 11/16
Con. Coppermines	5⅛
Con. Nev.-Utah	‡3/16
Emma Con	‡.10
First Nat. Cop.	1⅞
Goldfield Con.	.21
Goldfield Merger	.02
Greenmonster	‡7/16
Hecla Min	4 13/16
Howe Sound	‡4⅛
Jerome Verde	‡.50
Louisiana	‡3/16
Magma	30
Majestic	.15
Marsh	.04
McKinley-Dar-Sa.	.45
Milford	‡.75
Mother Lode	.34
Nixon Nevada	.41
Ohio Cop.	‡1
Rawley	‡2¼
Ray Hercules	4½
Richmond	‡.56
Rochester Mines	.34
St. Joseph Lead	14¼
Standard S. L.	⅜
Stewart	.13
Success	.11½
Tonopah	2
Tonopah Ex	1½
Tribullion	‡3/16
Troy Arizona	.10
United Cop	‡3/16
United Verde Ext.	38
United Zinc	1¼
Utica Mines	‡.08

TORONTO*	Sept. 3
Adanac	.05
Bailey	.02
Beaver Con	.25
Chambers Ferland	.09
Coniagas	2.37½
Hargraves	.03
Kerr Lake	5.62½
La Rose	.43½
Min. Corp. of Can.	‡2.00
Nipissing	8.62½
Peterson Lake	.07
Temiskaming	.28
Wettlaufer-Lor.	.03
Davidson	.30
Dome Exten	.13
Dome Lake	.10
Hollinger	4.75
McIntyre	1.37½
Newray	.11
Porcu. Crown	.10
Teck-Hughes	‡.14
Vipond	.10
West Dome	.08

* Bid prices. † Closing prices. ‡ Last Quotations.

Engineering and Mining Journal

Volume 106 · September 14, 1918 · Number 11

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LEADING OFFICERS OF THE NATIONAL SAFETY COUNCIL

The National Safety Council

The work of an organization such as the National Safety Council is unique in that its principal objectives are humanitarian. By bringing employers into close coöperation, individual efforts are concentrated and duplication is eliminated. For a moderate fee, a service is rendered that would be impracticable of attainment by the individual employer of labor. The National Safety Council bulletins are familiar to many engineers, and their influence in reducing accidents is appreciated. These bulletins are read by more than six million workmen weekly in the United States, Canada and some foreign countries. Work of the safety engineer.

ON SEPT. 20, 1912, the Association of Iron and Steel Electrical Engineers met in the city of Milwaukee, and, following the report of the Committee on Accident Prevention, resolved to launch a national coöperative movement for the dissemination of policies and methods worked out in the steel industry and found effective in reducing the number and severity of industrial accidents.

Forty delegates attended the First Safety Congress, meeting jointly with the Iron and Steel Electrical Engineers. An outline of procedure was adopted, together with a constitution and by-laws, and the work of scientific accident prevention became an integral part of American industrial life. Federal and state officials were in attendance and took active interest in the work. After several days of discussion and careful planning, a central body was established known as the National Council for Industrial Safety. For convenience of classification, departments were established to popularize and further the movement, and the close of the congress found the organization ready to take up safety work in the mining industry, on the railroads, in manufacturing and among iron and steel companies. Thus was a new coördinating factor placed behind the safety movement.

The new organization grew and prospered. A weekly safety bulletin service was established and has continued without a break for more than four years, growing to a distribution of 75,000 copies per week. Statistical researches were made and tabulated, and practical value was given to shop activities. The innovation of using available data in the simple and effective form of one-page illustrated bulletins, rather than in the compilation of massive treatises, proved the value of the council's services in presenting the lessons in readable form, fresh from the press. The council doubled its membership and greatly increased its usefulness in the second year.

The Third Safety Congress was held at the Hotel La Salle, Chicago. This series of meetings was epoch making, both in attendance and interest. It was at this congress that the industrial medical practitioner first made his voice heard. Plant managers learned that the installation of adequate mechanical safeguards did not comprise their entire duty. Sanitation, ventilation, control and eradication of industrial disease, elimination of infections—all these and other questions were placed on the program and thoroughly discussed. Tuberculosis, blood poison, hernia, eye strain and excessive fatigue were handled in a way to awaken the interest and coöperation of the large audiences.

NAME CHANGED TO "NATIONAL SAFETY COUNCIL" MEMBERSHIP DOUBLED

A year of intense activity followed. With a broadened scope of activities the association changed its name to the "National Safety Council." The program of the Third Safety Congress furnished the text for the activities of the officers and members, and the work was carried on with renewed enthusiasm. The membership doubled, and with every mail came scores of experience statements from plant officials. These were compiled, digested and reissued for the information of the whole membership. It is significant of the interest taken in the work that the master minds of industry have cheerfully and unostentatiously given so liberally of their time and experience for the causes of safety and humanity.

The Fourth Safety Congress was held at the Bellevue-Stratford Hotel, Philadelphia. To meet the demands of the congress it was necessary again to divide the council into new sections, each group meeting being larger in attendance and more ambitious in program than the first congress at Milwaukee. The Governor of Pennsylvania, the Mayor of Philadelphia, the press and the public united to further the propaganda of the congress.

"ROUND-TABLE" GATHERING

After the preliminary "round-table" gatherings, devoted to general discussion, ten sectional meetings considered the particular safety problems of their industries. The Cement Section took a leading part in the congress, as did the Mining, Steam Railroad, Laundry, Paper and Pulp Manufacturers, Public Utilities, Textile, Industrial Hygiene, Safeguarding of Machinery, Foundry and Woodworking sections.

It was at this gathering that the greatest truth in the safety crusade was forcibly driven home to plant managers, safety engineers and the public: That all the safeguards, all the rule books, all the discipline, and all other efforts must fail without the earnest and willing coöperation of the workmen themselves. Millions of dollars had been expended by members of the National Safety Council in perfecting mechanical safeguards in their plants; other millions went for sanitation, for ventilation, and for preventive measures; yet the men vitally affected too often showed only a perfunctory interest in their own welfare.

An important lesson was gleaned from the wealth of digested experience and statistical data furnished through the medium of the parent body—the National Safety Council. Where one case of industrial disease was prevented in the shop or factory, two were susceptible of prevention and cure in the home life of employees.

From the time of the Fourth Safety Congress the importance of education, rather than compulsion, in safety matters, was given prominent place in the activities of the movement. The elasticity of safety work was never better exemplified than during the succeeding year. Employers who had held aloof, waiting for the movement to prove itself, came forward in whole-hearted recognition of the justness of the plea for a larger humanity. From an organization struggling to meet the patent demands made upon it in the simple necessities of every-day life, organized accident prevention, almost in a day, was placed beyond the need of financial worries.

From the Fourth to the Fifth Safety Congress the membership again doubled in number; the work of the sections was improved, an increased staff at headquarters facilitated the activities of the officers, and the newer phases of safety work were pushed with unrelenting vigor.

THE FIFTH AND SIXTH SAFETY CONGRESSES

The Fifth Safety Congress was held at the Hotel Statler, Detroit, and the Sixth Congress at the Hotel Astor, New York City, Sept. 12 and 13, 1917. Perhaps the most important contribution to the cause of safety during this period was the organization of an information bureau and library containing every scrap of printed material available, touching on the work of accident prevention. This information bureau, at present in charge of three trained librarians, classifies and files all information, sending it to hundreds of inquirers every month. Among the duties of a staff of safety engineers is the classification and preparation of the material for suitable bulletins and publications for employers and safety engineers properly to start them in new activities. For the year ended Apr. 1, 1918, five million bulletins were distributed to fifteen thousand representatives.

VALUE TO INDUSTRY OF THE PAMPHLET "SAFE PRACTICES"

During the year 1917 a monthly pamphlet, "Safe Practices," was born. This is an encyclopedic work, destined to take its place in literature with the foremost handbooks of accident prevention. A modest number on "Ladders" was followed by others on "Stairs and Stairways"; "Boiler Rooms"; "Crane Construction and Safe Practices"; "Knots, Slings, Bonds and Hitches"; "Belt Shifters," and like subjects. In time, it is intended to present every phase of industrial education, and by rule, illustration and practice complete a digest of safe practices for the prevention of accidents in every branch of industry. This is an ambitious program, but the National Safety Council can probably better than any other organization put it through to a successful conclusion.

Progress in Accident Prevention

THE development of the science of accident prevention in America within the last five years has been summarized in a single phrase, "Nothing is so valuable economically as the man." Outlined briefly, the following have been found to be the essential features of accident-prevention work:

1. To ascertain the actual conditions of risk under which employees perform each task and to determine the most practicable methods of eliminating or reducing this risk.
2. The provision of proper working conditions and of efficient safeguards for dangerous machinery and appliances.
3. Careful selection, instruction and supervision of workmen, and their assignment to work for which they are best suited.
4. The promulgation and rigid enforcement of necessary rules for safeguarding.
5. The inculcation of habits of caution in the minds of all concerned.

Actual conditions of risk, five years ago, were usually summarized as follows: Industrial accidents, fatal, one every four minutes; non-fatal, one every four seconds. Only male workmen were taken into account, and no reference was made to the many women and minors engaged—probably because no statistics were available. Elimination of risk has not been achieved or even approached, but a start has been made, approximating reductions of 15% in fatal and 40% in non-fatal industrial mishaps. Members of the National Safety Council who have carefully compiled statistics covering the five-year period report even more satisfactory totals, a few declaring reductions for both fatal and non-fatal classifications of 65 to 85 per cent.

Modern Industrial Methods and Standardization of Safeguards

The attempted achievement of proper working conditions and the standardizing of safeguards on dangerous machinery and appliances have revolutionized modern industrial methods, particularly when applied to plants engaged in "quantity production." Starting with the fundamental principle of installing only safe machinery and equipment, plant managers demand of machine builders that every guard of known merit shall be incorporated in the design of the machine. In the present-day workshop the executive strives to embody in every operation, beginning in the drafting and planning departments, provisions for safeguarding his workmen. The purchaser of a crane, for example, can now secure a completely appointed device—fully as efficient as any previous model, plus a full complement of guards.

Manufacturers of woodworking devices have gone further, probably, than any other group of machinery designers, and shapers, jointers, saws and planers are usually fully protected. The same may be said, varying only in degree, for the manufacturers of lathes, cutting, stamping and boring machines commonly found in workshops of every character. In the operation ot such machinery, however, plant executives, even through the most careful supervision, have not succeeded in achieving entire elimination of work accidents.

In older installations the safety engineer and department foremen are relied on to design and fabricate most of the guards. Certain large industries have systematized the designing, building and installation of guarding devices by turning the work over to a special department, and men engaged in this work are not called upon to take part in production. Remarkable results have been achieved, but as yet, although records in accident prevention show reductions of 85%, no safeguard, however elaborate in design and efficient in operation, is claimed to be "fool proof." Accidents still occur, though happily in decreasing number.

Initial Training Should Be in Home and School

Careful selection, instruction and supervision of workmen and the assignment to them of work for which they are best suited may be said to start in the home rather than in the factory, workshop or mill. Education in safety begins with the parents, continues in the schoolroom, and finally reaches the employment manager or foreman.

A score of American cities have attempted civic safety work, notably Rochester, N. Y., where a campaign of education embracing every phase of home, street, public and industrial accident prevention is being carried on. Thousands of educational bulletins, changed weekly, have been printed and displayed, and the lessons have proved of intense interest. Scenes familiar to every citizen of Rochester have been utilized to drive the lesson home, and it is a safe prediction that the campaign will prove of lasting benefit.

Special series of safety bulletins are available for use in public schools, and in many communities these are proving valuable aids to teachers in safeguarding pupils to and from their homes. Primary lessons in crossing streets, avoidance of traffic accidents, safety at play and in the home are taught in the lower grades, and in the advanced grades more comprehensive lessons are offered.

Scientific Course for Students

Carrying the idea to a logical conclusion, a national committee is now at work formulating a scientific course for students of technical schools and universities. The need for such a course is emphasized by the establishment in western Pennsylvania of a private course in safety engineering, under the auspices of a local branch of the National Safety Council, the industries being unable to secure a sufficient number of technically educated men to fill the positions awaiting such engineers.

Supervision, whether in production or in accident prevention, is one of the most important of industrial problems. In safety work it has often been said that "without the whole-hearted coöperation of the foreman, all efforts in accident prevention must fail."

Adopting the experience of safety engineers, it has been found advisable, if not imperative, to enlist the services of the general manager not only in enforcement but in every stage of preliminary planning. This secured, the executive staff accepts as the policy of the establishment the slogan, "Stop the Accidents," or, as more popularly phrased, "Safety First."

The management, the planning staff and the foremen working in unison, the employment manager is next in line for conversion to the movement. This is well emphasized by the present plan in certain large industrial plants of charting every position in the works and the acceptances by the employment managers of partly incapacitated men or women for lighter service. The plan, too, has worked well in returning injured men to work. Men incapacitated because of injury to a lower extremity are found suitable places.

The promulgation and rigid enforcement of necessary rules for safeguarding have worked out in actual practice to an advanced stage of mutual coöperation. Success in drafting shop rules for accident prevention has been attained when shop safety committeemen serve on boards organized for the formulation of accident prevention standards. In fact, next to the general manager and his superintendents, the members of the shop safety committee are the most valuable safety boosters in the plant.

Safety Rules Augmented by Bonuses

Safety rules are often augmented by bonuses, prizes and rewards of various kinds, and these serve to inculcate the habit of caution in the minds of all concerned. That "the best safety device known is a careful man" is an aphorism of proved merit. Discipline has its value, but watchful care must be exercised to prevent foremen from confusing discipline with peevishness or "nagging" of workmen. Proneness to follow precedent in operation, though excellent in maintaining discipline of a sort, is destructive to best results in safety work. Change of process, equipment and operation calls for complete revision of method, and gradually habits of personal caution and conscientious observance of safety standards are revising experience tables of lost-time mishaps.

Safety Provisions in Plant Design And Construction*

Perhaps the most interesting inquiry regarding industrial accidents concerns the extent to which they may be prevented. Is it reasonable to look forward to a time when accidents will be so few as to be negligible, or is it necessary to contemplate always having a huge yearly toll of deaths and injuries in industry?

The prevailing belief is that it is hopeless to attempt the entire elimination of accidents, at least within a measurable time. But the results of a recent study of accident causes in the iron and steel industry suggest that the current belief may be erroneous—that, though it may not be possible to do away with accidents, it is entirely practicable to make industry so safe that fatal and serious accidents will be of exceptional occurrence. This conclusion is the result of a careful analysis, and, in a broad way, it would seem applicable to all industries. The premises upon which the conclusion is based are summarized under three heads.

1. Until recently, emphasis has been placed upon the frequency of accidents rather than upon their severity. The vast majority of accidents occurring in the iron and steel industry are of a minor character. Thus, even when injuries causing loss of time of less than one day are excluded, more than 50% of all the injuries reported caused disabilities terminating in less than one week.

2. The safety movement has dwelt unduly upon the carelessness of the worker and has stressed too little the importance of safe tools, safe machines, safe practices, and safe construction. Carelessness and ignorance on the part of the worker are undoubtedly responsible for many accidents, but chiefly for minor ones.

3. Fatal accidents and serious accidents, as appears from the present study, are primarily due to fundamental engineering or structural defects, over which the workman has no control. The reduction in the rates of death and severe injury has been due primarily to engineering revision of structure and practice, and it is in that direction that real progress lies.

A careful examination of accident rates in connection with certain blast furnaces from 1905 to 1914 indictates that the major part of the reduction in severity rates which took place was due to structural and mechanical improvements in the department. The disappearance of hot-metal "break-outs" was owing to completion of modifications in design which increased the resistance of the furnaces. Experience strongly suggests the overwhelming importance of improvements in physical conditions.

In the openhearth department, injuries caused by cranes and hoists show high severity rates in the earlier years, particularly in 1907. This was due almost entirely to the structural defects then prevalent, such as absence of footwalks, poor access to the crane cage, overhung gears, and similar causes. By 1911 these defects had been largely corrected, and from that time severity rates dropped markedly and continuously. In injuries caused by hot substances, explosions other than ingot are the main cause of the early high severity rates. It is obvious that the carefulness of the individual workman can do little to prevent such happenings. When they occur, some workmen are killed or injured. There is rarely any warning to enable those exposed to escape. The lessened severity rate of recent years is to be credited mainly to revisions in structure and in method which were primarily introduced to favor production.

This review sustains the contention that the effect of personal care appears mainly in reduced frequency rates, and that engineering revision is reflected more largely in the decline of the severity rate. There must be no misunderstanding. This contention does not diminish the importance of organization. In an important respect it increases it materially. Organization and the interest it evokes lead to the discovery and remedy of structural defects. Without organization the revision so far accomplished could not have occurred. The facts here pointed out emphasize the importance of directing organization more vigorously to the discovery of faulty structure. Open and obvious faults have been noted, and it is becoming a matter of intensive engineering study to discover and remedy the less obvious ones. This goes beyond the province of many safety men and requires the assistance of able engineers.

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*Abstracted from an article by Lucian W. Chaney and Hugh S. Hanna in the Monthly Review of the U. S. Bureau of Labor Statistics.

Effects of Mine-Dust Inhalation*

BY J. S. HALDANE

An interesting study of the effects of various kinds of dust when breathed by mine or mill workers. The comparative immunity of coal miners from any ill effects led to investigations from which several interesting conclusions were reached, subsequently confirmed by experimentation with animals. The influence of adsorption is mentioned, and a suggestion made that ill effects from inhalation of quartz dust can be minimized by admixture of this with coal and shale dust.

THE disastrous effects produced by inhaling certain kinds of dust are now well known. It is equally well known that no evident ill effects result from inhaling certain other kinds. There is no evidence that dust inhalation has hitherto caused appreciable danger to life in British coal mining. The widespread introduction of stone-dusting as a thoroughly practical and effective means of preventing coal-dust explosions has, however, directed new attention to the possibility of injurious effects of dust inhalation in coal mines.

INJURY TO LUNGS CAUSED BY DUST

The ill-effects from dust inhalation in mining have been observed only where hard rock is mined, and, practically speaking, only where the rock is in quartz, or stone such as granite, containing quartz. Observation not merely on miners, but also on other persons exposed to dust from various forms of quartz or crystalline silica, all tell the same story of dangerous injury to the lungs and death from phthisis after prolonged inhalation of quartz dust. The natural inference from these observations would seem to be that dust inhalation is dangerous in proportion to the amount of quartz or silica inhaled, and this was my own belief a few years ago. My opinions on the subject were, however, much shaken by observations made in the course of the work of the late Royal Commission on Metalliferous Mines and Quarries. We visited many quarries where hard stone containing about 70% of silica was being worked and dusty crushers were in use, so that men were considerably exposed to siliceous dust. I thought this dust must certainly be dangerous; but careful inquiry among workers, ordinary doctors, and medical officers of health failed to furnish evidence of injury.

DUST NOT INVARIABLY DANGEROUS

In 1911, while on a scientific expedition in the Rocky Mountains, I visited the gold mines of the Cripple Creek district. The stone worked is hard and contains about 70 to 80% of silica. Rock drills were working everywhere without water jets to stop the dust; and the men were evidently inhaling much dust. On careful inquiry, however, I found that miners' phthisis or other lung injury from dust was unknown in the district, although it does occur at some other groups of mines in the Rocky Mountains.

In gold mining in quartz reefs there seem to be striking differences at various places as regards the danger of the work. At the Mysore mines, for instance, where the gold is in quartz, I am informed that there is little trouble from lung affections attributable to dust; and in Western Australia there appears, also, to be only a moderate amount. In the Transvaal, on the other hand, the pulmonary diseases caused by dust have been of a most formidable character, necessitating extremely drastic preventive measures.

EFFECT OF QUARTZ DUST

The ill-effects of quartz dust have been attributed to the sharpness of the particles, and their consequent irritant action on the lungs. But if so, one would expect the quartz dust to prove irritant in proportion to the amount inhaled. One would also expect to find the sharp spicules in the lungs, whereas what is actually found consists of extremely fine particles, which do not look specially sharp or different in appearance from other fine particles.

The whole matter was so mysterious that it seemed desirable to try to clear it up by experiments on animals; and the Medical Research Committee asked me to arrange for the investigation, and provided the necessary funds. The experiments were made on guinea pigs. From previous investigations it appears that any kind of dust particles (except, perhaps, when they are soluble and chemically harmless) will cause inflammatory changes in the lungs if enough of the particles are inhaled. The nose and air passages are, of course, a great defence against dust, and in some animals the convoluted surfaces inside the nose constitute a particularly efficient defence. The particles which fall against the surfaces of the nose and air passages are swept out by the action of the cilia lining these passages, or by coughing. Nevertheless a considerable portion of the finest dust reaches the lungs, and will cause harm if it is in sufficient amount. This harm, if caused immediately, seems to be much the same with all sorts of dust. But if the harm is not caused immediately, there is a great difference in the effects. Certain dusts, and notably any unmixed form of crystalline silica, cause lasting and cumulative injury; whereas others, and notably coal dust or shale dust, cause no cumulative injury, and no injury at all unless they are present in enormous amounts.

RESULTS OF EXPERIMENTS

Now, what happens to the dust within the lungs in these two cases? On this point the experiments gave a perfectly clear answer. When the animals were exposed to as nearly as possible equal quantities of the fine dusts, and for equal times, the dusts were, at the end of the period of exposure, found to be abundantly present in the lungs. With coal dust there was special abundance, which is what we should expect, considering its lightness and fineness. The lungs became quite black.

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*Excerpt from a paper to be submitted to the Chemical, Metallurgical and Mining Society of South Africa, and the Institution of Mining Engineers of London.

But if the examination was made some weeks later, it was found that the coal dust and shale dust lungs were clearing up, whereas there was no evident diminution in the dust in the lungs of animals which had been exposed to powdered flint or quartzite dust from a Transvaal gold mine. After several months the coal dust and shale dust had entirely disappeared from the lungs, whereas the flint and quartzite were nearly as abundant as immediately after the exposure to the dust.

NATURE'S EFFORT TO COMBAT EFFECTS OF DUST INHALATION

The examination showed that all the dust particles are taken up into the protoplasm of certain of the epithelial cells lining the air cavities of the lungs. In the case of the coal dust or shale dust these cells detach themselves and wander away with their load of dust particles. Some pass directly into the ends of the bronchial tubes, and are thence swept upward by the cilia and swallowed. They thus pass out of the body by the alimentary canal. Other dust-laden cells wander into the lymphatic vessels and are carried to the lymphatic glandular tissue surrounding the bronchi. From this position they wander through the walls of the bronchi, and are then swept out like the cells already referred to. Still other dust-laden cells are carried into the lymphatic glands at the roots of the lungs, and where they wander afterward is still uncertain.

In the case of the flint or quartzite dust, nearly all the dust remains *in situ*. It is only to a comparatively small extent that the cells wander out with it, though some wandering does occur, and some of the dust gradually reaches the lymphatic glands, where it can readily be recognized, as it becomes coated with a dark pigment.

EFFECT OF COAL DUST

It can now be realized readily what is happening in the lungs of a coal miner breathing large quantities of coal and shale dust, as compared with what is happening in the lungs of a gold miner breathing quartzite dust. As fast as the dust goes in, day by day, to the coal miner's lungs, it is carried out again by the dust cells. His lungs, it is true, are probably always more or less black; but, on the other hand, what he coughs up is black and full of the dust on its way out again. His black spit is in truth his salvation. On exposing the animals to relatively small daily doses of coal or shale dust, and continuing this over a long period, it was found that after a few days the dust in the lungs ceased to increase. The intake of dust was thus balanced by the output. From all we know about similar physiological processes we may be fairly sure that the capacity for eliminating dust particles grows with use. If this is so, the practice of constantly getting rid of coal and shale dust may help the lungs in eliminating other kinds of harmful particles, such as tubercle bacilli, and may thus account for the remarkable fact that coal miners are, and always have been since statistics were first available 60 years ago, extremely free from phthisis.

In the case of the miner breathing quartzite dust, the dust remains for the most part *in situ* in the lungs, and there tends to accumulate from month to month and year to year. Some of it is certainly got rid of; but to reach a balance between intake and output, without there being a dangerous permanent loading of the lungs with dust, the amount of dust inhaled must be reduced to a minimum. The fate of men who have constantly, and often against constant warning and against the law, exposed themselves to heavy concentrations of quartzite or granite dust in working rock drills and in blasting, is tragic. For many years I have abstracted for the home office the information obtained by local registrars in Cornwall as to the mining history of miners who have died there. Since the war no statistics have been published, but for 10 years previous to the war the average duration of employment on machine drills of the men who died in the Redruth area, and had worked machine drills in the Transvaal only, was 4.7 years, and in Cornwall only was 7.8 years. Practically every one of these men died of phthisis, and usually at an age below 40.

On the ultimate effects of chronic overloading of the lungs with dust, I do not purpose to dwell at present. It may suffice to mention that an overdevelopment of connective tissue gradually occurs, constituting the condition of "fibrosis," and that at the same time the lungs become extremely susceptible to attacks by the tubercle bacillus, so that death from phthisis is the usual result.

Why is coal or shale dust easily removed from the lungs, but not siliceous dust? And why, above all, is pure quartz so difficult to remove, whereas the large proportion of quartz in shale dust is removed easily? Let consideration be given the first question first. The evidence points to the fact that not only is quartz dangerous, but also other kinds of very insoluble crystalline dust. Thus Professor Beattie found that emery, a crystalline alumina, and carborundum, a carbon silicide, are extremely dangerous. Now, if it were the case that the danger is due to mere hardness or sharpness, one would expect to find that crystalline dust, even when mixed with other dust, is dangerous. But the quartz in shale and other hard stone is actually harmless in practice. The mere chemical composition of the stone does not seem to matter. There is, however, a quality in the dust that does seem as if it mattered, and this is its power of adsorbing other substances.

INFLUENCE OF ADSORPTION

Absorption or solid solution is a process distinct from chemical combination and similar to solution in a liquid. It depends upon attraction between the molecules of the adsorbed substance and those of any free surface on or in the adsorbing solid; just as solution depends on attraction between the molecules of the solvent and of the dissolved substance. The importance of adsorption in all kinds of processes used in industry is, of course, great; and the recent remarkable experiments by Ivon Graham on the solution or adsorption of gases by coal[1] point out one direction in which adsorption is of great interest in coal mining. Particles of coal dust and other insoluble carbonaceous matter possess in a high degree the property of adsorbing other substances. The same property is possessed in a less degree by such substances as shale; whereas crystalline substances such as quartz seem to have little adsorptive power.

It is highly probable that insoluble dust particles are attractive and stimulating to dust-collecting cells in proportion to the soluble substances adsorbed in the dust particles; and that the particles containing little of these substances will be correspondingly unstimulating. This, at least, seems to me the most probable explanation of why some kinds of insoluble dust stimulate the cells and others do not; and the facts so far known seem to be consonant with this explanation, though far more work on the whole subject is required.

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[1] Trans. Inst. of Mining Engineers, LII, p. 338, 1917.

To the second of the two questions the answer seems simpler. The particles of quartz are taken up by dust-collecting cells, as already mentioned, though the cells do not readily wander out with them. But if enough of the juicy adsorbent particles are also present, they will stimulate the cells sufficiently, and consequently the whole of the dust, including the quartz, will be removed. In this way it can be seen how a mixture of quartz with silicates, as in shale dust and the dust from many hard stones, causes no harm; also why the dust in the Transvaal gold mines is so much more harmful than in some other districts where the metal mined is also in quartz. In the Transvaal both the gold-bearing reef and the surrounding country rock is quartzite. The quartz dust is thus pure. At Mysore, on the contrary, the country rock is not quartzite; and the dust is, therefore, a mixture containing, probably, enough of the stimulating variety of dust to stir the dust-collecting cells to activity.

POSSIBLE SOLUTION OF THE PROBLEM

It is evident that the facts ascertained point to the possibility of attacking the problem of dangerous stone dust in mines and elsewhere from a new side. If the inhalation of dangerous stone dust cannot be altogether prevented, it is possible, apparently, to neutralize its effects by causing another kind of dust to be inhaled with it. Dust from pulverized clay or shale, or a mixture of coal dust with shale dust, would seem to be suitable. A black mixture of, say, 60% of shale with coal dust might be specially suitable, as it would be easily visible, and could not explode. The most suitable method of applying it, so as to insure that the men should breathe enough of the dust, would have to be carefully thought out; but I do not see why practical success should not be reached, particularly if the existing precautions against inhaling quartz dust were vigorously maintained. When little quartz dust is inhaled, less of the neutralizing dust will be required, just as, in the case of coal mines, the less coal and coal dust are deposited along the roads, the less stone dust will be required.

The need for further experiments on the effects of inhaling different kinds of dust, and on the conditions needed for neutralizing the ill effects on the lungs, is evident, but as the practical conclusions which can be drawn from what has already been discovered are both evident and important, it seemed worth while to give the present summary. Observations of mining engineers on the effects of dust inhalation and the conditions in different mining districts throughout the world would, of course, be a most valuable help in guiding future experiments and devising effective methods of preventing the terrible suffering and loss due to miners' phthisis and fibrosis.

As far as coal mining is concerned, the results of the investigation are fortunately reassuring. So long as the dust in a coal mine is not explosive, and is not breathed in excessive quantities, it seems to do no harm, and possibly even does some good.

Injuries From Rolling Objects

By CHESLA C. SHERLOCK*

Legal decisions record a large number of cases in which the courts have been called upon to consider the question of injuries caused by falling objects. A significant fact is to be noted in these cases where injury was caused by objects rolling down hillsides: in every instance the employer has been held liable in damages for the injury done.

In a Utah case, it was shown that the plaintiff and a number of other householders lived in a deep ravine, so that it was necessary, in delivering supplies, to unload them on top of a hill about 200 ft. above the level of the houses, from which point each person removed his own supplies to his home. The plaintiff was working in his yard when a large piece of coal came rolling down without warning from the top, where the defendant's employee was unloading coal, and struck him, breaking his arm and rendering him unconscious.

It was shown that the edge of the pile was only two feet from the edge of the incline, and that there was no barrier or railing there to prevent pieces of coal rolling down, and upon this showing a verdict was given to the plaintiff and affirmed by the Supreme Court.

In a Washington case, the plaintiff was engaged with another workman in operating a rock drill a hundred feet or so below the main body of workmen. The nature of his work required him to pay close attention to the drill. A rock loosened by the men above, though they had placed brush below them to hold back material, rolled down on the plaintiff and injured him. The court held that because of the employer's measures in piling up brush to protect the plaintiff, the plaintiff had a right to assume that all due measures for his safety had been taken, and that he should recover damages.

Workmen are frequently injured while working under overhanging rocks or under the overhanging side of a hill. In a New York case, the plaintiff was working under an overhanging ledge, which had begun to crack badly. The evidence showed that the situation had been examined by the foreman and that he had made extensive tests to determine whether the crack was widening, and that he had found that it was, but had done nothing. The plaintiff did not know of the dangerous character of his place of work and had had no opportunity of finding it out. The court awarded him damages.

Bureau of Oil Conservation Needs Inspectors and Engineers

The Bureau of Oil and Natural Gas Conservation, Washington, D. C., wishes to secure the services of six field inspectors, whose work will consist of visiting the larger oil- and gas-producing localities and ascertaining the condition as to wastage of oil and gas. It also desires the services of eight fuel-oil combustion engineers. As far as possible, it is hoped to obtain inspectors who will volunteer their services to the Government during the period of the war, but if this is not possible, a fair remuneration, together with the necessary expenses, will be paid. Only men having had experience in these respective lines need make application.

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Method of Mining Pillars at the Fortuna Mine Of the Braden Copper Co., Chile

BY CHARLES HOLLISTER*

The orebody was first stoped by shrinkage, leaving pillars. The pillars were undermined and caving was attempted, but pillar caving ceased when the back apexed with the hanging wall. Stopes were then drawn empty and filled with waste, and drifts and raises were driven in the foot wall. That part above the section stoped was developed by transverse parallel drifts, connected by inclined raises at close intervals, that were drilled and blasted, retreating from hanging to foot walls. In mining the pillars below this section central drifts were driven through each and at close intervals short incline raises put up on each side and connected over the drift. The intervening ground between raises was drilled and blasted, retreating as described in the first operation.

THE method of mining at the Fortuna mine of the Braden Copper Co., Chile, is adapted from that used at the mines of the Ray Consolidated Copper Co., Ray, Ariz., namely, shrinkage stopes separated by pillars at regular intervals transverse to the orebody. by simultaneously drawing the ore from several stopes and pillars. Several methods of pillar attack were originally tried at Braden. One method was to excavate under the pillars by a series of drifts and crosscuts, undermined by drilling and blasting out the solid subpillars so left between. Though this plan seemed feasible at the time, and probably would have been successful under different conditions, results at the Fortuna were not satisfactory.

In drawing the broken and caved stope and pillar ore after undermining the pillars, the action was a gradual sloughing of the ore from the back of the pillars until the back apexed at the inclined hanging wall, forming an arch that prevented further caving, and leaving a large block of ore on the foot wall.

Horace Graham, who became superintendent about the time that the operations detailed were in progress, made some decidedly advantageous and well-devised changes in the mining method, eliminating entirely the wide pillar and stope system in favor of narrow stope and pillar units. This change retained the advantages of flexibility possessed by the old method, and though increasing the proportion of initial breaking necessary by reason of the additional amount of shrinkage stoping required, the saving in chute blasting and the extraction of cleaner ore compensated for the additional work. Accordingly, the stopes were all completely drawn and waste filled in, under and alongside the partly caved pillars and close to the stope backs.

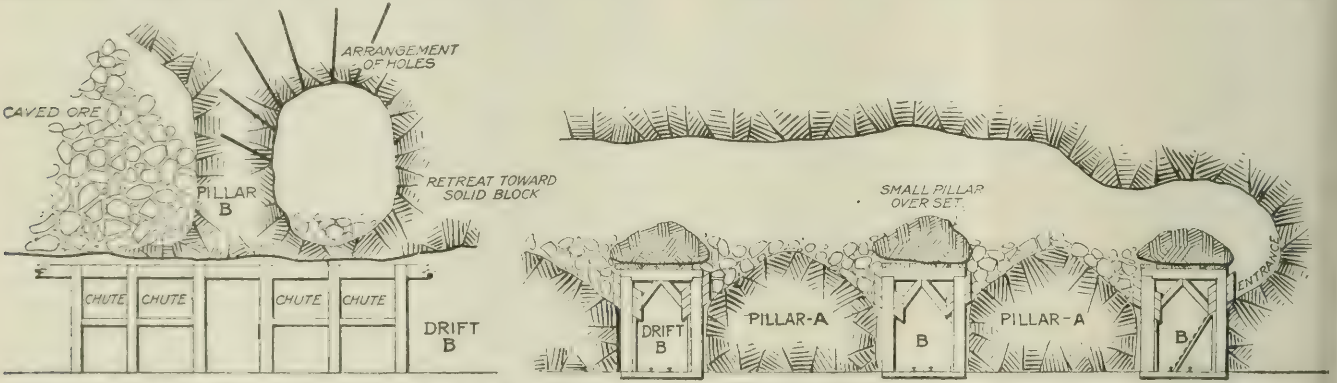

FIG. 1 LONGITUDINAL AND END SECTIONS SHOWING METHOD OF OPENING UP AND STOPING UPPER SUBLEVEL AT FORTUNA MINE

At the Fortuna, the orebody presents an elliptical horizontal area 3000 ft. on the long axis and 260 ft. across at the widest part. The dip of the orebody is steep, and it has been developed by tunnels at four levels from the surface to a depth of 1425 feet. Shrinkage stopes extended across the orebody from wall to wall and ranged from 15 to 25 ft. in width; pillars left between stopes were usually from 15 to 24 ft. wide. The flexibility of this system permitted a widening or narrowing of the stopes or pillars, according to changes in the character of ground—wide stopes and narrow pillars for hard ground and *vice versa* for soft ground. At Ray, the earlier 25-ft. wide pillars, alternately separated by 25-ft. wide shrinkage stopes, were mined first by taking a 10-ft. wide shrinkage stope up through the center of each pillar, thus stoping out the core, and then undercutting the pillar base and caving the whole over large areas

To mine the uncaved block and recover the arched pillars, it was decided to raise in the foot wall at a distance sufficient for a good margin of safety and to develop a sublevel system for stoping and caving. The block was divided into two parts, an upper and a lower. The upper section was that portion of the ore above the ground that had been stoped and the lower section included the pillars of the stoped-out and filled portions below. The upper section was developed, first, by a drift in the foot wall from raise to raise; then drifts 24 ft. center to center from the foot-wall drif to the hanging wall of the orebody, driven parallel t the original line of pillars. Incidentally, in driving th foot-wall drifts, a large orebody was developed which had not figured in former calculations. Preliminary work was practically completed on this level when I took charge of the Fortuna division. Some stoping had been started, though this did not appear to promise entire success.

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Eventually, the following method was adopted: Chutes, of which only a few had been previously constructed, were placed staggered for two sets, then a set missed, etc., to the end of these transverse drifts. As shown in Fig. 2, short inclined raises were driven at about 35° to the horizontal, connecting with similar raises through the pillars between adjacent drifts. This left a pillar 6 ft. thick over each chuteless set between raises. The connecting raises were then stoped up from 7 to 8 ft. high, and the muck was drawn down, leaving only working head room. The intervening 6-ft. pillars were then drilled and blasted successively. The men were always safe, as the retreat was away from the undercut and caving area, as shown in Fig. 2. The result of this procedure was completely to undermine the entire block, and though it was thought at first advisable to put up a cut-off shrinkage stope to free the block from the foot wall, the rapid and complete caving of the ground made that procedure unnecessary. The block yielded 110,435 tons out of a possible expectancy of 120,000 tons. Timbers in this section were 8 x 8-in. sets with 8-ft. posts and placed at 5-ft. centers along the drifts.

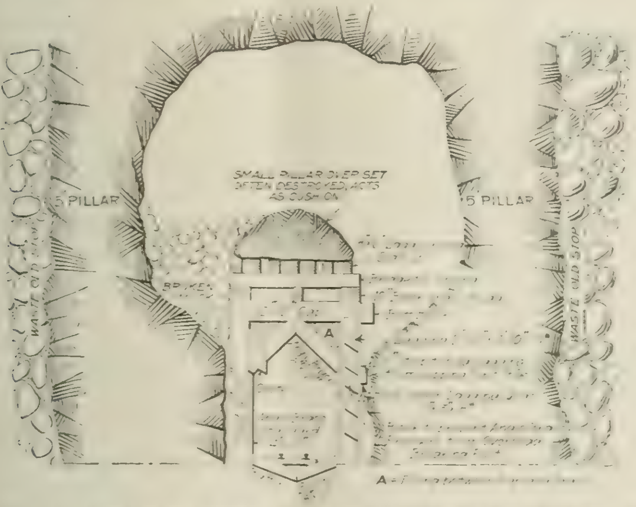


FIG. 2. DETAILS OF TIMBER SET AND SECTION OF STOPE OPENED UP IN LOWER PILLAR LEVELS

The second or lower section above the Fortuna No. 3 sublevel, with the exception of a part of the foot-wall drift, was developed during the drawing stage of the upper section. The development plant was practically identical, central pillar drifts being 24 ft. center to center, and timbering and chute building following at a working distance behind each heading. Owing to the heavy character of ground expected in this section, 12 x 12-in. timber sets were used, supplemented with bridges for spiling purposes.

The conditions that existed here were entirely different from those of the first section. The ore in the shrinkage stopes on either side of the pillars had been completely withdrawn, and the stopes were filled with waste. The problem that presented itself was to prevent pillar stopes from breaking into the old filled stopes and allowing the waste to mix and dilute the pillar ore. Chutes as shown in Fig. 2 were placed in each timber drift set and raises driven up 6 ft. at an angle of 45° into the pillar, along each side of the drifts. The raises were then continued by inclining backward to connect over the top of the drift. After this was done for the total length of a drift, the small pillars between openings were drilled and shot. The result was the removal of a core which, with occasional holes to widen the excavated area, caused the pillars to cave freely, and the caved ore was drawn from the chutes. The extraction up to Mar. 1, 1917, from pillars No. 1, 2, 3, 4, 5, and 6 was, respectively, 100, 77.3, 64.2, 78.6, 37.7, 80.7, 80.4, and 58 per cent. Upon my return to the United States at this time, the chutes, with the exception of those in Pillar No. 1, were all still producing ore.

CONCLUSIONS

It is of interest to note that at Ray the top weight on timber sets manifested itself first, resulting in a firm setting of the timber sets before side pillar pressure took effect. This, however, was not the condition at Braden. The primary pressure was exerted by side squeezing, causing the posts to yield by bending inward. To relieve this strain, the angle braces, as shown in Fig. 2, were changed from 50° to 40° from the horizontal, and 8 x 12-in. batter blocks were used in place of sills. A crew was kept picking away the ground back of posts to relieve the pressure. Conclusions were:

1. In heavy sections of wide area it is imperative to start caving operations as soon as possible after drift development and timbering have fair lead. This to permit chute construction and raising without interfering with the other work.

2. Timber must be well blocked all the way around, or the first weight of the subsiding ground will push the sets over, thereby losing an entire drift, with resultant high cost and frequently with fatal delay. Poorly fitting collar braces seem to be the main contributory cause of leaning timber sets, owing to their failure properly to withstand excessive pressure.

3. A timber set, to give the best service, should subside gradually and vertically under pressure. No timber can hold up the enormous weight imposed by caving ground, and the best to be expected is a maximum life of resistance. Caps 12 x 14 in. in section have been crushed to a thickness of four inches, yet the posts showed no sign of strain except a tendency to splinter with the grain. It was noticeable, both at Ray and Braden, that the point of least resistance along the posts, provided the set stood squarely, was about 18 in. above the bottom. This is undoubtedly caused by the expansion of the pillar base through the crushing weight of the irresistible mountain overhead.

Eighty-seven Mining Titles for properties located in various states of the republic were issued during the month of June, 1918, by the Mexican Department of Commerce and Industry, according to a consular report, and of this number 49 belong to the State of Sonora alone, where the mining industry has assumed a considerable impetus during recent months. Of these mines, 16 are for gold and silver; 8 for copper; 7 for gold, silver and lead; 7 for gold, silver and copper; 7 for silver and copper; 7 for silver and lead; 4 for molybdenum; 2 for manganese; 3 for antimony; 3 for fluorspar; and the remainder are for silver gold, or copper combined with various other metals.

Safety and Health in Hydrometallurgical Plants

By A. W. ALLEN

Measures which increase efficiency in metallurgical plants nearly always result in greater safety, general improvement, and better health. Such installations are scattered throughout the world, and this paper therefore is addressed to a wide audience. A plea is made for full consideration, at the time the plant is designed, for the operator of the mill and his helpers. The fact that inefficiency and poor results are often caused by the continual need for unproductive and wasteful effort, in an attempt to counteract the ill effects of unsatisfactory plant design, should be kept in mind by the engineers from the outset.

ACCIDENTS to machinery or workmen in hydrometallurgical plants are usually to be attributed to a multiplicity of causes. Faulty design of plant arrangement and faulty estimation of power requirements for certain machines are often responsible. Other than in exceptional cases, no margin is allowed—no safety provision. Pulley and belting widths are often kept at a minimum consistent with theoretical requirements. When the mill starts, a cloud of dust coming from the rock-breakers, or raised by the injudicious or overzealous use of the broom, finds its way between belt and pulley. Slippage follows, and is usually the forerunner of serious trouble, often culminating in personal injuries.

Reasonable Capacity Margin Desirable

Underestimation of capacity needed is another potent cause for a condition of affairs that leads to trouble of many kinds. A machine that will carry the load only when favored with unremitting attention is the cause of general inefficiency, owing partly to neglect of other units of the mill—a condition which often leads to minor accidents.

Cheap, second-hand, and often defective machines sometimes cost much more in the long run than a new and guaranteed item of equipment. Workmen are unacquainted with whatever hidden deficiencies and weaknesses are present, and accidents frequently result. The question of actual rather than of apparent economy should be considered in the first instance. If this is done, a liberal and expert estimate of probable cost for repairs and renewals will often sway the decision in favor of the unused and guaranteed machine

Ample Space and Elbow Room Essential

Space is usually the cheapest of commodities in a mining locality, and yet treatment plants apparently are often designed with an idea that the ground on which they are to be erected is almost priceless. Ample elbow room between dangerous belts and moving mechanisms is an imperative necessity if safety and comfort are to be considered and promoted. Compactness in design need not and should not involve a sacrifice of all elements of safety—or of any of them

Congestion and crowding of equipment have been especially noticeable in the past in connection with cyanide plants designed by certain "experts," whose metallurgical concoctions were monuments to their ignorance of practical working conditions. In such plants the operator's patience was reduced to almost complete disappearance by the frequent necessity of having to crawl through indescribably dirty holes and narrow passageways to tinker with valves, or to assist in the flow of slime pulp which the designer of the plant had assumed would move under the influence of some law of accelerated gravity as yet undiscovered. In practically all such instances the designer could have prevented perpetual discouragement and annoyance, occasional injury, and ill health, by the use of a modicum of common sense, and the provision of adequate space and ample head room. This would have gone far to insure efficient control, and would have provided room for those minor modifications in arrangement usually needed in all chemico-metallurgical installations after the first run.

Operators' Point of View To Be Considered

One of the most important considerations to be kept in mind throughout the preliminary stages of the development of plans and specifications should be the provision of every possible incentive to productive effort on the part of those who will operate the plant, and the elimination of arrangements that may lead to discouragement of any kind, and which may result in the avoidance of, or in attempts to avoid, routine duties. The operator of the plant must be considered, and considered to the fullest possible extent—from the outset. His attitude toward every phase of the work must be anticipated. His duties must be freed of tasks that are not required in a sensibly designed installation; and then, provided he has coöperated to the best of his ability, he will be able to hand over the plant, or section, at the end of his shift with the realization that the work has been well done, and that nothing has happened to diminish his enthusiasm. This should be the aim of the designer of the plant, who, if he knows what he is doing, has the power to influence the careers of the men who will work in his mill to a far greater extent than is usually realized.

Unproductive Effort Leads to Inefficiency

Nothing is more detrimental to the general efficiency of operations than the presence of a perpetual irritant in the form of some disagreeable duty—disagreeable only because of the shortsightedness of the man who designed the plant. Nothing will occasion so much loss as when employees have a justifiable "grouch." This may arise from causes which those in authority cannot appreciate, such as many minor personal discomforts which often lead to illness or injury. What is needed is emphasis on the fact that plants are operated by human beings who are possessed of more or less keen susceptibilities. Keeping of this fact constantly in mind while designs are being considered is a prime necessity.

If this was done in all cases, a great amount of discouragement would be avoided, less initiative would be stifled, and much unproductive effort would be saved for efficient purposes. A discouraged man is often an angry man, and an angry man is less likely to consider his own or another's safety—less likely to be able to make a wise decision in an emergency—than one who is contented with his surroundings.

FAULTY COST ESTIMATION OFTEN LEADS TO UNSOUND ECONOMIES

The cost of plants is usually underestimated, and for a number of reasons that it is unnecessary to dwell upon. Toward the completion of erection work the most rigid economies are sometimes introduced; and everything that can be considered, by any possible stretch of the imagination, as not absolutely necessary, is eliminated. Satisfactory arrangements for dry walkways, substantial ladders, and broad stairways, insuring both safety and comfort, are thrown out as unessential, in conformity with an eleventh-hour policy of cheeseparing. Temporary substitutes are put in, and the promise of standard equipment at a later date is seldom fulfilled. Concrete flooring is often omitted, for the same reason; and the operator is sometimes expected to watch a daily waste of gold or silver in solution or other valuable product and at the same time maintain his enthusiasm for effecting economies in other directions. Such a policy is the worst kind of mistake. A good floor that can be kept clean and keeps itself drained should be the first consideration in a wet-crushing mill. It is no economy to neglect a provision that will add to health and comfort, to say nothing of the saving of the valuable metal effected. It is absurd to expect men to be enthusiastically responsive to appeals to "keep the place clean" when the most elementary precautions to encourage or insure this have been ignored in the original design of the plant.

In many cases the smallness of the installation is pleaded as a reason for the avoidance of what a large corporation would consider essential health and safety provisions. This excuse is not always legitimate, and is often made through adopting a mistaken policy of erecting a mill before the mine had been developed to a scale sufficient to justify the expenditure for an adequate treatment plant.

MANUAL LABOR ECONOMIZING HAS AIDED SAFETY MOVEMENT

Dusting in a hydrometallurgical plant is usually confined to primary crushing, and the ill-effect on the health of the workers is small, due possibly to the fact that the dust usually contains a percentage of non-abrasive particles. The introduction of tubular mills of various designs has unconsciously aided the safety movement, inasmuch as their adoption has led to a greater simplification of operation, making personal attention less necessary, and so reducing the liability to accident. The economy in manual labor resulting from the use of mechanical devices such as crushed ore distributors and excavators has also resulted in a diminution in injuries, and an improvement in general health, by freeing a number of workers from monotonous and often unhealthful tasks.

Apart from those arising from the lack of safety provisions, the majority of accidents occurring in a modern plant result from unexpected causes. The relation of knowledge of danger to resultant accident is marked. The deadly nature of cyanide is well known, and poisoning from this cause, in spite of continual contact, is happily rare in most countries, and deaths from cyanide poisoning are so uncommon as to be almost negligible in number. Precautionary measures are now standard, and though in isolated districts, where it is impossible to convince natives of the danger, it is not uncommon to have a number of poisonings with "green" gangs, all the cases respond to the antidote, which is kept handy.

High-tension current is well known as dangerous—the effects of a slight shock are not easily forgotten—but the number of accidents from this cause is comparatively small. Other dangers are more insidious and less obvious. Salivation, or mercury vapor poisoning, is not uncommon among amalgamation-plant workers—a condition that has often been improved by an educational campaign in the mill.

SAFETY PRINCIPLES IN ACCORD WITH EFFICIENCY PROGRAM

On reviewing the situation it is impossible to avoid the conclusion that, in general mill work, the insuring of greater safety and better health has often resulted without a recognition of safety-first principles, *per se.* This proves the eminently sensible nature of the safety campaign, because the changes that have tended to reduce or eliminate danger and discomfort and increase security and satisfaction were concordant to a plan insuring greater efficiency in general results, made in the first instance to increase returns and decrease costs, or both. The resulting economy in labor diminished the likelihood of accident and freed workers for other less dangerous but more responsible tasks, and so aided the movement that has done so much to stabilize industry in general.

Development of Mining in Papua

A project involving the construction of a light railway, 18 miles in length, to connect Port Moresby (Papua) with the Laloki River, to serve a copper-mining enterprise, is being considered. The government had decided to spend £35,000 on the construction of this line, but the project was temporarily abandoned on account of the war. The harnessing of Rona Falls, on the Laloki River, for the purpose of generating electric current for mining purposes, has been authorized.

Papua, which is one of the largest islands in the world, lies to the northeast of Australia, and is practically unexplored. One quarter of the island was taken from the Germans by Australian forces during the early days of the war, and one half of Papua is now under Commonwealth administration. The remainder of the island belongs to the Dutch.

Gold has been found extensively in river estuaries on the mainland, and also in the smaller volcanic islands. Development of the colony is likely to be slow, on account of climatic conditions, coupled with isolation from trade routes and centers of civilization, but it is expected that extensive mineral deposits will eventually be opened up.

Differential Flotation at Wallace, Idaho

By C. T. Rice

The efficient treatment of zinc-lead ore by flotation involves the adoption of a system of selective concentration. This article describes in detail a typical installation of this kind in the form of an addition to a jig and table concentration plant. The capacity is about 300 tons per day, and a plan is shown giving the general arrangement of equipment. In the older section of the mill the crushed ore is cleaned by jigs and tables, and, after regrinding in a conical mill, is treated in the differential-flotation annex as here described. The installation is of particular interest to millmen in that it exemplifies the solution of a problem that many mining companies have under consideration—how to increase recovery without greatly changing existing methods of ore treatment or of increasing the capital input for plant and appliances. A flotation unit can be added to an existing mill with as much ease as and not much greater expense than an old-time canvas plant.

THE recent installation of differential flotation at Morning No. 2 plant of the Federal Mining and Smelting Co., to adapt it for the treatment of zinc-lead ore from the Morning mine, involved a consideration of several important details. The annex was added to the old mill buildings, and apart from the fact that the hillside facilities permitted the placing of the Pachuca emulsifiers at the head of the flotation machines, instead of between the two roughers, the arrangement may be followed elsewhere. The design is well worthy of study and is to the credit of T. M. Owen, the Federal company's flotation expert—one of the few men who have had experience with differential flotation both in this country and Australia.

The installation has an underload capacity of 300 tons of 60-mesh flotation feed per 24 hours. In the older section of the mill the ore is crushed and treated on jigs and tables, not so much to get out the lead and zinc as to reduce the amount of crushing to be done subsequently by making tailings rejections as early as possible throughout the treatment. The final product is then crushed to 80 mesh in an 8-ft. x 36-in. Hardinge mill before going to the flotation plant. The drawings illustrate the treatment which begins at this stage.

Drag-Classifiers and Air Lifts Used

The Hardinge mill operates in close circuit with two drag classifiers, and the overflow from these is delivered, by a 6-in. centrifugal pump, to the 40 x 12-ft. Dorr thickener. The pulp is thickened to a consistence of 4 to 1 and then pumped to the Pachuca emulsifiers feeding the lead roughers. The emulsification is accomplished in two Pachucas, and as there is a considerable amount of granular material in the feed, a second and smaller air-lift pipe has been added to the Pachucas. These auxiliary air lifts do not operate in close circuit with the tank, but discharge either into the second Pachuca or into the feed box of the first series of roughers. The same system of two air lifts (one to elevate the granular material that would not overflow from the tank, and which otherwise would build up in the Pachucas) is also used in the zinc-emulsifying Pachucas.

As will be seen from the drawings, there are two lines of lead pneumatic machines and four lines of zinc machines, each line being composed of two roughers and a cleaner, the second rougher taking the bottom flow from the first rougher, and the float from both roughers going to the cleaner. The bottom flow of the cleaner returns to the lead Pachucas for re-treatment, tailings only being made by the second rougher of the series. In the lead series, the tailings from the second roughers go to an 8 x 8-ft. tank, where any irregularity in the discharge of the lead machines is equalized, and the feed held and mixed slightly so as to even it in grade, as well as in quantity, before being pumped to the zinc emulsifiers. The tailings from the second roughers in the zinc section go to the creek.

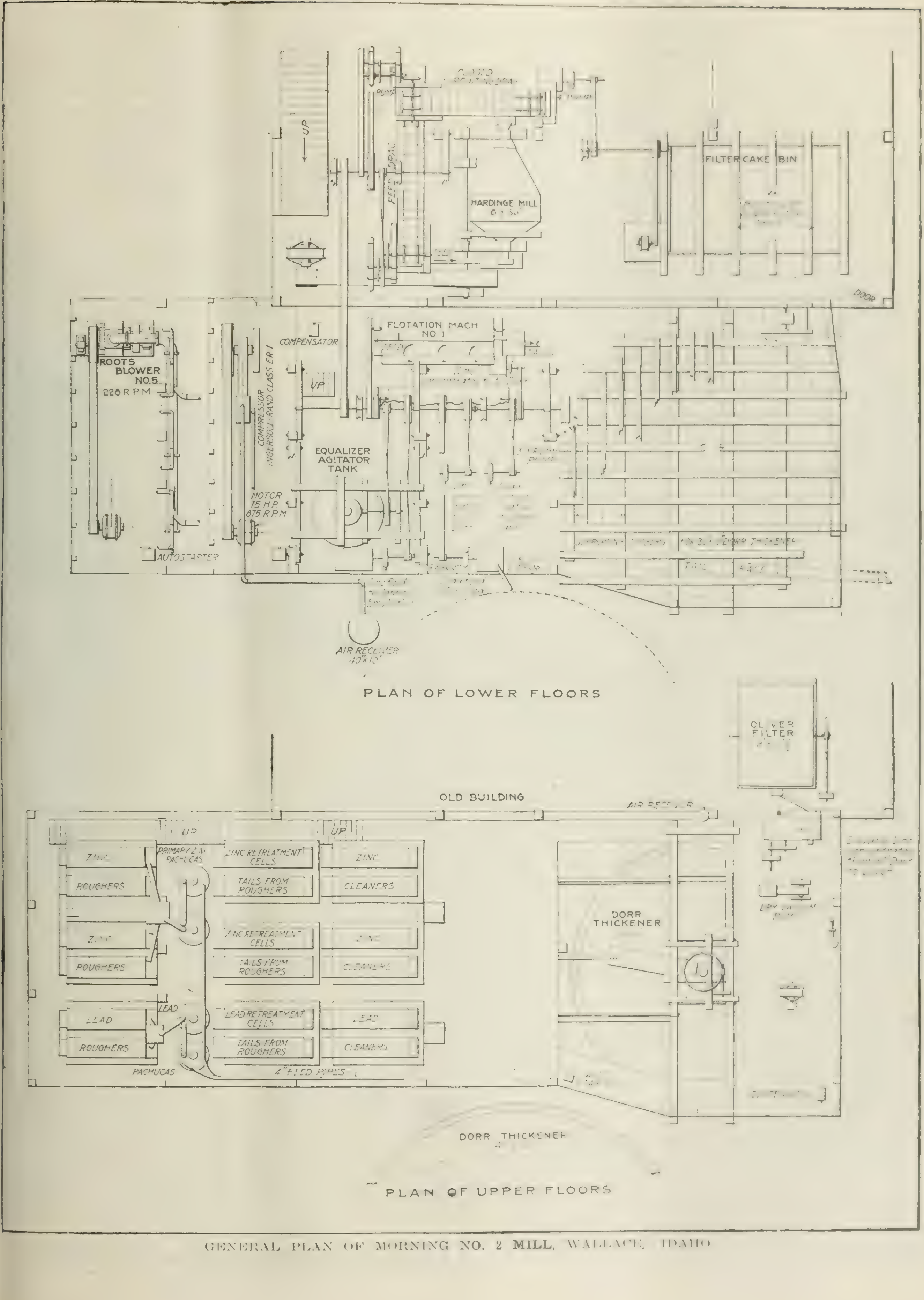
Emulsification for Zinc Separation in Janney Emulsifier and Pachucas

The emulsification for the zinc machines commences in a Janney emulsifier and is completed in two Pachucas. The single Janney does not give the pulp sufficient emulsification, but from the trials made during the six weeks that the plant operated, it was thought that the two Janney emulsifiers running in series would produce a better emulsification than could be obtained with the two Pachucas. The Janney emulsifier was, however, installed only as an experiment, and the plant did not run long enough to permit a decision as to which device gave the better emulsification.

The air for the Pachucas and for other purposes is supplied by a small compressor at 15 lb. per sq.in. The air for the Callow cells is delivered by a No. 5 Root blower at 3½ lb. per sq.in. pressure. The flotation machines are 2 x 10 ft. in size and equipped with cast-iron filter-pan individual bottoms for each cell. This now represents the standard practice of the district. The froth concentrate from the lead cleaners is added to the lead concentrate from the tables, and the mixture settled in tanks. The amount of lead froth obtained is too small to warrant the installation of a filter. The zinc froth is settled in a 30 x 10-ft. Dorr thickener to a consistence of about 1 to 1 and then raised by a small bucket elevator to the feed box of an 8 x 11½ ft. Oliver filter. The oil used to float the lead is No. 2 Cleveland-Cliffs, and No. 8 G. N. S., or No. 350 Pensacola for the zinc. Sulphuric acid is added previously, to promote the flotation of the zinc and to keep down the siderite. The arrangement of the machines on the different floors is shown in the drawings, together with other operating details.

After six weeks of operation, the plant was closed by court order, arising out of litigation concerning the title to part of the Morning orebodies. The suit has been settled in the lower court in favor of the Federal company.

Remember the Comfort Fund of the 27th Engineers.



GENERAL PLAN OF MORNING NO. 2 MILL, WALLACE, IDAHO

Automatic Elevator-Bucket Discharge

By H. M. Schleicher[*]

Methods employed for procuring discharge of the bucket when the material elevated has a tendency to pack in it have been described recently in two papers concerning belt elevators. One of these papers is published in the Bulletin of the A. I. M. E. for February, 1918, on page 273, and the other in the *Engineering and Mining Journal* of Dec. 29, 1917, on page 1113.

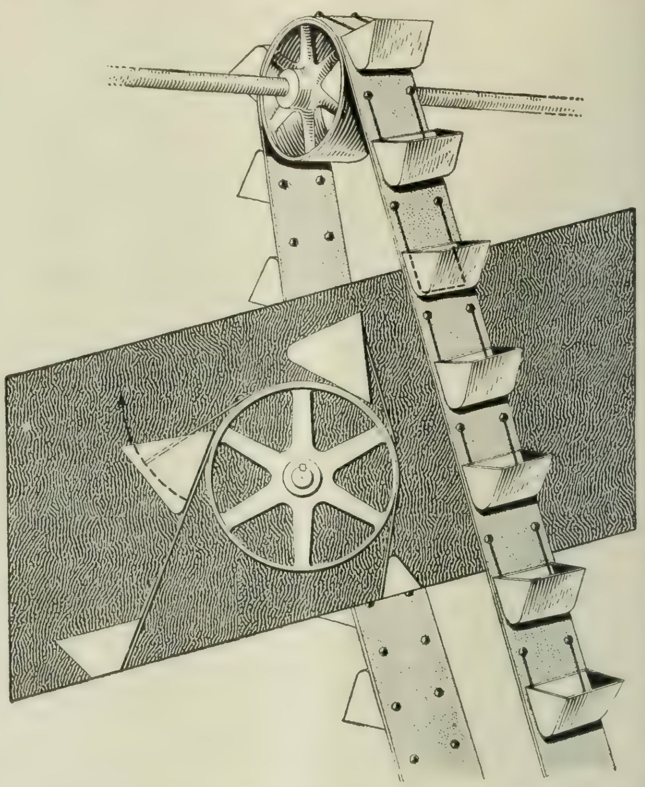
In an interesting paper in the Bulletin of the A. I. M. E. for October, 1917, on page 1475, A. P. Watt, in describing the handling of flotation concentrate, writes: "If conditions are such as to permit its use, an elevator is preferable to a centrifugal pump for elevating flotation concentrate." If the concentrate is at all like the material produced in a flotation plant of which I had charge a few years ago, a marked tendency to pack tightly in the bucket and remain there will be noted, and it will be necessary to resort to extraneous means for insuring discharge.

Many of the methods outlined in the papers referred to for aiding the discharge of the buckets depend upon a bumping or vibrating device which, theoretically, would seem hard on the elevator mechanism. A method developed in the flotation plant mentioned would seem to be worth bringing to the attention of millmen, as it was effective, quiet, and not harmful to the elevator. The principle involved is simple, and the device is cheap and readily installed. The method is illustrated in the accompanying sketch. A given point on the belt starts around the head pulley before any point below it. The ends of a wire U-shaped loop are fastened to the belt just above a bucket and project down into the bucket. As the ends of the loop start around the head pulley, the bottom of the loop describes an arc across the bottom of the bucket. Furthermore, and more important, as the ends of the loop leave the head pulley on the down side, the action is reversed, and at this time the bucket is inverted and in the proper place and position to discharge.

The wire loop is provided with eyes at the ends of its arms, by which it is fastened to the belt with small belt bolts over large washers. The bottom of the loop is made to conform closely to the form of the bucket. The loop should be of such length that it does not touch the bucket anywhere, either when the belt is straight or going around a pulley; that is, the arc described by the bottom of the loop should be shorter than the distance across the bucket. The bucket, in traveling around the pulley, remains tangent to it and does not change in relation to the belt at any time, although the loop does change in its relation to the bucket when it starts around and again when it leaves the pulley. The first sweep of the loop through the bottom of the bucket loosens its load and the second sweep, taking place while the bucket is inverted, insures discharge.

Trials of this method were made with ordinary telegraph wire bent into shape by hand around four nails driven into a mill post. The nails were positioned so that the wire, when bent around them, took the desired shape, and by removing the heads of two of the nails the eyes on the loops could be made at the same time. These loops were tried at varying lengths until the proper length was ascertained. Those made of soft wire did not show much wear after two months' operation, but were rather soft for the best work. They tended to bend, which would be avoided if spring-steel wire were used. Loops made of steel should give long and satisfactory service.

The device will work satisfactorily on fine, wet materials. The wire should be stiff enough to penetrate the load, and should be fastened to the belt over large flat washers. As the material in the buckets has little opportunity to pack, the wire need not be as thick as would at first thought seem necessary.



DEVICE FOR INSURING BUCKET DISCHARGE

It is desirable to find the correct length of the loops so as to avoid contact of the wire and the bucket. In order to have a starting point for ascertaining the proper length, the following formula, which gives the approximate length, is offered: Let D be the diameter of the head pulley in inches. Measure the distance from the tip to the back of the bucket, divide by two and call this W. Then $L = \sqrt{Dw - W^2}$ = length of the loop. This can be only approximate, as the shape of the buckets varies and in deriving the formula the loop is assumed to be in a position which may hold good only for a particular case. It will be necessary to adjust one loop properly and then make the remainder the same, both as to length and the distance the loop projects into the bucket. The device has proved effective, and it is hoped that others encountering the difficulty of material packing in elevator buckets will make up and experiment with at least one loop to learn what it will do in their particular cases.

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Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Development of Brazilian Iron-Ore Deposits

That the iron-mining industry in Brazil is to be developed soon after the close of the present war seems evident, states a consular report. The prospect of early development is due to the fact that many important iron-ore deposits have been acquired by foreign and Brazilian syndicates.

Below are given the names of the companies that are at present said to be the more important owners:

The Itabira Iron Ore Co., an English concern, with its head offices in London, incorporated by the Rothschilds, Baring Bros., and E. Sassel, and which purchased the Conceicao and Esmeril deposits for 2,400,000 milreis (about $600,000 in American currency). This group has control of the Victoria Minas Ry. The deposits, situated at Itabira de Matto Dentro, are estimated at 99,000,000 cu.m. and capable of producing 296,000,000 tons. The purchase price paid by the prior holders was 400,000 milreis ($100,000).

The Brazilian Iron Steel Co., an American corporation, represented by M. Harder, has acquired, also in Itabira de Matto Dentro, the deposits known as Caná and Sant' Anna, containing 33,000,000 cu.m. or over, or 132,000,000 tons. The purchase price is stated as 300,000 milreis (about $75,000). This organization has also purchased the Algeria and Cota deposits, situated in the municipality of Santa Rita Durão (Marianna), for the sum of 150,000 milreis (about $37,500). These deposits are reported to be capable of producing 10,000,000 tons. The same organization also has a concession to construct a railroad operating between the mines of Santa Rita Durão (Marianna) and S. José da Lagoa.

The Minas Geraes Iron Syndicate, an American company, organized by Phel. Hartemback, Ernest Moser and John Hammond, has purchased the deposits of Paracatú and Bananal, situated in Cattas Atlas and in Santa Barbara.

The Société Franco-Brésilliénne and Bernard Goudchaux & Co. (presumably French), represented in Brazil by an engineer named Corvée, has acquired the deposits of Candonga, in S. Miguel de Guanhães, estimated as containing 10,000,000 tons of ore, for the sum of 200,000 milreis (about $50,000).

The Société Civile de Mines de Fer de Jangada, a French company, also represented by an engineer named Corvée, has purchased the Jangada mines, in the municipality of Villa Nova de Lima (Paraopeba), with a capacity of 15,000,000 tons, for the sum of 100,000 milreis (about $25,000). This mine is being prospected by Professor Metayer.

The Deutsch Luxemburgischs Bergwerks und Hutton Aktiengesellschaft, a German company, purchased the Corrego do Feijão deposit, situated in Piedade do Paraopeba (Villa Nova de Lima), for the sum of 100,000 milreis ($25,000). The deposit is at present being prospected by an engineer named Westerma.

A. Thum purchased the Casa de Pedra mine, situated in Congonhas (Ouro Preto), with 500,000 cu.m., and capable of producing 2,000,000 tons. The sum paid was 60,000 milreis (about $15,000).

The Bracuhy Falls Co. has purchased the Serra do Mascate and Mendonca mines, situated in Congonhas (Ouro Preto), with deposits estimated at 8,000,000 cu.m. and capable of producing 29,000,000 tons. The sum paid was 70,000 milreis (about $17,000). The same company has also acquired the Inhotim deposit, situated in Paraopeba (Bomfim), for the sum of 100,000 milreis (about $25,000). All of the prospecting of these mines for the company is being done by an engineer named Joaquim de Almeida Lustoza.

Carlos Wigg, of Rio de Janeiro, has purchased the Fazenda da Vargem, Marinho and Rocinha deposits, situated in Serra da Moeda (Ouro Preto), capable of producing 10,000,000 tons. The purchase price was 50,000 milreis (about $12,500).

Trajano de Medeiros, a Brazilian engineer of high standing, has purchased the Morro do Veado, Retiro das Almas and Barra deposits, situated in Serra da Moeda (Ouro Preto), capable of producing 12,000,000 tons. The sum paid was 50,000 milreis (about $12,500).

The Corrego do Meio deposits, situated in Sabará, were acquired by a German syndicate for the sum of 450,000 milreis (about $112,500) through an intermediary named Phel. Hartemback.

The Companhia Metallurgica Brazileira, with head offices in Rio de Janeiro, which is also connected with the manganese mining interests, Companhia Morro da Mina, purchased for a reasonable price eight mines, all in the State of Minas Geraes, the group representing a total reserve of some 100,000,000 tons.

The Companhia de Mineracão and Metallurgia do Brazil, organized on Sept. 8, 1917, in Rio de Janeiro, has acquired the iron mines belonging to Antonio da Costa Lage, who is one of the incorporators and the largest shareholder in this company.

The Canadian Metallurgic Co., which is said to be making plans for an electric smelting furnace on Governor's Island in the Bay of Rio de Janeiro, capable of producing 500 tons of steel daily, has acquired a manganese mine at S. João d'El Rey, and also certain iron deposits.

The Companhia Siderugica Mineira, with its head offices in Bello Horizonte, State of Minas Geraes, and founded in 1917, for the purpose of exploiting the iron industry, has also acquired important deposits of iron, which are now being operated. The company was incorporated with a capital of 350,000 milreis (about $87,500), the principal shareholders being João Gomes do Val and Amara Lanazi, of São Paulo.

The firm of Quieroz Junior & Co., owners of the Usina Esperanca (Esperanca Mill) and concessionnaires of the Usina Wigg, also possess an extensive deposit of iron ore situated at Itabira de Campos, the ore being of excellent quality for the manufacture of pig iron.

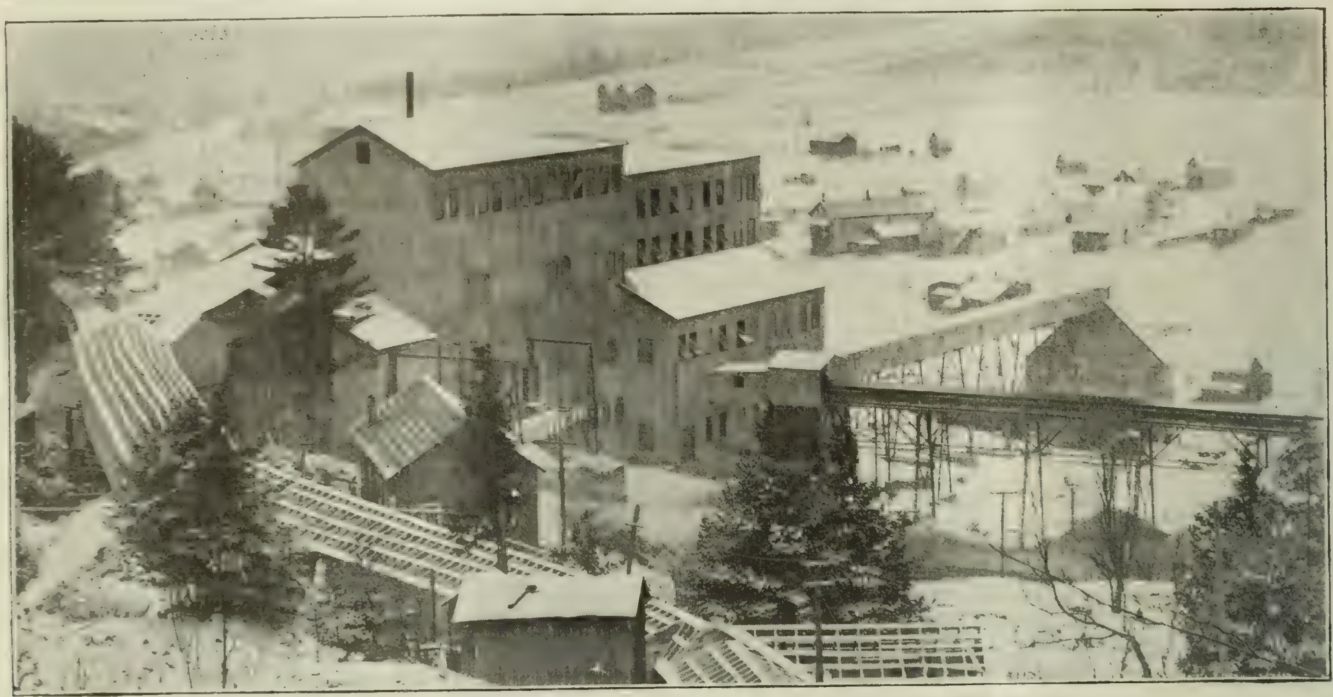
The Companhia Siderurgica Brazileira, founded by Carlos Wigg and Trajano de Medeiros, owns seven deposits of iron ore in the State of Minas Geraes, with a total area of 7120 hectares, which also contain considerable manganese ore.

Besides the deposits referred to, it is said that negotiations are being carried on to obtain the deposits known as Fabrica, situated in Congonhas de Campo (Ouro Preto), belonging to Colonel Machado; also deposits known as Tres Irmãos, in the municipality of Bomfim, and a deposit known as Serra do Pires, in the municipality of Ouro Preto.

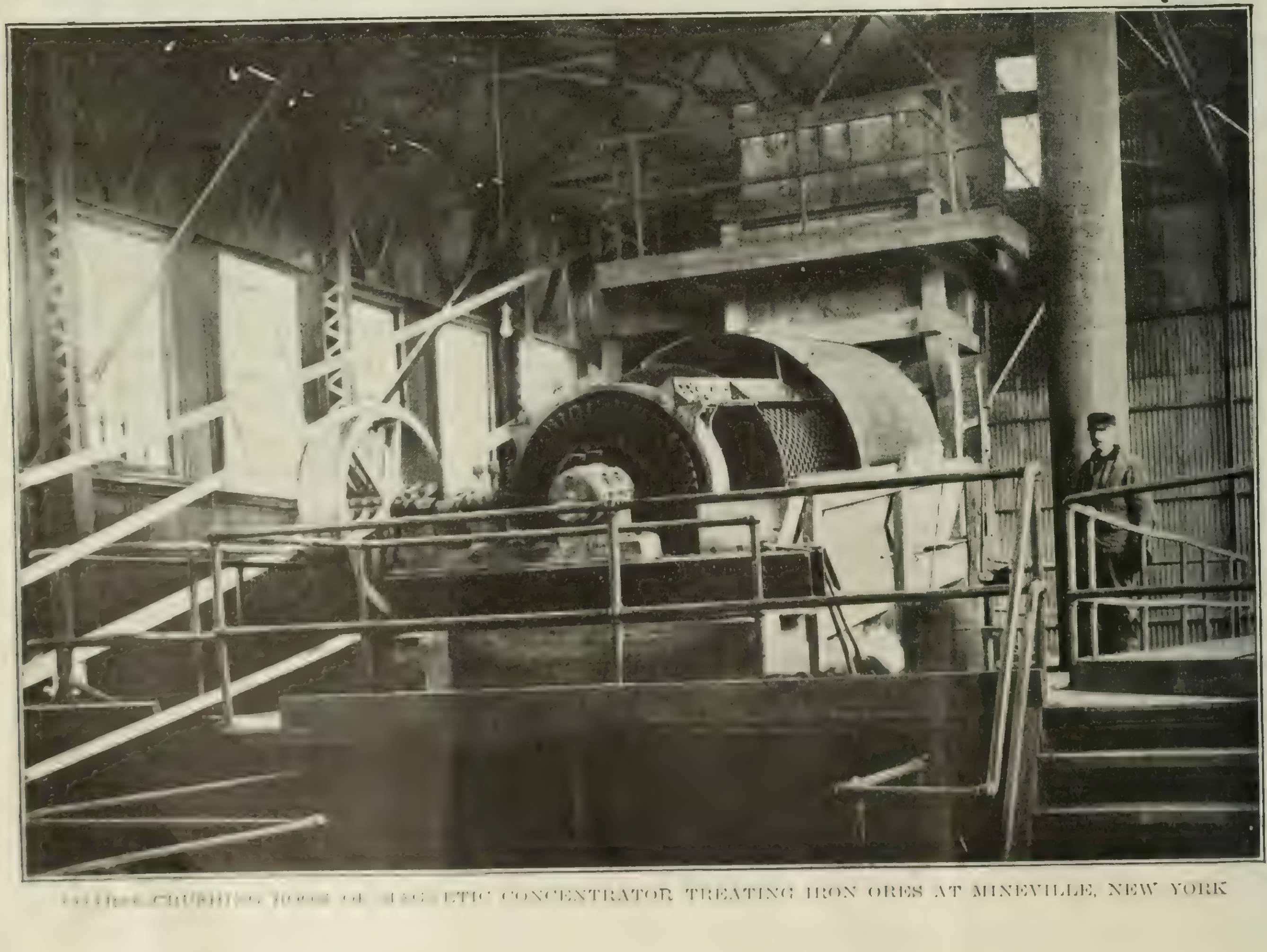
It is reported that the Itabira Iron Ore Co., which owns immense deposits in Itabira and Matto Dentro, with more than 100,000,000 tons of iron ore running from 68 to 70%, will, soon after the war, exploit these deposits. The plan is to construct a branch line of the Victoria & Mines Ry., which is under that company's control, to transport the ore to tidewater. The plans of this company are: (1) To install modern machinery in the mines for the extraction of large quantities of ore; (2) to extend the railroad to the mines at Itabira de Matto Dentro; and (3) to construct a fleet of vessels specially built to discharge the mineral automatically at the destination in Europe and to be suitable for transporting coal from Europe to Brazil.

Crystalline Graphite for Making Crucibles should contain as high as 85% of graphitic carbon, and should be free from mica, pyrite, and iron oxide, which are particularly harmful impurities, states the *Mining Journal.* It should also preferably contain a large proportion of flakes 1 millimeter or more in diameter, so that its fragments may interlock and thus be more easily bound together by the clay with which it is to be mixed. In the United States most makers of crucibles prefer to use a mixture of Ceylon graphite with American flake graphite, for Ceylon graphite is more nearly free from impurities, and its more nearly cubical fragments have a much smaller surface area in proportion to their volume than the thin flakes of the domestic graphite, so that it requires the use of less clay as a binder. Domestic flake graphite may be used alone for making crucibles.

Photographs From the Field



NO. 4 MILL OF WITHERBEE, SHERMAN & CO., MINEVILLE, NEW YORK



[illegible] CRUSHING ROOM OF MAGNETIC CONCENTRATOR TREATING IRON ORES AT MINEVILLE, NEW YORK

COSTA RICAN MANGANESE DEPOSITS WORKED BY AMERICAN MANGANESE MANUFACTURING COMPANY

TEST MILL OF THE BUFFALO HUNTER MINING, MILLING AND DEVELOPMENT CO., SILVER CLIFF, COLO., SHOWING ORE DEPOSIT IN THE BACKGROUND. TREATMENT OF THIS ORE INVOLVES THE SO-CALLED MANGANESE-SILVER PROBLEM

Handling and Storing of Explosives*

BY ARTHUR LA MOTTE†

The development of measures and appliances for avoiding accidents incurred in the use of explosives and for minimizing their results has been the subject of careful study and experimentation. Though there exists among mining men a general familiarity with specified precautions, a closer analysis of the recommendations made by manufacturers is often desirable. The list of "don'ts" seems formidable, but it should prove interesting to mine executives, foremen and workmen.

IT HAS been maintained that it takes three generations to make a gentleman; the same may be said of a man who can be depended upon to engage in hazardous work with a maximum of safety. One must begin with his grandfather. The primary characteristics of the safe man are unselfishness and consideration for others. Personal bravery and nerve, or cowardice, has nothing to do with it. Thorough knowledge of the subject has a great deal to do with it. The most unsafe man on dangerous work, or, rather, in handling dangerous goods, is the man who is afraid to be afraid. He may know that the thing he is doing is dangerous—he may know that it is dangerous to remain where he is under certain conditions—but he is often afraid to take cover himself or to warn others, or to take ordinary intelligent precautions, for fear of being thought afraid.

TIMID ATTITUDE OF FOREMEN DETRIMENTAL TO BEST SAFETY PRACTICE

I remember being in a mine some years ago where five men were killed by the tipping of a skip while it was being hoisted, because several of the men rode on the bail, causing it to tilt in front and engage a cross-tie. Positive orders were thereupon issued that no one should be allowed to ride on the bail; and yet, only three days later, when I was coming out of the mine, in company with the foreman and several others, the skip was stopped and several men got on and climbed out on the bail. When the foreman remonstrated with them, saying that this was against orders, one of the men sneeringly remarked: "What's the matter with you? Are you afraid?" This instantly silenced the foreman, who made no further objection, and we went out under exactly the same conditions as those which were known to have caused a fatal accident.

ENFORCED DISCIPLINE FREQUENTLY ESSENTIAL

The prevention of this type of accident, it seems to me, can be accomplished only by discipline, laying down hard and fast rules and enforcing them ruthlessly. Education, which is effective in preventing a large class of accidents, seems to be helpless here. If possible, rules should be made so inelastic as to prevent even the officers of the company from violating them. In the army, for general safety, even the commanding general may not do certain things, and I feel it would have a beneficial effect on industrial workers if they knew that their chiefs were not allowed to do various dangerous things which are forbidden the workers.

PROCESS OF MANUFACTURE ONE OF SAFE HANDLING

To return to the subject, it is necessary, to an extent, to begin with the grandfather of the dynamite; that is, the raw materials. These are purchased on specifications, submitted to a rigorous analysis, and are carefully inspected, sorted and strained. The inert or non-explosive ingredients which enter into the manufacture of explosives are just as carefully treated as are the more essential ingredients; and this inspection is brought right up to the last process in the course of manufacture. For instance, the wood meal and nitrates are given the final sieving in the mixing house just before they are put into the tub and incorporated with the nitroglycerin. This latter ingredient is put through a series of processes which would delight the heart of any safety man. From first to last it is "handled with gloves," generally rubber gloves. After separation from the acid it comes in contact only with wood or rubber. It is washed and stored in wooden tubs under water. It is drawn off through rubber pipes, the flow through which is stopped by elevating the end of the pipe. It is weighed in rubber buckets and is transported either through rubber-lined gutters by gravity or by a rubber-tired traveling tank with a rubber hose for a spout. Buildings are floored with rubber and the workmen wear rubber-soled shoes. The scales are covered with rubber, both the platform for the box and the platform for the weights. The weights also are covered with rubber. The operation is carried out in a frame building having an earth embankment entirely surrounding it as high as the eaves of the building itself, and this building is kept as far away from every other explosive building as the experience of the plant engineers shows to be necessary. After the dynamite is made, it is transported, in the process of being punched and packed, in wooden boxes having no exposed metal parts, and is punched with soft rubber-tipped wooden sticks. Special shoes are worn throughout the danger area, and the floors of the buildings have coverings of soft rubber-like material which can be taken up from time to time and burned.

PRECAUTIONS DEVELOPED FROM CLASSIFICATION OF ACCIDENTS

For a number of years a list of accidents in the use and handling of explosives was kept, compiled from the British and Canadian government reports and supplemented by an elaborate system of American newspaper clippings. The object was to classify the accidents which happen in the use of explosives in such a way that a brief list of precautions could be made up which would cover practically every condition likely to arise in the use of explosives in mines, quarries or on construction work. The list is added to from time to time, whenever a new cause of accident is reported. It is not always possible to be specific, but that the list covers the ground fairly well is shown by the fact that in the last few years no accident has been brought to the attention of the du Pont de Nemours management which is not covered by the rules and which would not have been prevented had all of the precautions been observed. This list of precautions is printed in the company's catalogs, and I will take each rule in turn and try to explain the reason and necessity of the precaution.

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*Paper to be read at the Seventh Annual Congress of the National Safety Council, September, 1918.

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All rules begin with the injunction "Don't." I remember reading this list at a convention of coal miners a few years ago, and one of the miners told me at the end that if he obeyed all the rules he would not be able to use explosives at all, but when I asked him to describe in detail each of the different operations through which he went in his blasting, I showed him that at no time did he do anything in violation of these rules, which was probably the reason why he had never had an accident with explosives.

HANDLING OF EXPLOSIVES DEMANDS CARE

"Don't forget the nature of explosives, but remember that with proper care they can be handled with comparative safety." The function of explosives is to explode, and a perfectly safe explosive would be useless. The company has always tried to avoid describing any explosive as safe, but explosives can be used in such a way that accidents are avoided, and for the man who handles explosives a good thought to carry is: "Don't take a chance, and don't try conclusions with dynamite." It is dangerous, of course; but so is a mine mule, and both the mule and the dynamite will perform their allotted work and render good service if treated with the proper amount of respect.

DANGER OF SMOKING AND USE OF OPEN LIGHTS

"Don't smoke while you are handling explosives, and don't handle explosives near an open light." Not all explosives ignite from a spark with the same facility. Blasting powder and nitro-starch powders are most easily ignited. The paper shells covering dynamite give it a certain amount of protection, but there is considerable difference, even among the various kinds of dynamite, in the ease with which they are ignited. Straight dynamite ignites more easily than ammonia dynamites and gelatins. The permissibles of the ammonia-base type are least easily ignited. A pipeful of ignited tobacco spilled in an open box of dynamite would probably ignite it; it would certainly ignite blasting powder. Open lamps on the hats of men who carry the dynamite around in the mine are distinctly dangerous, as sparks are continually falling from wick lamps, and, although acetylene hat lamps are safer, I have seen a lighted lamp drop into a box of dynamite. The best practice is for powder men to be equipped with permissible electric hat lamps, which are the safest lights known. It is thought that the Park Avenue explosion in the New York subway construction was brought about by a man bringing an open light into the powder house, where a number of detonators had been inserted into the dynamite. I remember seeing a drill runner drop an open bug-light into a lot of paper shells which had been removed from several boxes of gelatin dynamite and which entirely covered a box of primers. This was in one of the New York subway tunnels and probably closely paralleled, except for the result, the Park Avenue explosion.

PRACTICE OF CARRYING LOOSE MATCHES CONDEMNED

"Don't carry loose matches in your pockets while loading explosives—use safety matches." A number of accidents have occurred from the dropping of matches from hat bands into bore holes which were being loaded with dynamite. Quarrymen frequently appoint a number of laborers to fire the block-hole and mud-cap shots, for the lighting of which they fill their pockets with matches and stick half a dozen into their hat bands, so that in case one match goes out at a critical time they can quickly lay hand on another. These men are called upon, in the loading of a large blast, such as well drill holes, to assist the blasting foreman, and it seldom occurs to him to take matches away from the men, especially out of their hat bands. In leaning over the holes, matches stuck into the hat band are likely to fall into the bore hole and fire the dynamite. Though dynamite will usually burn peacefully in the open, it cannot be depended upon to do so in a bore hole, and will certainly explode if the detonator has been inserted.

NO SHOOTING OR HUNTING NEAR MAGAZINES

I almost hesitate to read the next rule on the list, as it would seem that no one out of an insane asylum would require it, yet the failure to observe so obvious a precaution has been the cause of many serious explosions. "Don't shoot into explosives with a rifle or pistol, either in or out of a magazine." To an intelligent man it would appear to be a plain case of suicide, and yet not many years ago a customer tried to convince one of the company's salesmen that the dynamite would not explode if fired into with a small-caliber rifle bullet. The customer tried the experiment in his cellar, shooting into several cases of dynamite which he had stored there. However, he failed to prove his point, as the dynamite did explode, killing the experimenter and his entire household. "Don't allow shooting or hunting near magazines." Though magazines should be bullet proof, it is seldom that they are, and, even if they were, the doors are likely to be open when explosives are being carried in or out. The risk of a disaster is too great for any sensible person to take any chances.

CARELESS DEPOSITION OR STORAGE OF EXPLOSIVES

"Don't leave explosives in a field or in any place where cattle can get at them." Black powder probably would do them no harm, but nitroglycerin is a powerful poison. Although cattle like the taste of the soda and nitrates in dynamite, the other ingredients would probably poison them. "Don't handle or store explosives in or near a residence." In some parts of the country it is the custom for miners to buy their own explosives and take home what they do not use in the day's work. This introduces a great hazard into the home, both on account of the possibility of children getting hold of the explosives and because of the danger in case the building should take fire. The new Federal regulations governing the handling of explosives will probably result in fewer accidents from this cause.

"Don't leave explosives in a wet or damp place. They should be kept in a suitable dry place, under lock and key, and where children or irresponsible persons cannot get at them." There is an increased effort in the matter of conservation to use nitrate of ammonia explosives, which require less nitroglycerin. Nitrate of ammonia explosives are more hygroscopic than other types, although any explosive will deteriorate when stored in a humid atmosphere. Probably the chief cause of explosives taking on moisture is storage in magazines built into the side of a hill in so-called dugouts. The actual loss in dollars and cents from this kind of treatment of explosives is considerable, but there are two reasons from a safety standpoint why explosives should be kept dry. In the first place, wet dynamite and wet blasting caps produce only a partial detonation, which is likely to cause a blown-out shot, and is highly dangerous in coal mines containing inflammable gases or dust. Secondly, the fumes from a partial detonation are more poisonous than those from explosives which are in good condition and explode perfectly. Dampness in blasting caps is a prolific cause for dynamite igniting instead of detonating, and a charge of burning dynamite in a bore hole fills the working place with extremely poisonous fumes. At present more care is taken to keep explosives under lock and key than was the case a few years ago. Blasting caps are particularly attractive to children, and from 30 to 50 accidents are caused every year through their playing with them, resulting in the loss of fingers, hands or eyes, and occasionally in loss of life. When one considers that a modern blasting cap will blow a hole through a $\frac{1}{16}$-in. steel plate, and that the pieces of flying copper will imbed themselves in iron two or three feet away, it is not difficult to realize what a power for mischief these necessary articles may become.

EVILS OF IMPROPER CHAMBERING OF BORE HOLES

"Don't explode a charge to chamber a bore hole and then immediately reload it, as the bore hole will be hot and the second charge may explode prematurely." This operation, variously known as "springing," "chambering," pot-holing," "squibbling," and so on, is done by exploding a succession of charges in increasing amounts in the bottom of the bore hole, with little or no tamping, in such a way as to expand the bottom of the hole, so that a larger charge may be accommodated. In some rocks the enlargement is produced by shearing and scaling off rock from the sides of the bore hole, and in others by compressing the rock itself. This latter, of course, is possible only in soft rock. Considerable heat is generated, not only by the explosive itself, but in the compression that occurs, and unless ample time is allowed between "springing" shots, accidents are likely to occur from an explosion of the charges which may be placed in the hot pocket, or become ignited from fragments of fuse or wire insulation. Of course, when the pocket is full of water and fills up immediately after each "springing" operation, there is no danger from the hole being too hot, but another hazard presents itself in the loading of "sprung" holes. That is the danger of the dynamite, especially when a straight dynamite is used and the cartridges are slit, getting between the cracks and crevices of the rock in such a way that when the hole is being tamped it may be pinched under considerable pressure and cause an explosion. For this reason, dynamite of the gelatin type is much safer to use where this operation is regularly performed, but where gelatin cannot be used the next best thing is not to slit the cartridges.

WOODEN TAMPERS SHOULD ALWAYS BE USED

"Don't do tamping with iron or steel bars or tools. Use only a wooden tamping stick with no metal parts." There is great danger in punching dynamite with an iron tamping rod, especially in holes bored in hard rock, but I venture to say that nearly half the miners who use dynamite use their drill steels for loading the charges, and, considering the frequency of this practice, it is a wonder that more accidents do not occur. It would seem a simple thing to provide miners with wooden tamping sticks and compel their use, but a number of them look upon it as a needless refinement, and always having their drill steels with them, they prefer to use them. When powder men remonstrate with them, they say that if the drill does strike a spark it will not ignite the dynamite; that they use it carefully and ram the dynamite in gently. However, it is only the survivors who say this. The men who are killed do not give their versions of these affairs. One of the curiosities of legislation was a bill introduced in one of the state legislatures requiring the use of several inches of copper on the end of the tamping sticks. When black blasting powder was used to a greater extent than it is now, copper was looked upon as a safe material to use with it, because it would not strike a spark, and that same feeling has descended to dynamite, but it is just as easy to detonate a drop of nitroglycerin or a pinch of dynamite with a copper hammer as it is with a steel one.

FORCING CARTRIDGES IS FREQUENT CAUSE OF ACCIDENTS

"Don't force a cartridge of explosives into a bore hole." This is one of the prolific sources of accidents in the use of explosives and one of the most difficult to control. If a miner or blaster has a cartridge of dynamite sticking half way down in a bore hole, it is a great temptation to drive it further by main strength rather than let it go and waste the bore hole and all the labor that it represents. Fortunately, modern explosives, which are much less likely to explode from rough handling than the straight dynamites of 10 or 20 years ago, have reduced the number of accidents from this cause to a considerable extent. The remedy, of course, is to have the drill bits always made to gage, allowing for a sufficient clearance over the diameter of the dynamite that is being used.

SAFE AND PROPER CIRCUITS SHOULD BE PROVIDED FOR ELECTRIC BLASTING

"Don't have a wire carrying electric current near detonators or charged bore holes at any time except for the purpose of firing the blasts." One of the dangers of having electric mining or quarrying machinery around explosive operations is the chance of one of the terminals coming in contact with the electric blasting-cap wires. Considering the care necessary to make connections properly for firing the blast purposely, it would seem that this danger is remote, but a number of accidents have occurred through careless placing of light wires. When the blasts are fired by the lighting or power current, it is doubly necessary to observe this caution, because, even with special safety switches, there is always a chance of the workmen becoming confused and connecting the wrong wire. Though the power and lighting current is generally advised for quarry and construction work in the open, the regular blasting machine is much safer in underground work, as by its use the danger of connecting the blast to a live wire can be avoided, and though in open work the number of shots that it is desired to fire at any one time may be in excess of what the blasting machine can do, it is rare indeed that such necessity arises in mining or tunneling operations. By keeping an entirely different circuit for the firing of the blast, much greater safety in operation is secured, but under no conditions should electric drills, electric punchers or undercutters be operated or other wires allowed around a room where men are charging bore holes for electric firing.

MEN SHOULD BE PROTECTED FROM BLASTS

"Don't explode a charge before every one is well beyond the danger zone and protected from flying debris. Protect your supply of explosives, also, from danger from this source." "Don't cut the fuse short to save time. It is dangerous and wasteful of explosive, as it is impossible to tamp such charges properly." There are not many accidents from flying rock where electric firing is practiced, as compared with cap and fuse, because the blaster will not operate the blasting machine if he knows he is in range of the blast, and, even if his leading wire is being continually shortened by the rock falling upon it, he will take care to lengthen it by splicing on other wire until he can get into a safe place; but in quarry work this does not always hold. The blaster is likely to continue to use his leading wire without taking this precaution and get too close to the danger zone. I have seen blasters fire their shots from the cover of an up-turned dump cart while there was an unused half-box of dynamite, with three or four electric blasting caps in it, out in the open a few feet away from them. It would seem an unnecessary hardship to expect the blaster to take all unused explosives and accessories back to the magazine before the blast is fired, as he may have to use some of them in case it became necessary to reprime a bore hole, but it should be impressed upon him that these left-overs should be put in a safe place before the blast is put off.

HANG-FIRES AND SAFETY FUSES

"Don't hurry in seeking an explanation for the failure of a charge to explode." This is to warn blasters against returning to the face in the event of a hang-fire, until sufficient time has elapsed to render it safe. High-grade safety fuse is a wonderfully reliable device. It is strong, resists abrasion well and stands immersion in water, often for several hours; and it is uniform in its burning speed. Cheap fuse is not regular in its burning rate, is not waterproof and will not stand abrasion against rock in the bore hole nearly as well as the better grades. However, any kind of safety fuse is likely, occasionally, to hang fire. This happens at times from the blaster failing to ignite the powder core, and the jute or cotton wrappings of the fuse may smolder for several minutes and then ignite the core, or, if the fuse is cut in the hole, the powder core may go out but ignite the jute beyond the break, which may cause a hang-fire. It is difficult in experimenting with fuse to simulate the conditions which cause hang-fires, but hang-fires do occur in actual work and are a prolific source of accident.

Accidents happen more frequently, perhaps, from a miscount in the number of explosions. Where eight or ten fuses are lighted simultaneously, two will frequently go off at exactly the same time, making one report. Consequently, blasters are inclined to venture back to the face, even if the reports heard do not tally with the number of fuses lighted, assuming that two or more have gone off together. In the event of a misfire, half an hour is the least time that should be allowed before investigating. Two or three hours is much better, and waiting until the next day is practically safe. Hang-fires can be eliminated by the use of electric blasting caps and electric squibs, and the increased sales of these devices are gradually cutting down the number of accidents from this cause.

CARE TO BE OBSERVED IN MISFIRES

"Don't drill, bore or pick out a charge which has failed to explode." A careful miner can sometimes be depended upon to remove the tamping and insert another primer. It is, however, at times safer to drill another hole near the missed one, but this is not practicable in many instances, especially in hard rock and in "sprung" holes. As a precautionary measure against striking the charge in the case of a misfire, it is suggested that a piece of newspaper or a handful of some other easily recognized foreign substance be placed on top of the last cartridge before the tamping or stemming is done. This acts as an indicator, so that the tamping may be removed with comparative safety without any chance of digging into the explosive.

VARYING ACTION OBTAINED IN DIFFERENT EXPLOSIVES

"Don't use two kinds of explosives in the same bore hole except where one is used as a primer to detonate the other." It is a common practice in some sections to place a dynamite cartridge in the bottom of a bore hole and the main charge of black powder on top of that, firing the black powder with fuse or squib. The dynamite explodes from the shock of the black powder, but it does not explode as completely as when detonated by a blasting cap, and it is doubtful if any real benefit is obtained. Different explosives have such different rates of detonation that it is not only wasteful but frequently dangerous to use this method of blasting.

BEWARE OF FROZEN OR CHILLED EXPLOSIVES

"Don't use frozen or chilled explosives." Although frozen dynamite is more difficult to detonate with a blasting cap than when it is properly thawed, it is more sensitive to other kinds of shock. Before low-freezing explosives became as generally used as they are today, a number of accidents occurred when men broke the frozen cartridges in two or rolled them to break up the frozen crystals. In loading well drill-holes with large-sized cartridges, a number of thawed cartridges could be dropped into the holes, sometimes 100 ft. or more in depth, with safety. Punching a hole into a frozen cartridge is by no means a safe operation, and the fumes from frozen dynamite are more poisonous than from the same dynamite when properly thawed. In fact, frozen dynamite frequently takes fire from the blasting cap and burns up, giving off large quantities of exceedingly noxious gases, which may render the workings uncomfortable if not dangerous to the men.

"Don't use any arrangements for thawing dynamite other than those recommended by the manufacturer." Thawing dynamite is one of the frequent sources of accidents, or, rather, it has been, as the use of low-freezing explosives has cut down the number of accidents from this cause enormously. Manufacturers of explosives have investigated every kind of thawing device and recommend only those which they know are safe. Thawing must be done slowly, at a relatively low temperature, and no part of the explosive should be exposed to any temperature higher than that which can be comfortably borne by the hand. It should not be heated on stoves or on hot rocks or metal, or placed on top of a steam boiler, or over any steam or hot-water pipe, or over heated metal surface. The warmer dynamite becomes, the more likely it is to exude, and a drop of nitroglycerin falling a few inches on a heated metal surface may explode. For this reason the radiators or coils in a thawing house should always be over or to one side of the dynamite, and never directly under it. It is often a great temptation to thaw dynamite by putting it directly on top of the radiator, but this is an exceedingly dangerous operation, and radiators should be fenced off so that it is impossible to do this in the thawing house. Explosives should never be taken into or near a blacksmith shop or forge, as the flying sparks incidental to the work there performed are likely to ignite or to detonate them.

PROMPT USE OF THAWED DYNAMITE RECOMMENDED

"Don't allow thawed dynamite to remain exposed to low temperatures; use it as soon as possible." Blasters often attempt to use explosives which have become chilled or partly frozen, and when remonstrated with say that the powder has been thawed. For this reason, they are urged to use the dynamite as soon after it has been thawed as possible and to take precautions against it freezing again after it leaves the thawing house.

"Don't paint magazine roofs black." On a bright summer day the temperature directly under the roof of the magazine, especially if the ventilation is poor, may rise to as high as 130 deg. This may cause the dynamite to leak, and the waterproofing on fuse and electric blasting caps to run, so that they will not only not be waterproof, but they will not carry the spark or explode. For the same reason, high explosives, fuse or detonators should not be exposed to the direct rays of the sun longer than is necessary. Sunlight tends to decompose nitroglycerin, as well as to cause it to leak if it becomes too hot.

PRECAUTION TO BE OBSERVED IN THE USE OF BLASTING CAPS

"Don't allow priming (the placing of a blasting cap or electric blasting cap in dynamite) to be done in a thawing house." A separate place should be provided for the operation of priming, so there will be no temptation to use the magazine or thawing house for this purpose. The Park Avenue explosion in the first New York subway excavation was probably due to failure to observe this precaution. "Don't prime or connect charges for electric firing during a thunder storm." A number of accidents have occurred from lightning exploding charges connected for electric firing, not only in the open but in tunnels where leading wires have crossed the rails and the rails have been struck by lightning. "Don't carry blasting caps or electric blasting caps in your pockets." In the first place, the blasting caps are likely to accumulate moisture, in which case they may set fire to the charge instead of detonating it, or become filled with foreign matter, in which case they will not explode from the fuse, and, finally, they are too dangerous and sensitive to make this a safe practice; besides which, they are likely to fall out, become lost and turn up again at an inopportune moment. "Don't attempt to take blasting caps from the box by inserting a wire, nail or other sharp instrument into the caps," and "Don't try to withdraw the wires from an electric blasting cap." The explosive charge in blasting caps is extremely sensitive, as mentioned before, and a box of blasting caps has enough potential explosive force to blow a man in two. The proper way to remove one cap from a box is to tilt it over slightly until a few caps slide part way out, and then withdraw one of the caps with the fingers. "Don't fasten a blasting cap to the fuse with the teeth or by flattening with a knife—use a cap crimper." Crimping caps with the teeth is a common operation, but aside from the danger of biting the shell down on the fuse, it does not make an efficient crimp, and the fuse may come out or moisture get in. The cap crimper is a tool made specifically for this purpose, and it should always be used. "Don't keep electric blasting caps, blasting machines or blasting supplies in a damp place." All of these accessories are either spoiled or their life and usefulness are materially abbreviated by damp storage. A blasting machine which is kept in a dry place will be twice as effective as one not kept dry, and the same is true of blasting caps.

MANNER OF WIRING

"Don't leave the leading wire connected to the blasting machine." To make assurance doubly certain, it is not a bad idea to carry the blasting machine with one if it is necessary to return to the charge; then it is possible to be sure that nobody has tampered with it or will attempt to fire the charge while one is in the danger zone. "Don't loop or tie wire connections. Scrape the ends of the wires clean and bright and twist them tightly together." In mines where there is much acid water or corrosive gases, it is worth while to have all the blasting-wire connections soldered, as a number of misfires have been observed from connections, which were originally well made, becoming so corroded as to fail of their purpose.

CARE TO BE USED IN PLACING OF BLASTING CAPS

"Don't insert blasting cap or electric blasting cap in explosive cartridges carelessly. Have closed end of detonator point toward the bulk of the charge, and have it tied to the cartridge securely." A large proportion of blasters using electric blasting caps punch a hole diagonally through the side of the cartridge, insert the detonator and take a half hitch around the cartridge with the wires. If the hole is punched through the cartridge at too great an angle, it is likely to go through the cartridge and possibly jam in the bore hole. This would probably lead to a fatal accident. The detonator should lie as nearly as possible in the central axis of the dynamite cartridge, although a slight angle does no harm, provided the end of the detonator is well inside the cartridge. The object in having the detonator point toward the bulk of the charge is that the greatest effect of the detonator is from its loaded end. If the detonator points away from the bulk of the charge, unexploded powder may be deposited in the bottom of the hole and afterward cause trouble. The detonator should always be tied or fastened securely to the cartridge, so that there is no danger of its pulling out when the charge is loaded and tamped. Otherwise unexploded powder or misfired holes may result.

Necessity for Separate Storage

"Don't store or transport blasting caps or electric blasting caps with high explosives." High explosives by themselves are fairly insensitive to shock and will withstand an extraordinary amount of rough treatment at times without exploding; whereas detonators are extremely sensitive both to shock and to sparks, and though they are violent in their explosion, effects are local. When they are carried in the same receptacle or transported together there is established a condition combining the sensitiveness of the caps with the far-reaching force and violence of the high explosive. The rule against storing or transporting blasting caps with high explosives is a particularly necessary injunction, and, unfortunately, it is often largely disregarded in mines and quarries where the powder man carries a box containing 20 or 30 lb. of dynamite with a box of caps or a bunch of primers on top of the dynamite.

Precautions Against Electric Blasting

"Don't attempt to use electric blasting caps with the regular insulation in very wet work. For this purpose secure 'waterproof' or 'submarine' electric blasting caps." This does not necessarily apply where only one shot is fired at a time, but where several shots are fired there is a possibility of electric leakage and short circuits through the ground to the electric blasting cap wires. This results in the under holes and those adjoining going off and the holes in the middle of the line missing fire. "Don't use old or broken leading wire or connecting wire." Broken wires are prolific sources of misfires and failure to get the shot off at the time desired. Breaks inside of the insulation are not easy to detect, and the use of wire that may contain broken sections or strands often costs much more than would new material.

Effect of Temperature on Fuse

"Don't handle fuse carelessly in cold weather, for when cold it is stiff and breaks easily. It should be warmed slightly before using." "Don't store fuse in a hot place, as this may dry it out so that uncoiling will break it." The waterproofing material on fuse is a compound of various asphalt tars with guttapercha and similar substances which become brittle in cold weather and which also are likely to run if subjected to too high a temperature. It is well worth while to store the fuse, at least immediately before its use, at a temperature between 60 and 80 deg. F. If the fuse is too cold it may crack when uncoiled and cause a misfire or a hang-fire, with its resulting danger, or, if stored in too hot a place, it is likely to go out and cause a misfire.

"Don't lace fuse through dynamite cartridges, and don't place several slit or broken cartridges on top of primer with cap and fuse. This practice is frequently responsible for the burning of the charge." The paper shell of the dynamite cartridge is sufficient protection against the side spit of the fuse from igniting the dynamite inside the shell. Without this protection the side spit is almost sure to ignite the dynamite, which will burn much more rapidly in a bore hole when strongly confined than it will in the open, sometimes causing the loss of a considerable proportion of the charge, besides giving off poisonous fumes and possibly blowing out the tamping and so making the explosion ineffective.

Strong Detonators Insure Effective Results In Blasting

"Don't expect explosives to do good work if you try to explode them with a detonator weaker than a No. 6." The use of modern low-freezing ammonia dynamites has resulted in an immense reduction in the number of accidents, as those explosives are less sensitive to shock and friction than those in general use 20 years ago. At the same time, these explosives require a much stronger detonator to develop their full power then did the older type of explosives. Although it is possible under favorable conditions to detonate even these modern explosives with weaker detonators than a No. 6, there is a considerable factor of safety gained by using the stronger caps. They not only insure complete detonation, but increase the effective power of the explosive and reduce the amount of noxious fumes to a minimum. Explosives which have been stored for some time under adverse conditions become more insensitive, and a larger detonator tends to offset this condition to a considerable extent. Strong detonators will fire larger charges than weak ones, and they not only reduce chances of misfires, but almost entirely eliminate the chance of a properly primed charge burning instead of exploding. No. 6 or stronger detonators are required for all "permissible" explosives which are not "permissible" unless the strong detonators are used.

De Beers Consolidated Mines

The report of the De Beers Consolidated Mines, Ltd., for the year ended June 30, 1917, shows that the revenue from sale of diamonds was $22,530,781, and that from other sources $1,196,639. Mining expenditures were $5,630,279, and miscellaneous expenses increased total disbursements to $9,266,196. Dividends aggregating $10,560,305 were paid, and $1,111,022 was set aside against income taxes. The undistributed balance carried forward was $9,007,215. The British monetary units of the report have been changed in the foregoing to those of the United States at the standard ratio of $4.8665 to the pound.

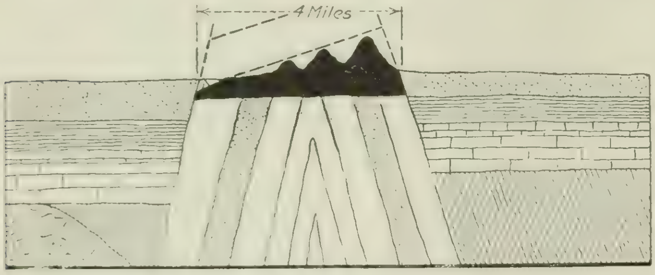
Bonuses paid to its employees engaged in military service by the De Beers company aggregated $869,226 on June 30, 1917. The number of its employees in active service as of that date was 354.

Geologic Structure of Sierra del Oro, In New Mexico

BY CHARLES R. KEYES

Sierra del Oro, in northern New Mexico, has been shown to be a horst of great size—four miles in width—a huge block of flat-lying rocks resting on top of a truncated pre-Cambrian arch and evidently a type of laccolithic intrusion.

SIERRA DEL ORO, or Gold Mountains, is a name that was applied by the first Spanish settlers of the Southwest to a lofty group of peaks in northern New Mexico. It is one of the oldest and most famous of American mining districts. The name is derived from the rich and extensive placer deposits which surround the bases of the mountains. They have, however, an even stronger claim to the title because of the fact that the eruptive rock of which they are composed carries a notable gold content. Numerous assays average more than a dollar a ton. The San Pedro copper mine occupies the flank of one mountain. Silver, lead and zinc in numberless veins occur on other hills and mountains. Two exceptionally mineralized belts, the halcyon days of which are probably yet to come, traverse the entire length of the district.



CROSS-SECTION OF SIERRA DEL ORO HORST, IN NEW MEXICO

The facts that these mountains rise abruptly out of a vast plain affording little display of geological structure and that the formations are mainly eruptive seem to have been the chief cause of much of the misinterpretation of the tectonics of the region. The circumstances that four mountain groups lie in a straight line, that the mountains are laccolithic in character, and that the ore deposits are manifestly sharply confined to a narrow belt appear to have been generally overlooked. Genetic significance of such related groups of facts is missed entirely.

Mineral Belt in Tract of 80 Square Miles

When the district was examined recently for purposes of railroad location, with the main object of possibly adjusting the right of way to the service of the greatest number of potential industries that would yield the largest immediate tonnage, the probabilities of future development had to be worked out largely along geological lines. As the mineral belt was soon found to be sharply outlined over a tract about 4 miles wide and 20 miles long, within which stood the four groups of eruptive mountains, it was assumed that this, perhaps, represented one of those great tilted fault blocks which characterize so many of the Great Basin ranges.

Satisfactory evidences revealing geological structure wholly fail near the mountains themselves. Ten miles beyond them, along the line of their trend, the fault block, if it exists, should appear in cross-section where its axis intersects that of the highly tilted Sandia-Manzano ranges. Inspection of this district in and between the Tijeras and Hell canyons discloses the entire substructure of the postulated block. Instead, however, of being a simple tilted prism of strata, it is found to be a huge block of flat-lying rocks perched upon the summit of an ancient arch of extremely resistant beds. On each side of the prism is a profound fault of more than 1000-ft. throw. The entire structure is that of an ordinary horst of gigantic size. The salient features are represented in the accompanying illustration.

Horst Rests on Truncated Pre-Cambrian Arch

The support of this remarkable, four-mile-wide horst appears to be a truncated pre-Cambrian arch the rigidity of which is maintained mainly by a thick siliceous stratum locally known as the Tijeras quartzite. Standing almost vertically, the two huge white quartzite plates are often mistaken for gold reefs, or true mother lodes.

Aside from its mining interest, the principal economic significance of the great horst lies in the circumstance that its bounding fault planes are fundamental elements in the formation of those anomalous intrusive masses known as laccoliths. With these fault planes doubtless coincide the supply pipes of the igneous bodies. Their faces are the chief belts of metamorphism, mineralization and ore localization. For the first time the associated intrusions reveal the mechanical contrivance by which laccoliths are formed. Instead of being mere erratic blisters in the earth's crust, as so long commonly assumed, they are found to be really wedge-shaped bodies of intrusive magma definitely determined and placed by special geologic structures. Thus initiation of ore deposition follows a regular plan.

Laccolithic Intrusions Favor Ore Deposition

Dependence of extensive ore deposits upon the laccolithic type of magmatic intrusion is unquestionably much more important than has been commonly believed. Perhaps when final comparisons shall have been made, ore deposits associated with laccoliths will prove to be the most important of all. Laccolithic bodies are found to occur more frequently than was, until recently, thought to be the fact.

Laccolithic intrusions provide many exceptional conditions favoring copious ore deposition. The strata above are literally floated. This cover is seldom more than a mile in thickness. Thus it retains, on the one hand, the ordinary volcanic vapors, and on the other does not occlude them within their mass, as do plutonic rocks. The cover is commonly creviced and parted around the margins of the wedge. The metallic gases and watery vapors expelled from the cooling magma pass at once into chambers and porous tracts, where they are confined for a greater or less period, or enter into the groundwater circulation. All in all, laccoliths offer ideal conditions for the accumulation of large orebodies. Perhaps it is only under such conditions that ores derived directly from cooling magmas segregate. At any rate, the definite determination of the laccolithic character of igneous masses may prove to be of great practical service in prospecting in new or slightly explored mining districts the foundations of which are igneous rocks.

Efficient Guard Rails

By George M. Douglass*

In most industrial plants the provisions adopted for guarding against accidents are fairly efficient as far as the equipment is concerned, but the same cannot be said of structural work.

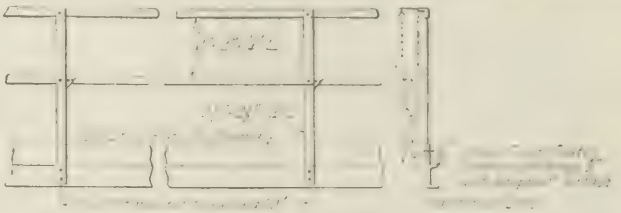
It is probably fully 10 years since the example was set by the larger industries of including in their general specifications for machinery and structures those safety features necessary to prevent accidents to workmen, yet it is common to see drawings of modern installations in which such important items as guard rails for walkways, runways, and stairways are omitted or given without dimensions. The result often is that guard railings, for instance, will measure 36 in. in height, whereas the standard height of such a railing should not be less than 3 ft. 6 in. Details are too often left to others than those who should be responsible for them, and the man in charge of the work who gets the blueprint and instructions usually makes a railing that is anything but standard. If he happens to be familiar with safety requirements he may possibly call the attention of those in authority to the design of the railing; but, as a general rule, the man doing the work of actual construction will abide absolutely by the drawing without making any comment.

In my opinion it is time that firms which make a specialty of structural work should be aware of the fact that there is such a thing as a safety standard for guard railings; and that, whether their customer's plan calls for this type or not, they should make it a practice to build it exclusively. Only those who are close to the work can appreciate the importance of good guard railings. It is not always from the height of 20 to 30 ft. that a workman falls, to be killed or maimed. I have in mind three fatal cases, which occurred within a short time, in which the height from which the men fell was no more than 10 feet.

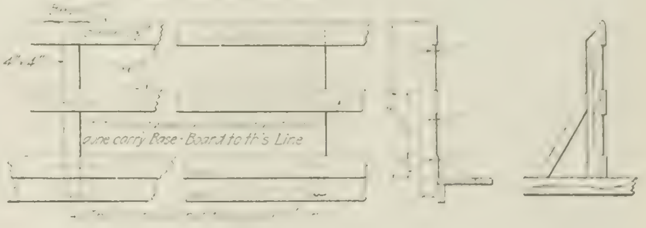
Make the railing 42 in. high, with good posts, spaced fairly closely. Put a base rail or toe board close to the floor, and let it be at least a 12 x 2-in. board if any work is done on that trestle. A 4 or 6 x 1-in. middle rail, with a top rail of 4 or 6 x 2 in. let into posts in the manner shown, will result in what may be termed a standard guard railing. The same principle may be applied generally to similar structural steel work.

Do not lay a plank flat on top of the posts, with a side piece to strengthen, as it will rot. Moreover, such a rail makes a convenient seat, and it is against safety rules to sit on railings. The top rail on edge is not designed for comfort, but it lasts, and it takes less lumber to make it. With wooden rails, use bolts instead of nails wherever possible. The railing is then easily taken apart whenever necessary, and can be moved and used elsewhere as occasion requires.

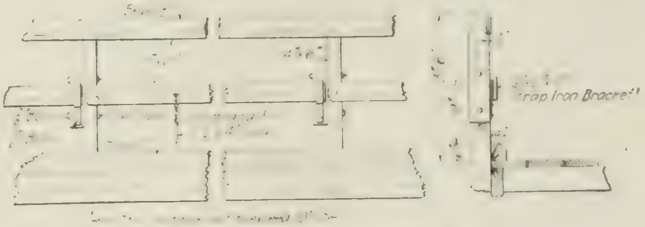
The special design of railing shown was made to use on certain old-style ore bins, where the bosses claimed that if a standard safety rail was placed they could not do the dumping. It will be noted that, first of all, a dumping timber was arranged. This timber took the place of the usual standard toe board; and, being offset somewhat, permitted dumping without trouble. The middle rail was swung on a bolt through the post and could be held vertically with a pin attached to a chain. This gave all the opening necessary for the dumping. After filling the bin at that point the middle rail was dropped into position, and the standard railing was intact. Previous to the installation of the new type of rail, it was usual for a couple of men to fall into the bins in one day. Since then, a period of two years, not one workman has been injured in this manner.



Steel Rail Construction



Wood Rail Construction



Special Wood Rail Construction

DETAIL OF EFFICIENT GUARD RAILS

Proportion of Development Work to ore production in stoping as typified at the Dome mine, in the Porcupine district of Ontario, is discussed in its report for 1917. It has been found imperative to maintain a certain minimum ratio, else production suffers. At least 1500 to 1800 sq. ft. of stoping area per machine drill is necessary to secure the desired stoping efficiency. The average duty for all breast and back stoping can be maintained at 50 tons per machine shift on that basis, and for a given daily output from the mine a definite area of stopes must be working.

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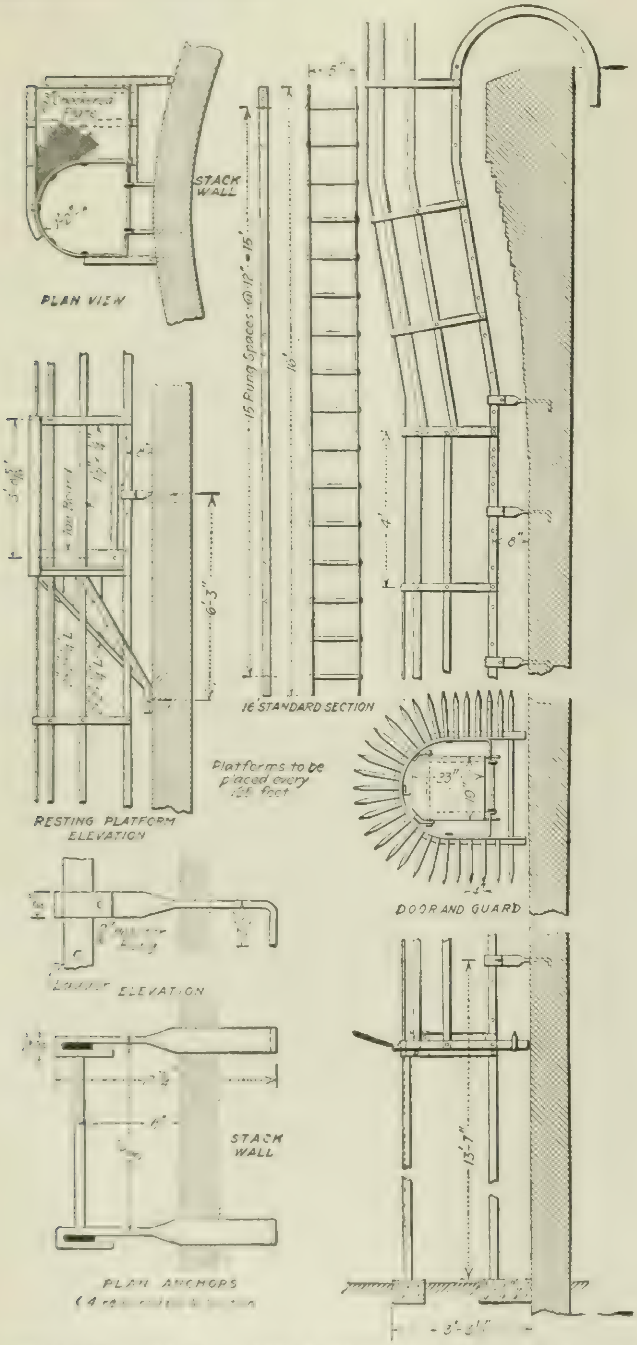
*General safety inspector, American Smelting and Refining Co., 120 Broadway, New York

Standard Safety Ladder For Tall Chimneys

By George M. Douglass*

The increasing height of chimneys of metallurgical plants, for the more efficient control and dispersal of fume or smoke, is admittedly a most important development and will doubtless repay the immense expenditures involved in the erection of massive and notable structures of this kind.



CONSTRUCTIONAL DETAILS, STANDARD SAFETY LADDER

The building of such high chimneys, however, emphasizes the need of a safe means of making regular inspections and observations in connection with metallurgical operations, as well as of facilitating repairs whenever necessary. Some one must climb such structures at regular intervals, and it is essential that means be provided that may be considered efficient and safe for ascending and descending. To ask a man to climb a tall chimney with nothing to cling to but a row of hand holds—a grip for the fingers and a rest for the toes being all there is between him and eternity if a slip is made or he becomes exhausted—would be positively inhuman.

A type of standard chimney ladder is shown herewith, in which a number of safety principles have been incorporated. A resting platform is placed every 125 ft., and an improved type of door and guard forms a feature of the design.

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*General safety inspector, American Smelting and Refining Co., 120 Broadway, New York.

The Safety Congress From The Mining Viewpoint

The seventh annual congress of the National Safety Council, which will be held at St. Louis from Sept. 16 to Sept. 20 (inclusive), will consider many problems of especial interest to miners and metallurgists. On Sept. 17 the division of metals and metallography will discuss eye protection and the use of leggings and shoes of special design, as applied to furnace and foundry work. On Sept. 18 addresses will be given by D. K. Glover on "Hazards and Safeguards in Coal Breakers and Washeries"; Robert Johnson on "What Relation Has Labor Turnover to Mining Accidents?"; Edwin Higgins on "Safety Work in Metal Mining From the Employees' Standpoint"; M. W. Reed in "Hoisting Ropes"; and a paper will be read on the subject "Is the Experienced Miner Most Liable to Accident?" In the afternoon Prof. R. M. Raymond will discuss "Standardization of Mine Cars in Metal Mines"; H. M. Chance, "Acetylene and Electric Cap Lamps From a Safety Standpoint"; A. H. Fay, "Suggested Methods of Keeping Mine Accident Records, and Results Obtained"; J. S. McKaig, "Hazards in Ore Dressing Plants"; Arthur La Motte, "Handling and Storage of Explosives." On Sept. 19 papers will be presented by C. A. Mitke on "Practice of Mine Ventilation"; F. L. Hoffman, "The Dust Hazard to Health in the Stone Industry"; Dr. F. M. Barnes, Jr., "The Effects of the Use of Pneumatic Tools on the Nervous System"; W. A. Borcherdt, "Abatement of Dust From Drilling Operations by the Use of Water Drills"; and Lieut.-Col. C. H. Connor will present a report on "Standardization of First-Aid Methods."

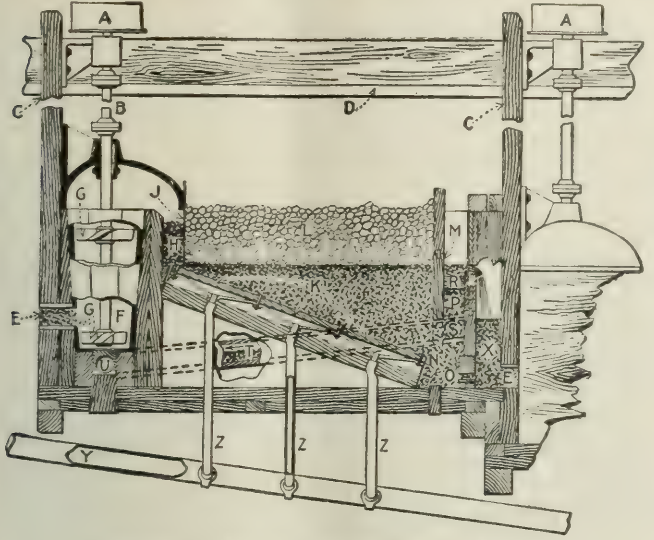
In addition to the subjects of direct application to mining practice, a number of phases of accident prevention and safety endeavor work will be considered, many of which will apply to mining as to other industries. Organization methods, health problems, relation of employer to employee, benefits, insurance, and many other questions of vital importance to all industries will be discussed.

Automatic Sprinklers for Fire Protection in metallurgical mills are likely to be considered an unnecessary refinement, because the usual 24-hr. operation necessitates enough watchmen on the job to obviate the automatic feature. Several mills among the Calumet & Hecla subsidiaries were, however, equipped with this system in 1917, according to annual reports, including the Ahmeek, the Isle Royale, Lake No. 2 and the Osceola.

Mining and Metallurgical Machinery

The "Little" Janney Flotation Machine

The Stimson Equipment Co., of Salt Lake City, has placed on the market a new model of the standard Janney flotation machine, which is especially adapted for use in small plants treating from 20 to 75 tons per day. It is also suitable for larger mills where only a proportion of the ore, such as the slime, is to be treated by flotation.

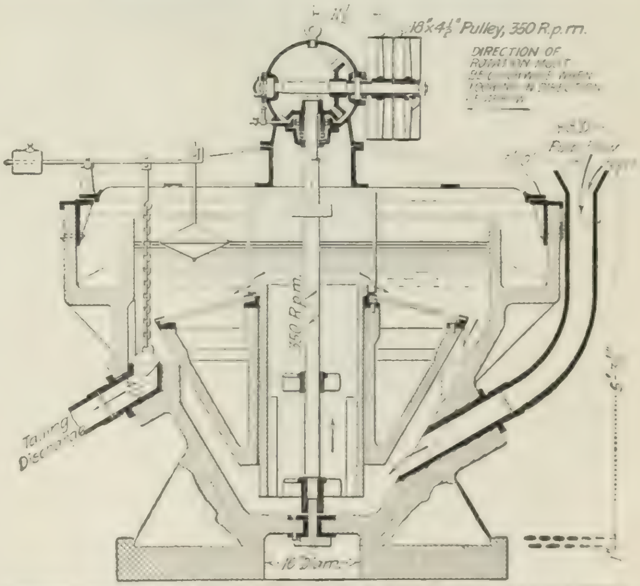


"LITTLE" JANNEY FLOTATION MACHINE

The new machine is belt-driven from a line shaft. The drive pulleys *A* are arranged so that they are all of the same elevation and are driven by a 4-in. belt from the line shaft. The length of shaft *B* between the couplings varies to compensate for the drop of 10 in. between the machines in the series. The support *C* also varies in the same manner. A runway *D* extends along the supports to facilitate ease of operation. The flow of pulp through the machine is as follows: Pulp enters the machine through the pipe *E* into the agitating or mixing chamber *F*. This is an octagon-shaped cast-iron liner, made in three parts. The pulp is agitated and discharged from the mixing chamber by the two impellers *GG*, and discharged into a launder which extends all around the mixing chamber and directs the pulp out into the spitzkasten at *H* behind the baffle *J*. This baffle is adjustable. The pulp now passes over the air pan *KKK*, which is covered with a four-ply, cross-stitched Palma twill air mat. This air pan has a slope of 4½ in. to the foot. The resulting froth *L* discharges over both sides of the spitzkasten into two concentrate launders, which have a slope of 1½ in. to the foot. The pulp now passes down under the baffle *M* at *N*. A small portion of the coarsest material passes on through the spigot opening *O*. The remainder rises up through the passage *P*. On each side of this passage is an adjustable weir *R*. These two weirs regulate the amount of material to be circulated back into the agitating chamber. The pulp passes over the weirs *R* (only one shown) down through a box (not shown) and out the opening *S* into the pipes *T* (only one shown). These pipes are on the outside of the spitzkasten and lead back through the opening *U* into the agitating chamber at opening *V*, which opening is directly under the lower impeller. This circulation of pulp may be built up to as much as ten times the amount of feed entering at *E*. The tailing from the machine passes over the adjustable weir *W* into the chamber *X*. By regulation of the weir *W*, any desired pulp level may be maintained in the spitzkasten. The weirs in the machine are simply narrow blocks of wood placed one upon the other. The tailing passing over the weir *W* and the coarser material passing out through the spigot opening *O* combine and pass on to the next flotation cell through the pipe *E*, or are discharged from the last cell in the series as a waste product. The high pressure air (3 to 5 lb.) is forced through the header *Y* from the blower and is drawn off through the pipes or hose *Z* to the three sections in the air pan *KKK*. An air valve is placed on each pipe *Z* in order to obtain any desired regulation of air passing through the air mats and into the spitzkasten.

Jones-Belmont Flotation Machine

An illustration showing the fundamental features of the new Jones-Belmont flotation machine, designed by A. H. Jones, superintendent of the mills of the Tonopah Belmont Development Co., of Nevada, appears herewith.



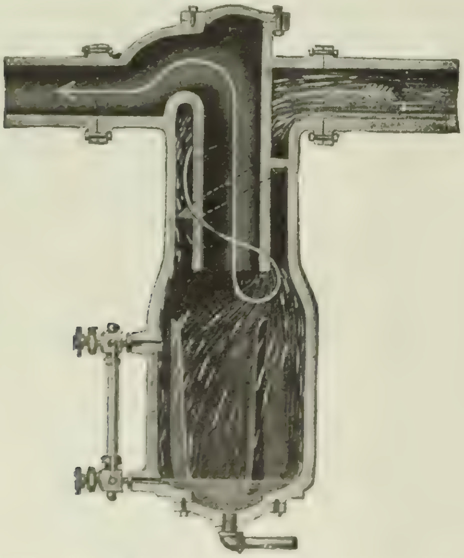
CROSS-SECTIONAL VIEW, JONES-BELMONT FLOTATION MACHINE

The pulp is introduced between two 60° cones, delivering to the bottom of a central barrel 18 in. in diameter, having both impellers and baffle plates. In addition to the emulsification effected, the arrangement acts as a pump, discharging the pulp from the top of the barrel with a decided swirling motion over a fabric blanket or apron 5 ft. in diameter and circular in form. At the outer edge of the blanket the pulp is either returned between the two 60° cones, over about nine-tenths of their periphery, to the bottom of the impeller barrel, or discharged to the next cell, or into the tailings, by a mechanically actuated valve. The operation insures a number of complete circuits of the pulp through the impeller barrel and over the blanket in each cell before it is discharged, and in this way permits satisfactory emulsification and frothing. By these means a surer and more complete circulation is obtained than is possible in many other appliances.

The pulp zone over the blanket has a depth of only about 12 in., allowing a lower air pressure to insure satisfactory results and less upper travel for sulphides to reach the froth zone. The delivery of the pulp over the top of the central barrel, close to the blanket and with a decided velocity, tends to turn over the gangue and sulphides many times during each passage, thus allowing every opportunity for the sulphide particles to separate from the gangue and join the froth; and the swiveling motion also tends to deliver the froth at the periphery to the circular launder without mechanical assistance and in a free and continuous flow.

Stratton Air Separator

The presence of water in compressed air is a source of great inconvenience in the operation of pneumatic tools. Air after it has been compressed and has passed through coolers contains a considerable amount of water. The after-cooler reduces the temperature of the air and condenses the water vapor. In these days of extensive use of compressed air in mining operations it is interesting to note a new specialty designed for the removal of water from compressed air. The Stratton air separator, as shown in accompanying cut, is manufactured by the Griscom-Russell Co., 90 West St., New York, for this service.



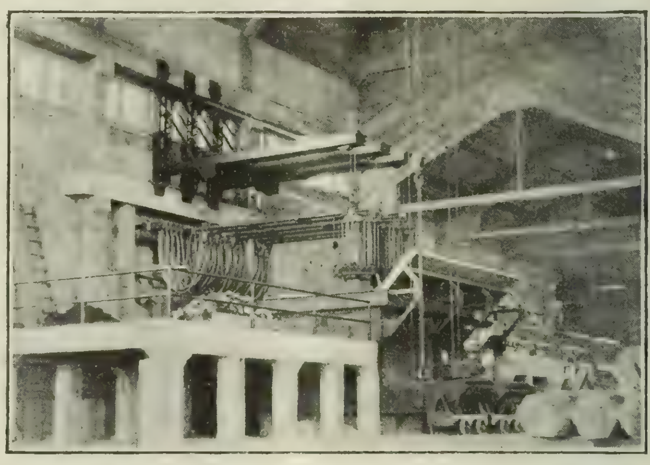
STRATTON SEPARATOR FOR REMOVING WATER FROM COMPRESSED AIR

The separator utilizes centrifugal force. The air and water entering the separator take a helical direction, resulting in a swirling motion. As water is several hundred times heavier than air, it does not make the turns as easily, and centrifugal force throws it out of the curving air current against the wall of the separator, which it meets at an angle, and adheres until the motion dies out in the receiver space at the bottom. The air makes the turn easily and passes out of the separator free from water. The separator is constructed of close-grained cast iron suitable for a working air pressure up to 160 lb. per square inch, and is made in various types of inlet and outlet to suit different piping arrangements.

Electric Smelting in California

Electric smelting is receiving considerable impetus in California in those sections of the state where the mineralized regions provide a variety of ores suitable for treatment and where water-power, both developed and undeveloped, is available.

A plant of recent construction is that of the Pacific Electro Metals Co., which is now operating a 40-ton silico-manganese 3000-kw. furnace at Bay Point, 30 miles east of San Francisco and accessible to both rail and water transportation. This company will soon be operating another furnace of the same capacity for making ferromanganese, and is installing three 300-kw. furnaces for the manufacture of ferronickel, ferromolybdenum, ferrochrome and ferrotungsten.



SILICO-MANGANESE FURNACE OF PACIFIC ELECTRO METALS CO. AT BAY POINT, CALIFORNIA

The main furnace building is a concrete structure, 120 ft. x 50 ft., and is adjacent to the transformer building, also of reinforced concrete. The necessary cooling and packing rooms for the alloys, as well as machine shop, storeroom, washhouse, office, laboratory and gatehouse, are all situated near the furnace building.

A three-phase furnace, provided with an open top, is used in the manufacture of silico-manganese, and the operation is a continuous one, the raw materials being fed by shovel around the 24-in. electrode as the metal is drawn off at the bottom by means of a tap hole. The transformer equipment for one furnace is composed of four single-phase, 1000-kw. transformers, one of which is a spare. An electrode plant has been built, and local raw materials have been utilized in the manufacture of electrodes. The Beckman & Linden Engineering Corporation, of San Francisco, designed the plant.

Events and Economics of the War

Following closely on the heels of the retreating Germans, the Allies have reached approximately the line that they held last March, though they have advanced beyond it at Quéant; in the south the enemy still holds the Chemin des Dames ridge, but has given up the Vesle. In Petrograd, the British Embassy was raided by the Bolsheviki, Captain Cromie, of the British Legation, being killed; in retaliation, Great Britain has placed the Bolshevist ambassador under arrest and demanded reparation. The Czecho-Slovaks in Siberia have gained control of the Siberian railway from a point 400 miles east of Lake Baikal to Penza, 600 miles southeast of Petrograd, the distance between the two points being 2000 miles; the Czecho-Slovaks have been recognized as a nation by Washington.

In the United States, the men of the nation between 18 and 45 years old were registered on Sept. 12 for the selective draft, unless they were already enrolled. A new list of preferred industries was issued on Sept. 9 by Bernard M. Baruch, chairman of the War Industries Board. The Food Administration ordered on Sept. 6 that breweries throughout the country must close on Dec. 1 next, and the Senate passed the Emergency Agricultural Appropriation Bill with the "dry" rider calling for nation-wide prohibition beginning July 1, 1919. The Water-Power Leasing Bill was passed by the House on Sept. 5. Secretary Baker, accompanied by John D. Ryan, is reported to have arrived in France. The U. S. transport "Mount Vernon," formerly the "Kronprinzessin Cecilie," was struck by a torpedo off the French coast and 35 of the crew were killed.

House Gets New Revenue Bill

The new revenue bill, by which it is purposed to raise about $8,000,000,000 by taxation, was reported to the House, on Sept. 3, by Representative Claude Kitchin, chairman of the Ways and Means Committee. The amount of revenue to be raised is the largest on record for any one bill and constitutes one-third of the estimated expenditures of the nation for the year ending June 30, 1919, the balance to come from bond sales.

Taxation sources of the last two revenue laws are closely adhered to in the proposed measure, though, in general, rates are greatly increased. The list of luxuries has been lengthened to afford a new source of revenue. The proposed war- and excess-profits taxes will directly affect only corporations. Individuals of all classes, however, will feel the effect of the new bill, if it becomes law. Consumption taxes were avoided, though the tax on beverages has been made so heavy that it is estimated that $1,137,000,000 will be raised through this source alone within the first year.

Other estimated yields are as follows: War profits, $3,200,000,000; individual incomes, $1,481,186,000; corporation incomes, $984,000,000. Thus over 80% of the total amount to be raised will come, it is proposed, from four taxation sources.

New Industrial Preference List Out

Preference List No. 2 of industries and plants, compiled by the Priorities Division of the War Industries Board and superseding List No. 1, issued on Apr. 6, was finally released on Sept. 9 (though dated Sept. 3) after prolonged speculation on the part of the public as to the classification made. The new list is the basis for industrial exemption from the draft, and may be regarded, it is said, as the governing factor in the distribution of labor, capital, material, transportation and fuel.

The major industries have been grouped according to their relative importance into four classes, given in the statement issued as follows:

Class 1, Class 2, Class 3, and Class 4. Requirements of industries and plants grouped under Class 1, Class 3, and Class 4 shall have precedence over those not appearing on the preference list. As between these three classes, however, there shall be no complete or absolute preference. The division into classes is for the purpose of presenting a composite picture of the relative importance of the industries and plants embraced within each group. It is not intended that the requirements of Class 2 shall be fully satisfied before supplying any of the requirements of Class 3, or that those of Class 3 shall be fully satisfied before supplying any of those of Class 4.

Industries concerned with mining and metallurgy that are included in the list are given as follows, with their class numbers:

Blast furnaces producing pig iron, 1. Brass and copper—Plants engaged principally in rolling and drawing copper, brass and other copper alloys in the form of sheets, rods, wire and tubes, 2. Chemicals—Plants engaged principally in manufacturing chemicals for the production of military and naval explosives, ammunition, and aircraft, and use in chemical warfare, 1; plants not otherwise classified and listed, engaged principally in manufacturing chemicals, 4. Coke—Plants engaged principally in producing metallurgical coke and byproducts, including toluol, 1; plants not otherwise classified and listed, producing same, 2. Explosives—Plants engaged principally in manufacturing same for military and naval purposes for the Government and the Allies, 1; plants not otherwise classified or listed, engaged principally in manufacturing same, 3. Ferroalloys—Plants engaged principally in producing ferrochrome, ferromanganese, ferromolybdenum, ferrosilicon, ferrotungsten, ferro-uranium, ferrovanadium, and ferrozirconium, 2. Mines—Coal, 1; producing metals and ferroalloy minerals, 2. Plants engaged principally in manufacturing mining tools or equipment, 3. Newspapers and periodicals—Plants engaged principally in printing newspapers and periodicals which are entered as second-class mail matter, 4. Oil and gas—Plants engaged principally in producing oil or natural gas for fuel, or for mechanical purposes, including refining or manufacturing oil for fuel, or for mechanical purposes, 1. Pipe lines and pumping stations engaged in transporting oil or natural gas, 1. Plants engaged principally in manufacturing equipment or supplies for producing or transporting oil or natural gas or for refining and manufacturing oil for fuel or for mechanical purposes, 3. Steel-making furnaces—Plants engaged solely in manufacturing ingots and steel castings by the openhearth, bessemer, crucible or electric furnace process, including blooming mills, billet mills and slabbing mills for same, 1. Steel-plate mills, 1. Steel-rail mills rolling rails 50 or more pounds per yard, 2. All steel plants operating steel rolling and drawing mills exclusive of those taking higher classification, 3. Tin plates—Plants engaged principally in manufacturing same, 3. Wire rope and rope wire—Plants engaged principally in manufacturing same, 2.

The term "principally" as used in listing industries is to be construed to mean plants whose output is not less than 75% of the products mentioned. No distinction has been made between any of the industries or plants within any one class.

To Protect Industry From Draft

The War Labor Policies Board of the Department of Labor, in coöperation with General Crowder, has organized the Committee on the Relationship of Industrial and Military Man-power, whose function is to prevent the new draft law from crippling industries. Charles Neave is chairman. The committee's representatives will advise the 168 district boards throughout the country in the matter of industrial exemptions. Two such representatives, one of whom will be a specialist on agricultural labor and the other an expert on manufacturing conditions, together with a third member to be selected by the board itself, will sit as an advisory committee in each district. In every case, the War Department will have the right to make the final decision.

Recommendations for exemptions of these special committees will be based upon the list of 64 essential industries recently issued by the War Industries Board. The committees will also have the power to initiate claims for such exemption.

Mineral Bill Reported to Senate

WASHINGTON CORRESPONDENCE

Early action in the Senate on the War-Minerals Bill, which has been practically rewritten, will be asked by Senator Henderson, of Nevada, the chairman of the Committee on Mines and Mining. As the request will have behind it the pressure of the influence of the President, the Secretary of the Interior and the Chairman of the War Industries Board, it is probable that the bill will be brought before the Senate in the near future. No opposition to the measure has shown itself in the Senate, and it is Senator Henderson's opinion that no fight will be made on the bill. The latter's report on the bill was submitted to the Senate on Sept. 5. Extracts from the report follow:

> The minimum-price principle had the approval of the House, but the attention of your committee was called to the possibility of the Government's thereby incurring onerous obligations which might be avoided by an elaboration of the contract principle approved by the House, thus lessening the Government's liability. By the contract system, the Government would know definitely just what the obligation would be; whereas the minimum-price feature might so stimulate production as to place the Government in a most embarrassing position.
>
> The adoption of a contract system places the Government in the position of buyer and seller, necessitating an increase in the appropriation from $10,000,000 to $50,000,000. This, however, is a revolving fund and should be returned to the Treasury through the various transactions when the purpose of the bill shall have been fulfilled.
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> In the course of the hearings, considerable opposition was expressed to the licensing feature, and it does not appear that this is essential to the successful operation of the legislation, and its withdrawal will render the measure more acceptable to the mining industry.
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> Many penalty provisions were contained in the House bill, but it is felt that this is sufficiently taken care of in Section 4 of the amended bill, under the President's power to establish rules and regulations and providing a penalty for failure to comply therewith.

The list of minerals coming within the purview of the bill was unchanged by the Senate committee with the exception of substituting "sodium" for "sea salt" and by the addition of phosphorus. The reason for adding phosphorus is that it has become a war mineral in every sense of the word, owing to its extensive use in smoke screens. The "mineral substances and ores, minerals, intermediate metallurgical products, metals, alloys and chemical compounds thereof," which are mentioned in the Senate bill, are as follows: Antimony, arsenic, ball clay, bismuth, bromine, cerium, chalk, chromium, cobalt, corundum, emery, fluorspar, ferrosilicion, fullers' earth, graphite, grinding pebbles, iridium, kaolin, magnesite, manganese, mercury, mica, molybdenum, osmium, sodium, platinum, palladium, paper clay, phosphorus, potassium, pyrite, radium, sulphur, thorium, tin, titanium, tungsten, uranium, vanadium, and zirconium.

In addition to the materials mentioned above, the Senate bill also includes "such other rare or unusual elements as the President from time to time may determine to be necessary and as to which there is a present or prospective inadequacy of supply." It is understood, however, that an amendment is to be offered which will alter the reading of the foregoing sentence.

The Coal Situation

Bituminous coal production showed a slight recovery during the week ended Aug. 24, according to the reports of the U. S. Geological Survey. It is still, however, far below the amount required to meet the deficit. The total for the week was 12,603,000 net tons, including lignite and coal made into coke, an excess of 669,000 net tons over the previous week's output.

The Geological Survey reports that the shortage for the week of Aug. 17 was due largely to lack of cars. The bituminous mines during that week produced 77.7% of their normal output. Of this deficit, car shortage contributed 12.4%; labor shortage and strikes, 4.1%; mine disability, 4.2%; no market, 0.5%; all other causes, 1.1 per cent.

Anthracite production for the week of Aug. 31, on the other hand, was the largest of the year, the total output being 1,806,121 tons, an increase over the preceding week of 100,000 tons. It was the first week of the year when the daily average exceeded 300,000 tons.

In the five months just ended, the anthracite industry has produced and distributed to the ultimate consumers about 34,000,000 tons of anthracite, which is a larger amount than has ever been produced before in the same period, this in spite of the serious labor shortage with which it has had to contend.

The industry enters upon the remainder of the year with no storage coal, and orders in excess of current producing capacity. The output can be increased if more labor can be obtained, it is maintained. The record production achieved has been due to greater efficiency in operating methods.

Gasoline Consumption Reduced

Consumption of gasoline in the states east of the Mississippi was reduced from 63 to 95% on the first trial on Sept. 1 of the effectiveness of the Fuel Administration's recent appeal to motorists to avoid using their cars on Sundays. Between 100,000 and 150,000 bbl. was saved on that day, according to A. C. Bedford, chairman of the National Petroleum War Service Committee. Illinois stood first, with a 95% reduction in gasoline consumed. In general, the states in the western part of the territory concerned decreased their consumption more than those on the eastern seaboard.

Colorado Meeting of Institute a Success

"ENGLAND today is the world's most efficient country, not even excepting Germany," said J. Parke Channing recently discussing the program of the war-work meeting in Colorado of the American Institute of Mining Engineers, which has just been concluded. According to Mr. Channing, the people of the United States have developed high efficiency as far as machines and methods are concerned, but have failed properly to utilize the country's man-power. Our foreign labor must be Americanized and given a national point of view, just as British labor at heart is British, if the war is to be successfully concluded and if increased efficiency is to be had after the war. Never was there a time, in Mr. Channing's belief, when it was so necessary to impress upon business managers the importance of the human side of engineering, for they are now in a position to solve the labor problem. He pointed out that the engineer's duty today is to convince the employer that, in the long run, the latter will be better off if he improves the condition of the laborer and educates him to produce his maximum output.

To increase the mineral output of the country and to conserve mineral resources at the mines was the object of the Colorado meeting. On the opening day, Sept. 2, in Denver, many hundreds of the 7000 members of the Institute registered, coming from all parts of the country and from many foreign mining fields. This was the first time in 22 years that the mining engineers have met in Colorado, and the tremendous effort which the Institute is making in war work greatly increased the importance of the gathering.

Since the beginning of the war Western mining centers have undergone great development. Witnessing this is the fact that, compared with one electric-furnace smeltery west of the Mississippi before the war, there are now eight in operation and three more under construction. Owing to this and other expansion, the smelting of ores has increased enormously throughout the West.

On the first day of the meeting, the members of the Institute visited the ferroalloy plant and other points of interest in Denver, and, later in the day, took a trip by automobile to the top of Lookout Mountain. A dinner was held at the Denver Country Club, followed by addresses made by officials of the Institute, including a number of representatives of the war-work committees at Washington. Early on the following morning the engineers entrained for Colorado Springs, which was the convention headquarters throughout the week, and from which side trips were made to other points.

At the technical session on Sept. 3, those present were told that 70% more coke than ever before will be available this year to help solve the fuel shortage. This supply will be further increased by the development of tar, coke-oven gas and other byproducts newly dignified in war time as available fuels. Pulverizing coal for attaining the greatest efficiency was another subject discussed. Some of the advantages of pulverized coal were stated to be the utilizing of every heat unit in the coal, the reduction of labor for handling coal, and the maintenance of a constant temperature in the furnace.

At noon on the second day, the Institute paused from its business sessions to hold a memorial service for Dr. James Douglas, the noted mining engineer and former president of the Institute, whose death was a severe loss to the mining industry.

A luncheon was held at the Broadmoor Hotel, Colorado Springs, which was attended by a large number, and a reception and dance were given the members and their families. An elaborate program had been prepared for the entertainment of the ladies accompanying the members.

The death knell of the world's supply of radium, now in constant use on the battle front, and a proved cure for forms of cancer, was sounded before the members on the third day, and a warning was given to the country's physicians and surgeons to accumulate all of this precious metal not needed for war purposes. The warning has an official tone, coming, as it does, from Dr. Richard B. Moore, of the U. S. Bureau of Mines. Dr. Moore stated that there are only about three ounces of radium element in existence at the present time.

Because the physicians and surgeons of the country are not purchasing enough radium to make the industry a financial success, said Dr. Moore, the material is being used on the faces of watches and clocks, electric light push buttons, and chains attached to electric globes. This is obviously dissipating a substance which has a distinct medical and military value. It was stated that there are nine different instruments used on aeroplanes having dials that are made luminous with radium paint, which is used, also, on compasses and gun sights. The efficiency of night firing on the Allied front with both machine guns and artillery has been greatly increased, says Dr. Moore, by the use of these luminous sights.

The engineers spent an entire day in Cripple Creek. They had an opportunity to observe the developmnt through many stages since the first crude methods were installed. An entire evening was given over to a technical session on geology and mining, at which nine of the forty subjects that were on the schedule were discussed.

August Pig-Iron Production

Pig-iron production in August was 3,389,585 gross tons, as compared with 3,420,988 tons in July, according to *Iron Age*. The daily rate for August was 109,341 tons for a 31-day month, as against 110,354 tons in July, also a 31-day month. This is an average loss of 1013 tons a day, notwithstanding a net increase of nine furnaces during the month. In the same period of 1917, however, production fell off 3048 tons and was at the rate of only 104,772 tons a day in August, 1917, although six furnaces were added in that month, giving 357 active on Sept. 1, 1917. Active furnaces on Sept. 1, 1918, total 372, blast having been started in 17 stacks in August and eight having been blown out. The output of 54,009 gross tons of ferroalloys ranks next to the record production of 54,663 tons last May and is 2247 tons greater than that of July, formerly the next highest. Only 28,038 tons of ferromanganese was made, as compared with 29,996 tons in July.

Hands Across the Sea

Forget that course in memory training and send the money into the Comfort Fund instead. Forget the 27th! It can't be done. We are sure of this from evidence that comes daily to hand. Today from Colorado, yesterday from South America, and again it was from Australia, that the friends of the 27th reached out to brighten things up for the regiment.

Last week in Colorado, while the members of the American Institute of Mining Engineers were grouped around the reception rooms of the Broadmoor Hotel at Colorado Springs, H. L. Brown proposed to collect subscriptions in behalf of the Comfort Fund for the 27th Engineers, if Mr. Ingalls would loan his hat for the purpose. The hat being loaned, the persuasions of Mr. Brown and his friends resulted in the collection of $215, which is entered in the list as from "Members of the A. I. M. E. meeting in Colorado Springs, Sept. 4, 1918."

The friendly interest in the regiment extends to our folks who are living in remote parts of the world. We get letters expressing interest and enclosing substantial evidence thereof from many quarters. Mrs. Harold Kingsmill wrote from Morococha, Peru, that she was sending 25 pairs of socks for the boys. She apologized for some of the odds and ends in the way of wool that she had to use in the knitting; but they are good socks nevertheless, and the boys will not mind the looks when they think that these were knitted in distant Peru, where wool supplies are not easy to get.

Capt. H. L. Jacques, commanding Company F of the mining regiment, writes as follows:

> On behalf of all members of Company F, 27th Engineers, I wish to express my sincere thanks for the many favors you have shown us, and to assure you that the many gifts and expressions of good will are highly appreciated by every man in this company. It is indeed gratifying to us to know that the mining industry is backing up the men who have heeded the call to the colors, and we in the service, as members of the mining industry, will surely do our very best in the present world crisis to merit these many favors shown us.

The subscription recorded below from the employees of the Utah Leasing Co. in Newhouse, Utah, was participated in by all of the 34 men on the company's pay roll, whose names are given as follows:

H. H. Adams, William Strange, John Doe, H. C. Hammer, K. K. Clark, J. E. Bonzo, Arch Bacon, L. Watts, F. Rogers, T. Flood, E. E. Meyer, W. H. Thompson, C. A. Bell, E. W. Muir, R. Anderson, A. Riela, O. Sigismund, James Bardino, Martin Bardino, Leland Rowley, James Davidson, Tom Wilson, W. J. Richards, Fred Morzenti, Joe Cavijioli, C. G. Woodbury, Bill Morris, M. Griffiths, Moses Helsten, Alfred Hall, Skelly Johansen, Tom McLaughlin, O. P. Johansen, Mike Antone, E. A. Goodwin, John Davidson, Fred McGary, Carl Goodwin, Frank Shay, D. P. Van Fleet, and E. L. Buterbaugh.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$14,436.50
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R Wallace	50.00
H P. Bowen	5.00
H L Brown and M W Hayward	16.00
Iron Cap Copper Co	50.00
W N Smith	10.00
E S Geary	5.00
H J. Wolf	10.00
F H. Siebold	10.00
H A Kee	10.00
W. S. Grether	5.00
Marion J Thomas	10.00
E F Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co	100.00
F P Burrall	25.00
Livingston Wernecke	5.00
E P Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
A. F. Taggart	10.00
G. E. Farish	25.00
H. K. Sherry	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
P. M. Arnold	10.00
W. A. Wolf	5.00
Employees of Utah Leasing Co., Newhouse, Utah	20.50
Employees of Braden Copper Co.	112.50
Charles A. Mitke (second contribution)	10.00
G. M. Colvocoresses	25.00
Charles Le Vasseur (monthly)	5.00
A. H. Wethey	25.00
S. Ford Eaton	25.00
H. H. Hunner	5.00
N. G. Thomson	25.00
Members of the A.I.M.E. meeting in Colorado Springs, Sept. 4, 1918	215.00
Total	$16,667.61

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Cross Purposes*

It is wearisome and discouraging to see various branches of the Government, whose war duties overlap each other in greater or less degree, still pulling and hauling at cross purposes instead of getting together, agreeing upon a program and putting it through without friction or lost motion. When a fresh case of conflict of views and activities arises, the public is likely to think again and again with wonder if not anger at the obstinate opposition that has been shown to the creation of a War Cabinet which would have organized harmony and team work among the multiform Federal agencies.

These reflections are forced upon every one today by the pronunciamento of Provost Marshal Crowder published this morning, knocking the elaborate draft plans of the War Industries Board, published only yesterday, into the proverbial cocked hat. Public opinion, only 24 hours ago, was discussing the War Industries Board's program of exemption as a well-conceived scheme based on exact information, at last a scientific effort to solve a difficult problem. But General Crowder now curtly declares, to quote the Washington despatches, that "the district (draft) boards would not have their hands tied by such rulings, which would be used simply in supplementing other information collected by the

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*Editorial in the *Evening Sun*, Sept. 10, 1918.

boards in determining whether industries were essential and whether the employees who claimed deferred classification or for whom deferred classification was asked were vital to such industries."

The situation, as it stands, is simply bewildering. The War Industries Board has at its head a highly competent business man, Mr. Baruch, whose advent to the position was generally hailed with approval. He has an elaborate and expensive organization working under him. A large proportion of the energies of this highly efficient machine has been given for weeks to collecting data, formulating conditions and deducing a systematic scheme of war needs in industry. The work has cost perhaps half a million dollars or more. It has taken the time of scores of intelligent men and women when men and women of any sort are scarce and their services are at a premium. It is as nearly an expert product as it is humanly feasible to produce.

Well, General Crowder treats it as all but negligible. It can only be useful as supplementary to the crude, local inquiries of the many hundreds of men who make up the draft boards. We should have looked for rigid local inquiry as supplemental to the great, scientific, country-wide theory. But not at all! The local board is the thing, and the big, reasoned effort of a great Federal commission, run under mere civilian auspices, is virtually scrapped, and a new and in some respects conflicting system substituted.

The saddest thing about it all is that Mr. Baruch and his board and General Crowder and the War Department are conscientiously trying to accomplish the same result. Both desire to bring about a draft which will produce the maximum of fighting men with the minimum of retardation of war industries and of injury to the life and prosperity of the country. But with the same patriotic aim and purpose the two cannot coöperate. It may be doubted whether Crowder even knew that Baruch was busy on a classification of industries. There was apparently no concert between them. One or other was wasting effort—perhaps both were, and effort means man-power and money. There was no one to bring them together.

There is no War Cabinet. The overburdened President cannot attend to details of administration. Apparently the Cabinet lacks the will or the power to coördinate activities. Indeed, there are so many agencies at work not truly subordinate to any Cabinet officer, that team work by Cabinet guidance is difficult. The mass of activities carried on by at least a score of minor organizations lacks organization in the large sense that Britain and France have secured through placing all the interests of the war under the control of small bodies, war cabinets of three or five members.

Chronology of Mining, August, 1918

Aug. 1—U. S. Steel Corporation makes 10% wage increase effective—Committee acting under the War Industries Board assumes control of sulphur-bearing materials.

Aug. 6—Meeting of "high-cost" copper producers with War Industries Board at Washington—Plant of Union Sulphur Co. at Sulphur, La., damaged by hurricane.

Aug. 8—Meeting of the Colorado chapter of American Mining Congress and Colorado Metal Mining Association at Denver to discuss the gold-mining situation.

Aug. 9—President approves the continuance of the 26c. price of copper.

Aug. 10—Missouri-Kansas-Oklahoma Zinc Institute formed at Joplin, Missouri.

Aug. 11—First unit of 1500-ton Ray-Hercules mill at Ray, Ariz., placed in operation.

Aug. 12—Meeting of American Mining Congress at Reno, Nev., to discuss gold production—Mexican oil decree modified so that government is now to receive one-sixteenth of the product of every foreign-controlled well.

Aug. 15—Price of silver fixed at $1.01½ per fine ounce by the Government.

Aug. 20—Lead Producers' Committee issued notice to manufacturers and dealers requesting that efforts be made to eliminate non-essential uses of lead.

Aug. 21—Agreement between sheet-zinc producers and War Industries Board to maintain existing prices.

Aug. 23—Fuel Administrator Garfield refuses to approve of increase in wages of coal miners.

Aug. 27—Henderson bill proposing Government production of metals and minerals needed for the war introduced.

Aug. 28—Meeting of iron and steel manufacturers in New York to discuss measures in connection with the new draft.

Aug. 30—I. W. W. leaders sentenced by Judge Landis at Chicago—Suit of minority stockholders of Hull Copper Co. against Charles W. Clark settled out of court.

Aug. 31—Draft Bill, requiring registration of all men between the ages of 18 and 45, signed.

Sound Taxation Work for the Senate*

Senators with principles and brains are not wasting their time, as some newspapers are, in discussing Chairman Kitchin's theories of taxation. As we must judge him by his words and acts, Mr. Kitchin hasn't any theories of taxation. He has a hatred of that part of his country north of Mason and Dixon's line. He has a passion for destruction. Wherefore Mr. Kitchin's taxation practices consist of inordinately penalizing, financially raiding and economically looting revenue sources that are distasteful to him.

It is idle to discuss the economics of the fellow in the fable who killed the golden goose. There is no need to explain in detail that as Kitchin makes it impossible for industry and business to be prosperous, or even to survive, he makes it impossible for the Treasury to continue to draw greater and greater revenue from those depleted sources. So what the responsible Senate leaders of both parties want to do without useless words about the Kitchin bill, what the Treasury Department wants them to do, and what the country must have them do unless it is to suffer permanent disaster from the Kitchin performances, is to put some sound taxation into the House measure, which Senator Smoot describes as a bungling absurdity.

We have not discovered any respectable sentiment against heavy income taxes. Everybody expects them; everybody whose war spirit is right is willing to pay his full share, big or little, so long as it is a fair share. The income of corporations merits no exception. Nobody suggests it. But a tax that penalizes a business

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*Editorial in the *Evening Sun*, Sept. 6, 1918 for not scattering all its earnings in dividends instead of holding a reasonable share of them back to provide for the expansion of that business and to guard against usual hazard to that business is simply a fool tax. The Senate may not lighten the burden on individual incomes. But if the Senate does not eliminate the discrimination whereby a corporation is taxed only 12% on its distributed earnings, but 18% on its undistributed earnings, it will help to lock the wheels of every great industry in this country.

If the Senate does not provide for greater revenues out of profits that come purely from war business, it will permit a wrong to every normal business. It is true that a tax on war profits, pure and simple, is merely a cutting of price to the Government on war materials supplied to the Government. No war could possibly be largely financed by taxes on war profits, because the most that such taxes could do would be to get the price of the war material down to cost. The material still would have to be paid for by other taxation. But there is no sound reason why a business whose profits come solely from the war should be permitted to make out of the Government anything like what normal business should be permitted to make out of its customary peace operations.

If the Senate writes into the revenue measure consumption taxes, ignored by Kitchin, we shall have not only fair taxation, which will hurt and can hurt nobody, but taxation which, paid by all, in cents by the small consumer, in dollars by the big consumer, will turn into the Treasury hundreds of millions, perhaps billions of dollars.

The Senate can do any of these things and improve the Kitchin measure vastly. Nothing that the Senate could do could make the Kitchin measure worse than it now is.

Yukon Gold Co. Suspends Dividends

The payment of further dividends by the Yukon Gold Co. has been suspended until such time as gold-mining conditions improve. Operations are to be continued, as a matter of patriotism, so long as the company can cover operating expenses.

William Loeb, Jr., president of the company, has sent a letter to stockholders, notifying them that dividends have been suspended, a portion of which follows:

"This action is absolutely necessary in order to conserve our cash resources. The estimated income for the year is a disappointment, as it has been to all gold companies, due to the abnormally high and constantly rising cost of labor, material, supplies and freight. Owing to the high wages paid to the miners of base metals, efficient miners are attracted away from the gold mines, and the labor left in the gold mines is only 60% efficient, and not obtainable in sufficient numbers.

"Notwithstanding these increasing burdens on this industry, the value of our product is stationary. If these were not war times and we were free to exercise our business judgment and leave patriotism out of account, the proper course to pursue would be to leave the gold in the ground, to be mined when times were more normal. As long as we can show a profit or break even, we consider it our patriotic duty to keep up the production of gold, one of the most essential of war metals, trusting that the Government will see the necessity of coming to the relief of this industry.

"The gold companies of the different gold-producing countries are petitioning their respective governments for relief, and it is hoped that the showing that will be made of the danger of a complete shut-down of gold mining will induce the governments to take some kind of action to relieve the situation. Many formerly profitable gold properties in this country are already now closed down, and others are only taking out their high grade ore; consequently the production of gold is rapidly diminishing.

"In California, where this company operates several dredges, the Public Utilities Commission has curtailed all electric power one-third, due to the shortage of water, and this will correspondingly reduce our output.

"In view of the above, it seemed to the board that ordinary prudence called for the action which it has taken."

The Fluid Ton

The ton, as a unit of measurement for solutions, was adopted early in the history of the cyanide process, on account of the obvious advantage of being able to report the value extracted in units corresponding to those used in the case of the tailing or ore treated. It was apparently first used about 1890 by the pioneer metallurgists of the Rand, as the term "tons of solution" appears in some of the earliest publications of the Chemical and Metallurgical Society of South Africa. The word "fluid" was not prefixed, just as it is commonly omitted when ounces of liquid are mentioned, but it is evident that a volume measure was intended, solutions for assay being accordingly measured by volume. The following quotations show that it has been definitely recognized as a unit of volume for hydrometallurgical purposes, agreeing with the general adoption of the "short ton" of 2000 lb. as a unit of weight:

W. A. Caldecott (*Journ. Chem., Met. & Min. Soc. of S. Africa*, Oct., 1908, IX, 124), "Reminiscences of the Early Rand": "The records of those times when assays were made on ounces of material and weighed in thousandths of a grain and reported in troy ounces, pennyweights and grains per 2240-lb. ton, when cyanide strength determinations were of solutions applied to charges measured in gallons, would indeed appear distant were it not that some of the former practices still linger in England, and our friends, the engineers, still prefer to speak of millions of gallons of water instead of employing the common cyaniding unit of a fluid ton of 32 cubic feet."

W. J. Sharwood (*Mining Magazine*, Nov., 1909, Vol. I, p. 226), "Measurement of Pulp and Tailing": "Next to accepting the metric system in its entirety, it is most convenient for practical purposes to adopt, as units, the ton of 2000 lb., the cubic foot, and the fluid ton of 32 cu.ft.—the last being the volume occupied by 2000 lb. of water, on the assumption that a cubic foot of water weighs 62.5 lb. The fluid ton is a unit that has been tacitly assumed and used for years in connection with cyanide work, but I believe that it has not been thus specifically defined." (A footnote adds: "Since this paragraph was written, W. A. Caldecott has indirectly defined the fluid ton in the same way.")

The Institution of Mining and Metallurgy, by an order of the Council dated Dec. 21, 1910, adopted the following (see *Trans. I.M.M.*, XII, 740, and *Bull. Min. & Met. Soc. of America*, VIII, 196): "In reporting assay values of parts by weight in a stated volume of the solution. In the case of cyanide solutions the use of the 'fluid ton of 32 cu.ft.' is recommended. It closely approximates 2000 lb., and is in common use."

Editorials

The National Safety Council

THE development of the National Safety Council has been so rapid that it is evident that its growth is due not only to its energetic personnel but also to the fulfillment of a real need. The growth of the safety-first movement received impetus from the formation and the achievements of the U. S. Bureau of Mines. This Bureau is performing a valuable service in accident research, gathering and publishing statistical information, the testing of mining appliances, the publication of safety rules, and in maintaining contact with mining companies and mining work. Individual mining companies have developed safety organizations. Of these we may mention the New Jersey Zinc Co., the Anaconda Copper Mining Co., the Butte & Superior Mining Co., and the Bunker Hill & Sullivan Mining Co. Other companies have excellent organizations, which are doing good work in the reduction of accidents and the maintenance of safe operating conditions.

As the safety movement developed, its sponsors soon discovered that personal contact with the miners was alone not sufficient and that additional means were necessary. Out of this need grew safety publications, such as the *Anode*, the *Spelter Journal*, the *Safety Review*, *Safe Practice*, and various state safety bulletins. These publications may be looked upon as supplements to the mine bulletin board. A great number of mines, large and small, could not undertake to organize publications of the kind mentioned. Other industries found the same difficulty. The National Safety Council meets this requirement with its *Safety Bulletins*. Its organization serves a number of industries, and its bulletins deal specifically with the requirements of each. By well-thought-out wording and pertinent illustrations a single accident and its results are brought home to the worker. Even if he is unable to read, the pictures carry the message. Placed next to the mine bulletin board and at gateways, change houses, shafts and stations, they keep the safety message ever present. The blunt picture of a one-legged miner standing before the grave of his leg is more than a sermon on safety, for it is something that cannot be readily forgotten.

In another place in this issue we publish a brief history of the National Safety Council, which is to hold its seventh convention at St. Louis this month. A part of the work of the convention deals with mining, and there will be a number of interesting mining papers read there. One of these, on the subject of handling and storing of explosives, by Arthur La Motte, is presented in the current number. It is an excellent review of the subject, and should be of considerable value to all quarry and underground workers, the aim of the author being the education of the miner by means of pertinent instructions.

We heartily commend the work of this organization, and take pleasure in bringing it before our readers.

"What You Can Do Now To Help The Next Liberty Loan"

UNDER the above caption we printed in our advertising columns in last week's issue two pages of suggestions for starting the work of the next Liberty Loan. We believe the plan for Liberty Loan meetings is a good one. We advise our readers who are in managerial positions, or who may assume the responsibility for organizing a meeting, to write for the pamphlet of "Suggested Programs." The time is short, and the best word that we can send to our boys on the other side is the news of the success of the loan.

Do not delay. Form your committee and get together at once. Decide upon your plans and then put them through. Get your business men together; bring your church members along, and don't fail to have one or two hammer-and-anvil orators.

Mining Low-Grade Copper Orebodies

IN THIS issue we present a paper dealing with a phase of mining operations that in many mines is the problem of greatest importance. The development of the large low-grade coppers of Utah, Arizona, Nevada and New Mexico has opened up a new field of mining in North and South America. These deposits have offered varying mining problems, each of which has been successfully solved according to its nature and conditions. In all cases the orebodies have been thoroughly prospected by drilling prior to underground development, and large capital expenditures have been made in order that low operating cost might be secured. Loss of ore in pillars and loss of grade by dilution have respectively been balanced against the cost of high recovery of ore and a mill feed free from waste. During the development stages, the ore extracted from drifts, crosscuts and raises yields a considerable tonnage, and this ore at the newer properties was treated in a pilot mill, which performed the double function of sampling the mine and solving the metallurgical problem.

At Inspiration, a series of tests was conducted by the engineering department on a laboratory scale intended to show the effects of different methods upon the grade of ore and recovery which results from drawing large tonnages of broken ore from under a caving caprock. The results of this experimentation as verified by subsequent operations have, so far as data can be obtained, justified the expectations.

At both Ray and Braden, where shrinkage-stope and pillar-caving methods are used, the pillar problem offered the greatest field for new ideas. In his paper, Mr. Hollister describes the solution of the problem at Braden, and his conclusions are the more valuable in that they emanate from one who has had long, first-hand experience with mining at both properties.

Complete data regarding the degree of final recovery obtained by the method discussed are as yet unavailable, as the orebodies are still far from exhaustion. We shall, however, watch with interest the reports from Braden, which, to judge from the data given by Mr. Hollister, promise to be all that could be expected.

Mr. Kitchin's Tax Bill

THE greatest tax bill in history has been introduced in the House of Representatives. Mr. Kitchin exultingly proclaimed this and made several remarks that betray his state of mind. He said that there are some persons who are enjoying incomes a thousand-fold larger than before the war; that it is all right to tax the $3 shirt, for he had never worn one costing more than $1.50, and such had been good enough for him; and, finally, that the Government can take $8,000,000,000 out of some of the people without hurting business. The last assertion savored, however, of whistling to keep up courage. There is a little too much protestation about it.

Mr. Kitchin's attitude is well understood. He and his committee colleagues have blandly disregarded the advice and wishes of the Treasury Department, and hence of the Administration. They are going to tax not war profits but rather are going to mulct the rich so as to punish them for being rich. The desideratum is the reduction of everybody to the basis of the $1.50 shirt. Those who are already living on the scale of the $1.50 shirt, or lower, need not pay much of anything.

Of course, the talk about incomes swollen a thousand-fold is the kind of buncombe, at which Mr. McAdoo himself has connived, that is intended to gain the applause and support of the masses. It is conceivable that a man possessing a thousand-dollar income in 1914 may by the lucky strike of a bonanza in a mine be enjoying a million-dollar income in 1918, but such cases are among the rarities, as Mr. McAdoo's own report to the Senate shows. However, the great question is the effect upon business, upon the beehives of the nation, of a tax law framed upon these theories.

There are some things that are sufficiently clear. The total business turnover in 1917 has been estimated at something like 50 billion dollars. If it be any greater than that in 1918, owing to inflation, the increase will be mainly in the wages paid to labor, for commodity prices have been so restrained by the price-fixing policy that there can have been little if any expansion in that way. On the contrary, the evidence is pretty strong that the aggregate of man-hours of work and the quantity of materials produced will be less in 1918 than in 1917. But let us disregard considerations of that sort and assume that the aggregate of business in 1918 will be as large as it was in the previous year, and that fully half of the total has now become war-work, Governmental expenditures now averaging about two billion dollars per month. Manifestly such a consummation has been possible only by curtailing ordinary industrial activities; but there is a limit to that. The majority of the people are not engaged in war-work at all, yet they must work, and have material with which to work, in order to live—not to speak of paying taxes. Without any doubt these people have already been reduced to a difficult situation. It is a certainty that the moderately well-to-do classes are no longer going to be able to subscribe to national loans in the way they have done heretofore after Mr. Kitchin has taken out of them in taxes what he is going to do. Their incomes will not yield enough, not even after the most drastic economizing in living.

The corporations and the wealthy and well-to-do people cannot pay the cost of the war. There are not enough of them, and their net income is not enough. Their gross income may be large, but the major part of it is paid out for labor and the things that represent labor. In fact, the produce of the nation is mainly absorbed by the 40 million workers. It is to them that the proceeds of industry accrue, especially at this time, when the fixing of savings by the thrifty in railways, houses, factories, etc., is checked by high prices and high taxation. If the wage-earners, especially those who are engaged in war-work, do not save, if they squander their earnings, and, worse than that, waste their time, the country is losing, and the financing of the war is going to become increasingly difficult. Moreover, the state of our industry is going to be jeopardized.

The theory of taxing the war-profiteer is a sound one, but the practice of taxing only the capitalistic profiteer and letting the laboring profiteer go scot-free is dangerous. Mr. Kitchin did not appeal either to common sense or the finer feelings of patriotism when he bragged that he had framed a bill to draw eight billion dollars in taxes without touching the breakfast table. He ought to have touched the breakfast table and done other things to discourage the laboring men —the real moneyed class of today—from indulging in luxuries and idling their time. As it is, we must look more and more to that class to supply the money for bonds. If they will only do that, and themselves rise in the scale while the present well-to-do class is descending, the nation will experience a leveling process but no economic loss; but such a happy outcome is not to be expected until the wage-earners have been taught, or compelled, to cease wasting and to work with maximum efficiency.

Safety Precautions in Mining

IN A RECENT issue of the *Journal* we printed an interesting description of a safety crosshead which was designed to prevent the recurrence of an accident that was, happily, unattended with serious consequences. An ordinary type of crosshead was being used in shaft-sinking work; and, owing to freezing of water, it stuck between the guides and allowed the bucket to proceed alone. The crosshead remained near the surface and the bucket reached a depth of 600 ft. before it lodged in the shaft timbers. The engineer, ignorant of what had happened, continued to pay out the rope until about 400 ft. was piled on the crosshead, which then collapsed. The force of the impact between crosshead and bucket was so great that the latter was completely cut in two by the steel guide plates. The tangled wreckage of rope, crosshead and bucket continued downward with gathering momentum to meet another bucket, which it also completely demolished.

Nine men were working in the bottom of the shaft at the time of the accident, but the crash heard when the crosshead struck the bucket warned them of imminent danger, and gave them time to seek what safety was offered in the corners of the shaft before the wreckage reached the bottom. Luckily no one was injured, and it was then realized that similar accidents could be prevented by the provision of the safety measures to which we have drawn attention.

Spreading of the Blight

THE War Industries Board appears to have set itself firmly against increased prices for anything, and the formal meetings between the producers and price-fixing committees have lost most of the interest they used to have. There is nothing much to be gained by the producers going to Washington to play checkers with Mr. Brookings. Some people still talk about speeding up production, but in many of the major minerals and metals we see waning outputs, in others statistics that are just about holding their own, and in but few any material increase except in those cases where the markets have been let alone. A depression is gradually spreading over the great mining industry, where there ought to be enthusiasm. This is in no way the fault of the producers. They are doing everything that they can. They have simply been led into an economic blind alley in which they are helpless.

The price-fixing committee is quite unperturbed about this. It says that it has enough of iron, copper, lead, etc., so wherefore should it raise prices in order to encourage production by those producers whose margin has disappeared? The latter are told that they will best shut down, so as to release their men to more essential occupations. At the same time, however, everybody is trying to curtail consumption for what are deemed to be not immediately necessary purposes. There can be such a thing, however, as making it so impossible for people to do business that they can neither subscribe enough to liberty bonds or have earnings on which to pay taxes. If the country is put wholly on a war basis, with the result of a relatively few contractors making great profits, of millions of mechanics and laborers receiving great wages and squandering a large part of them, the rest of the people may be so squeezed that they can yield no more.

The War Industries Board is not, of course, responsible for all of this. It is simply playing its part in a generally uneconomic policy. At the beginning of the war we thought that a sound precept was "Increase production and curtail consumption." The War Industries Board has changed this to "Decrease production and curtail consumption more and more."

BY THE WAY

Practical jokes were not unknown in the early days of Nevada mining. Dan De Quille tells the following story in "The Great Bonanza":

Old Daniels would sometimes get so drunk that he didn't know whether he was dead or alive. Very late one night some wags found him so much intoxicated that they at first thought he was dead. They got a hand-barrow and carried him out to the graveyard, where they found a Chinaman's grave that had been opened so that the bones of the defunct Oriental might be sent back to China. The old shattered coffin still lay beside the open grave, and alongside the coffin they laid old Daniels.

The wags then secreted themselves near the spot, in order to see how the old fellow would act when he came to his senses. When the air began to grow cold, Daniels began to toss and tumble uneasily, and presently was fully awake. He then arose to a sitting posture and began a deliberate survey of his surroundings—the empty coffin by his side, the open grave, the tombstones all around.

"The day of resurrection!" said he solemnly; then took another survey of the graveyard. "Yes," he repeated, "the day of resurrection—and I'm the first son of a gun out of the ground!"

The German Explanations

BY R. W. RAYMOND

To engineers especially, the explanations offered by the German staff and the German press, to account for the successive defeats of the German army, are peculiarly amusing. The other day, we were told that Ludendorff had shown masterly ability in throwing enormous reserves into the Marne salient, so as to facilitate the retreat of the force already there—which reminds me of the story of the Irishman who was seen punching a greenback down between the boards of the Atlantic City boardwalk. His explanation was that he was not wasting the greenback at all—he had lost a nickel in that crack, and he was simply putting enough after it to make it worth his while to take up the planks.

But the latest of these amusing *camouflages* is the pæan of triumph over "our victorious retreat," of which the following verses may perhaps be regarded as a sufficiently accurate echo:

AN INTERVIEW

"Wilhelm, what blacked your eagle eye?"
"O curious journalist!
It was this eye, now swollen high,
That smote old Foch's fist!"

"And, Wilhelm, 'seems to me you limp
And stumble as you go."
"'Tis true, I gave my leg a crimp
In stamping on the foe."

"O Wilhelm! whence, for goodness' sake,
That footprint on your seat?"
"That's where he failed to overtake
My masterly retreat!

"For I, when he came on apace,
With frenzy born of fear,
Strategically saved my face
Behind my conquering rear.

"Yes, even in battle's dread array
The leader still I'll be;
To hostile hosts I'll show the way,
And they shall follow me!

"Now let those brazen bands of mine
Strike up the usual tunes,
Beginning with *Die Wacht am Rhein*,
And ending, *Gott mit Uns!*"

Personals

Have You Contributed to the Association of the 27th Engineers?

Albert H. Fay, of the U. S. Bureau of Mines, spent Sept. 7 and 8 in Lead, South Dakota.

J. D. Cain, of Middlesboro, Ky., has been reappointed assistant state mine inspector of Kentucky.

P. C. Stoess, of Seattle, Wash., has returned from Alaska, arriving in Seattle about the middle of August.

Max Atwater has been appointed manager of the Butte & Plutus mining company in the Philipsburg district of Montana.

John C. Anderson, of Tucson, Ariz., has been examining mining property in the region of Oatman, Mohave County, Arizona.

B. Britton Gottsberger, general manager of the Miami Copper Co., is back at Miami after a six weeks' vacation in southern California.

L. S. Rogers, of Rogers, Norton & Co., New York, has been in Arizona, visiting the Silver King mine at Superior, and the Gibson, at Miami.

Dwight E. Woodbridge, of Duluth, Minn., is in Batesville, Ark., studying the manganese situation there. He expects to be there about a month.

Joseph Walker, of Joplin, Mo., representing the Edgar Zinc Co., recently spent several days in the North Arkansas zinc and lead field purchasing ore.

William Koerner, formerly with the Gray Eagle Copper Co., Siskiyou County, Calif., is now in charge of operations at Majuba Hill, Humboldt County, Nevada.

C. E. Addams, who recently resigned as general manager for the Arizona Hercules Copper Co., has leased the Ray silver-lead property three miles from Ray, Arizona.

Robert George Hall, formerly general manager of the River Smelting and Refining Co., St. Louis, Mo., is now resident manager of the Burma Mines, Ltd., of Namtu, Burma.

C. S. Parsons has been appointed superintendent of the Joseph Dixon Crucible Co.'s graphite mill and mine at Graphite, N. Y. He formerly was with the Mines Branch, Ottawa, Canada.

W. W. Williams is at present in Arizona as consulting engineer directing resumption of work on the famous Peck silver bonanza, which El Paso, Texas, men have begun to operate.

George H. Beaumont, vice president of Pickands, Mather & Co., will act temporarily as president of the Cromwell Steel Co., of Cleveland, Ohio, in the place of **Max McMurray**, resigned.

Edwin Young has been appointed welfare engineer at the Great Falls Reduction Works of the Anaconda Copper Mining Co., a newly created position. Mr. Young has been in the company's employ for 28 years.

Percy A. Rockefeller has been elected president of the United Metals Selling Co. to succeed **John D. Ryan**, who resigned in order to devote his time to the service of the Government as Director of Air Service.

D. L. H. Forbes is general superintendent for the Teck-Hughes Gold Mines Co., Ltd., of Kirkland Lake, Ont., Canada, the announcement in the Aug. 24 issue of the appointment of Robert Dye to the management of this property being in error.

N. H. Snow, for many years district purchasing agent for the Illinois Zinc Co., has given up active field work on account of ill health and has been succeeded by his son, **C. W. Snow**, of Platteville, heretofore employed as chemist and assayer by the company.

R. W. Mackey, assistant foreman, and **L. M. McBride**, engineer of the Homestake Mining Co. of Lead, S. D., have returned from Denver, where they took the examinations for engineer officers. Both men have been recommended for commissions, and will report soon for training.

L. L. Dieffenbach, general superintendent of the Balbach Smelting and Refining Co., Newark, N. J., completed 35 years of service on Sept. 3. His staff and old employees presented him with a handsome gold watch suitably engraved, accompanied by an address of loyalty and appreciation.

Arthur H. Young, director of the American Museum of Safety, New York, since Jan. 1, 1917, has resigned to take charge of the employee relations department of the International Harvester Co. **R. M. Little**, formerly a trustee of the museum, has succeeded Mr. Young as director.

Carl Hayden, formerly chief engineer and geologist for the Wisconsin Zinc Co. at Platteville, Wis., has gone to Canada in the interests of the Grasselli Chemical Co. **H. S. George**, formerly connected with the Wisconsin Zinc Co. and at one time director of the Wisconsin Mining School at Platteville, has succeeded Mr. Hayden.

W. H. Locker, of Duluth, Minn., vice president of the American Manganese Manufacturing Co., Dunbar, Penn., is at Batesville, Ark., buying manganese ore to be shipped to his company's furnace for ferro making. The company is operating mines in the Cuyuna district, but these do not produce an ore entirely suitable for ferro.

Prof. Volney Lewis, of Rutgers College, New Jersey, has been studying the chromite deposits and plant of the Carolina Chrome Co., of Waynesville, N. C., on behalf of the U. S. Geological Survey. **S. H. Hamilton**, mining geologist, accompanied Professor Lewis. Mr. Hamilton is at present engaged in field work in North Carolina and Tennessee for the Cranberry Furnace Co., of North Carolina.

William M. Corse, general manager of the Titanium Bronze Co., Niagara Falls, N. Y., has resigned to become associated with the Ohio Brass Co., at Mansfield, Ohio. Mr. Corse is a brass foundryman and metallurgist of wide experience. He was elected secretary-treasurer of the American Institute of Metals in 1908 and president in 1917. This organization now constitutes the Metals Division of the American Institute of Mining Engineers.

Obituary

J. M. Chambers, who introduced in New Zealand the Askham-Molloy and Parkes process of extracting gold from refractory ore, died in Wellington on Mar. 6, aged 55. Mr. Chambers erected plants using the process mentioned at Thames, Karangahake and Collingwood. Prior to his illness he was attorney in New Zealand for the Waihi Grand Junction Gold Co., Limited.

Societies

American Association of Engineers. A committee has been appointed to study after-the-war conditions. It comprises Isham Randolph, chairman; Edmund T. Perkins, Gardner S. Williams, and Samuel Moreell, secretary. The committee will be enlarged as its work increases and will join its forces with other agencies in the country that are studying the problem. The Chicago chapter tendered its incoming secretary, C. E. Drayer, a dinner on Sept. 4 at the City Club, Isham Randolph acting as toastmaster. Mr. Drayer outlined some of the problems now before the profession.

National Safety Council. The following have been nominated for members of the board of directors of the council to be elected on Sept. 16 at St. Louis: George T. Fonda, superintendent, bureau of labor and safety, Bethlehem Steel Co., Bethlehem, Penn.; Van. H. Manning, U. S. Bureau of Mines; A. H. Young, manager industrial relations, International Harvester Co., Chicago; Robert J. Young, manager, department of safety and relief, Illinois Steel Co., Chicago; John J. Eagan, president American Cast Iron Pipe Co., Atlanta, Ga.; J. W. Ensign, general manager, American Car and Foundry Co., Huntington, W. Va.; E. H. Fiesinger, safety engineer, Semet-Solvay Co., Syracuse, N. Y.; Dr. L. A. Shoudy, chief surgeon, Bethlehem Steel Co., Bethlehem; C. B. Auel, director of standards, processes and materials, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pennsylvania.

Institute of Metals division of the American Institute of Mining Engineers and the iron and steel section of the same society, together with the American Foundrymen's Association and the American Malleable Castings Association, will meet simultaneously in Milwaukee, Wis., during the week of Oct. 7. The program of the non-ferrous meetings will include a discussion of the conservation of tin. The following papers will be presented: Oct. 8—"The Metallography of Tungsten," by Zay Jeffries; "The Constitution of the Tin Bronzes," by S. L. Hoyt; "Notes on Babbitt and Babbitted Bearings," by Jesse L. Jones; "Oxygen and Sulphur in the Melting of Copper Cathodes," by S. Skowrouski; and "The Relation of Sulphur to the Overpoling of Copper," by S. Skowrouski, with discussion by Philip L. Gill. On the morning of Oct. 9 there will be a symposium on "The Conservation of Tin." This topic will be discussed by the following: G. W. Thompson, National Lead Co.; G. H. Clamer, Ajax Metal Co., Philadelphia; C. M. Waring, Pennsylvania R.R. Co.; M. L. Lissberger, Mark Lissberger & Son, Inc., Long Island City, N. Y.; D. M. Buck, American Sheet and Tin Plate Co., Pittsburgh; W. M. Corse, Buffalo; G. K. Burgess and Mr. Woodward, Bureau of Standards, Washington, D. C.; M. L. Dizer, War Industries Board, Washington, D. C.; a representative of the Niles, Bement, Pond Co., New York; a representative of the bureau of steam engineering, U. S. Navy, Washington, D. C. In the afternoon further papers will be read as follows: "The Volatility of the Constituents of Brass," by John Johnston; "Notes on the Metallography of Aluminum," by P. D. Merica and J. R. Freeman, Jr.; "The Effect of Impurities on the Hardness of Cast Zinc or Spelter," by G. C. Stone; "Dental Alloys," by Dr. Arthur W. Gray; "Electrolytic Zinc," by C. A. Hansen; and "The Condensation of Zinc From Its Vapor," by C. H. Fulton. Oct. 10—"Notes on Non-Metallic Inclusions in Bronze and Brasses," by G. F. Comstock; "Nichrome Castings," by Arlington Bengal; "Fusible Plug Manufacture," by G. K. Burgess and L. J. Gurevich; "Application of the Spectroscope to the Chemical Determination of Lead in Copper," by Messrs. Hill and Lucke; and "Radium," by Richard B. Moore. The program of the iron and steel section of the American Institute of Mining Engineers has been tentatively outlined as follows: Oct. 8—"The Limonite Deposits of Mayaguez Mesa, Porto Rico," by C. R. Fettke and Bela Hubbard; "The Manufacture of Ferroalloys in the Electric Furnace," by R. M. Keeney; "The Manufacture of Silica Brick," by H. Le Chatelier and B. Bogitch; "Notes on Some Iron Ore Resources of the World;" "Recent Geologic Developments on the Mesabi Iron Range," discussion by Anson A. Betts and J. F. Wolff; "A Volute Aging Break," by Henry M. Howe; and moving pictures of the triplex steel process. Oct. 9—"The Byproduct Coke Oven and Its Products," by W. H. Blauvelt; "The Use of Coal in Pulverized Form," by H. R. Collins; "Carbocoal," by C. T. Malcolmson; "Low-Tempered Distillation of Illinois and Indiana Coals," by G. W. Traer; and "Price-Fixing of Bituminous Coal by the U. S. Fuel Administration," by R. V. Norris and others.

New Patents

United States patent specification listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Electrolytic Iron, Process for Making. Axel Theodor Constantin Estelle, Hagen, Germany, assignor to Martin Filip Wijkstrom, Stockholm, Sweden. (U. S. No. 1,275,161; Aug. 6, 1918.)

Flotation—Separation of Mixed Metallic Sulphides. Leslie Bradford, Broken Hill, New South Wales, Australia. (U. S. No. 1,274,505; Aug. 6, 1918.)

Furnace, Electric. Mark Shoeld, Chicago, Ill., assignor to Armour Fertilizer Works, Chicago, Ill. (U. S. No. 1,274,794-5-6-8; Aug. 6, 1918.)

Mine Car Brake for Haulage on Inclines. William J. Mow, Grass Valley, Calif. (U. S. No. 1,274,071; July 30, 1918.)

Mine Railway Signal. Joseph A. Muir, Smithboro, Ill. (U. S. No. 1,274,072; July 30, 1918.)

Nickel Alloy with Cr, Si and Al; also in which Fe replaces part of Cr. Paul Richard Kuehnrich, Sheffield, England. (U. S. No. 1,273,877; July 30, 1918.)

Nickel Titanium Alloys for Resistance Elements. Wilbur B. Driver, East Orange, N. J. (U. S. No. 1,274,250; July 30, 1918.)

Pig Iron, Method of Producing. Frank H. Crockard, Birmingham, Ala. (U. S. No. 1,274,245; July 30, 1918.)

Potash—Process for Increasing Solubility of the Potassium Content of Cement-Kiln Dust. Raymond J. Nestell, Los Angeles, Calif., assignor to International Precipitation Co., Los Angeles, Calif. (U. S. No. 1,274,310; July 30, 1918.)

Potash—Process for Recovering the Constituents of Alunite in Technically Useful Forms. Henry J. Detwiller, Allentown, Penn. (U. S. No. 1,274,145; July 30, 1918.)

Roasting Ore, Process for. Charles H. Fulton, Cleveland, Ohio, assignor, by mesne assignment, to Metallurgical Laboratories, Inc., Chicago, Ill. (U. S. No. 1,273,844; July 30, 1918.)

Zinc, Process of Treating. Charles A. H. de Saulles, New York, N. Y. (U. S. No. 1,274,249; July 30, 1918.)

Zinc—Retort-Charging Machine. George W. Whipple and Cloise H. Baldwin, Cherryvale, Kan., assignors to Edgar Zinc Co. (U. S. No. 1,274,120; July 30, 1918.)

Editorial Correspondence

SAN FRANCISCO—Sept. 3

Fatal Injuries from Electricity in California during the 24 months of 1915 and 1916 numbered 50. In the same period there were 13 permanent and 676 temporary injuries. The cost of compensation and medical fees totaled $153,566. Tentative electrical station safety orders will be given two public hearings, one on Sept. 12 at Los Angeles and one on Sept. 25 at San Francisco, under the direction of the State Industrial Accident Commission.

Fatal Injuries in Rock Quarries in California during the 24 months of 1915 and 1916 numbered 32. There were 60 permanent and 2314 temporary injuries in that period. The total cost in compensation and medical fees was $176,034. Tentative quarry safety rules were given a public hearing at San Francisco on Aug. 28, and another such hearing will occur at Los Angeles on Sept. 11. These hearings are in charge of the State Industrial Accident Commission.

The Comstock Northend Mines in the four weeks ended Aug. 24 milled 2244 tons of ore, having a total value of $34,099. This represents an average value of $15.195 per ton and an average weekly production of 561 tons. The Mexican mill was operated about 79% of the total time. The largest total weekly milling production was 704 tons and the smallest, 442 tons. The highest per-ton value of ore milled was $37.03 and the lowest, $6.08. In the four weeks the Union Consolidated and Consolidated Virginia ran full milling time, whereas Ophir, Sierra Nevada and Mexican operated only two weeks each. Union Consolidated milled a total of 747 tons, of an average value ranging from $10.76 to $22.21; Consolidated Virginia a total of 1121 tons, of an average value from $11.62 to $14.75; Mexican, 171 tons, averaging from $22.14 to $37.03; Ophir, 65 tons, averaging from $7.20 to $8.56, and Sierra Nevada, 140 tons, averaging from $6.08 to $12.35. Development has been carried on at various levels from the 1600 at the Union Consolidated to the 2600 level at the Union and Sierra Nevada. From this development ore was saved running from as high as $74.64 per ton in the Mexican to $5.67 in Consolidated Virginia.

Daily Production of Petroleum in California increased 14,129 bbl. from June 1, 1917, to June 1, 1918, according to reports filed with R. P. McLaughlin, state gas and oil supervisor. This increase is due to developments in the last year in the Montebello and Casmalia fields. The wells in these fields average a daily production per well of 862 bbl. in Montebello and 166 bbl. in Casmalia. But for the results of this development the state would be now facing a serious decrease. The average total daily production in these fields in June, 1918, was 16,322 bbl. in Montebello and 4708 bbl. in Casmalia, making a total daily increase from the two fields of 21,030 bbl. In the week ended Aug. 17, six new wells were made ready to drill, and in the week ended Aug. 24, the number of new wells ready to drill increased to 21, making a total since Jan. 1 of 497 wells. In the same period of 7½ months 8[illegible] wells were reported for test of water shut-off. This test is often the most critical operation in the drilling of an oil well. Besides determining whether formations are protected, it is during this test that the operator often obtains the first definite knowledge as to whether he has a productive well, so that operators are especially desirous of the presence of the state supervisor or a deputy. About 50% of the shut-off jobs are reported satisfactory upon the first test. About 40% require further testing. The remaining 10% are rejected as positive failures at the first test. The encouraging outlook for favorable Congressional legislation is having a good effect in many fields of the state, particularly in western Kern County and in the Montebello, Coalinga and Midway. The new work long planned by large companies will be promptly started as soon as the leasing bill is enacted into law. Congressional delay has been largely if not wholly responsible for the unfavorable condition of the oil industry in the state during the last two or three years. There is at present a spirit of optimism abroad

California Gold Production in 1917 amounted to $20,087,504, according to Charles G. Yale, of the U. S. Geological Survey. This is a decrease of $1,323,237 from the total production in 1916, which amounted to $21,410,741. In the first half of 1918 the gold production in the state was less than in the first half of 1917 by $1,174,500, making a total decrease in the 12 months of 1917 and six months of 1918 amounting to $2,497,737. In the "Journal" of Aug. 17, it was estimated that the decline in gold production in the first half of 1918 was approximately $2,500,000. The Survey figures are, of course, dependable, as they represent official returns, and the "Journal" figures were based on the writer's individual estimate. The deep mines, which formerly produced 62 to 64% of the total gold, are now producing about 55%, and by the end of 1918 will be producing less. The gold dredges now produce 90% of the placer gold, which was increased about 6% in 1917. Copper, lead-silver and zinc mining have prospered and have drawn many men from the gold-mining camps. Mr. Yale shows that in one gold-mining county having a population of 8000, about 1000 miners left for other fields in the first half of 1918. Nevada County, where the cost increased $1.15 per ton, produces the highest average per ton value of ores; but in 1917 the average value from 14 mines was only $7.84, compared to $9.10 in 1916. And that is approximately the rate of increase in other counties. Although copper mining is prosperous, there was a decrease in production in 1917 of 14% from the production in 1916. There was a decrease of 2.9% in zinc production, but an increase of 7.6% in the production of lead. The copper mines have particularly suffered from labor shortage, in spite of procuring men from the gold-mining counties, although some of the copper mines have increased production. Two mines have been closed down temporarily on account of the high cost of transportation or lack of transportation. Flotation of copper ores has advanced at the Mountain Copper Co., the Engels, the Bully Hill and the Walker plants. Silver production in the first half of 1918 was 32,000 oz. less than in the first half of 1917, so it is apparent that practically all mining in California has been affected by the shortage of labor and lack of transportation, though gold mining has carried the additional burden of a decrease in the purchasing power of gold. There has been notable advancement in chrome and manganese mining, as well as in tungsten; but even these minerals have been hit rather hard by lack of transportation and shortage of labor.

SALT LAKE CITY—Sept. 5

The Possible Effect of the New Draft upon the mining industry in this state in calling to the colors a still larger proportion of available labor, at the present time not too plentiful, is being considered by the Utah chapter of the American Mining Congress, which at a meeting on Aug. 31 appointed a committee consisting of J. C. Lynch, J. M. Bidwell and G. W. Lambourne to look after the interests of labor coming within the limits of the new law. It is felt that in view of the fact that mining is recognized as a war industry, mining companies will be able to obtain permission to retain such men as are actually needed for ore production. At the meeting it was therefore recommended that members be prepared to submit to the district exemption board the names of employees essential to ore production.

August Shipments from Tintic of 739 cars exceeded the July output by 119 cars—the tonnage coming from 30 shippers. A car of bullion by the Tintic Milling Co. is of interest as coming from a camp which up to the time of the starting of the milling enterprises in question has been a shipper of entirely first-class ores through a period of many years, and is keeping up its output of ores of this class. A car of manganese ore was shipped by lessees from Chief Consolidated ground. The largest single shipper is the Dragon Consolidated, with 199 cars, which is finding a ready market for its fluxing iron ores. This company will stop mining other ores, which will be exploited under lease by the Tintic Milling Co., which will treat the lower grades at its mill and ship the better ore. The Chief Consolidated, with 162 cars, is the next heaviest shipper, and shipments are of ores more typical to the district. This company, as is true in general throughout the district, except in the case of several Knight properties shipping to the Tintic Milling, is able to market with present high costs and labor scarcity, only its higher-grade ores. The complete list of shippers is: Dragon Consolidated, 199 cars; Chief Consolidated, 162; Eagle & Blue Bell, 84; Iron Blossom, 80; Tintic Standard, 69; Centennial-Eureka, 59; Grand Central, 37; Colorado Consolidated, 36; Mammoth, 26; Gemini, 23; Gold Chain, 19; Ridge & Valley, 15; Showers, 6; Swansea, 6; Eureka Hill, 5; Bullion Beck, 4; Yankee, 4; Godiva, 4; Victoria, 4; Scranton, 4; Alaska Lease, 3; Sunbeam, 2; Uncle Sam, 2; May Day, 2; Scotia, 1; Golden Key, 1; Old Susan, 1; Primrose, 1; Huish & Bean (manganese lease) 1; Tintic Milling (bullion), 1.

TONOPAH, NEV.—Sept. 2

Activity in Divide District, six miles south of Tonopah, is greater than in any other camp in southern Nevada, owing to the striking of a large shoot of high-grade ore in the Tonopah Divide mine. In addition to that mine, other properties being worked are: Brougher Divide, Tonopah Dividend, Divide Extension, Gold Zone, Gold Reef, East Divide and Hasbrouck. Chief development work to date has consisted of sinking. In the Tonopah Divide mine, ore has been opened on the 160, 265 and 370 levels. Electric-power lines are being extended to the district. When completed, a compressor and machine drills are to be installed in this property, and shipments made to Goldfield Consolidated mill. At the Brougher Divide mine the shaft is down 177 ft., and drifting is under way. At the Gold Zone mine, the shaft has been sunk 300 ft. and a crosscut driven to the vein, where good assays were obtained. Crosscutting on the 300 level of the Tonopah Dividend mine is under way. Contract will be let by the Divide Extension Co. to deepen the shaft, now 100 ft. deep. The Hasbrouck mine, in the southwestern part of the district, has been the largest shipper. Sinking of Gold Reef shaft, now down 65 ft., will be resumed. At the East Divide mine a hoisting equipment has been installed, and the power line is to be extended.

JEROME, ARIZ.—Sept. 3

The Hull Copper Co. Litigation has been settled by compromise, which also brings a settlement of all differences between the United Verde and United Verde Extension companies. The published story is that both the Clark and Douglas interests were desirous of securing the Hull property, and that in the summer of 1916 Charles W. Clark, general manager of the United Verde, paid George W. Hull $1,000,000 cash for his stock in the Hull, Columbia, Consolidated King, and Cleopatra copper mining companies, and for certain surface rights in and about Jerome. This deal included the transfer to Clark of 77% of the stock of the Hull company. The remaining 23% was held by about 4500 scattered stockholders. Soon after the transaction was completed, John H. Page, of Phoenix, and others formed a "Stockholders' Protective Association." Then William H. Kemp, of Boston, brought suit in the superior court of Yavapai County, Arizona, on his own account and that of other minority stockholders, seeking an accounting by Hull of the company business transacted by Hull while he was connected with it. The complaint alleged that after Hull had organized a company capitalized at $10,000,000, with shares of $1 each, he traded property owned by him for the outstanding stock, a large amount of which he sold, representing it as treasury stock, and the proceeds of which were not used for development purposes, as the buyers of that stock believed they were to be. Finally Hull, so it was further alleged, attempted to "freeze out" others associated with him, then got title to the property, and later sold it to the Clark interests. Hull died after the suit had been filed. After some delay, a receiver was appointed on the application of the plaintiffs. Rather than give up possession of the property, the Clark interests filed a supersedeas bond of $1,000,000, as a guarantee that the minority interests would not suffer. The hearing of the case was set to begin at Prescott, Ariz., on Aug. 26, but was postponed a few days. Meanwhile conferences were held in Los Angeles, Calif., between the Clark interests, represented by Charles W. Clark, general manager, and Robert E. Talley, assistant general manager of the United Verde company, with their attorneys, and representatives of the minority stockholders—William H. Kemp, of Boston; Elmer Sykes, F. W. Lowry, and Hugh McKay, of Denver; John H. Page, of Phoenix, and a number of attorneys representing Douglas and the minority stockholders. When the conferees reached Prescott, the court was informed that a compromise had been arranged and an agreement executed, and this the presiding judge approved and handed down his decree in accordance with the terms thereof. These terms are: That Charles W. Clark is to return 2,500,000 shares of stock to the treasury of the Hull company for cancellation; his title to 5,181,173 shares is confirmed, thus giving him a majority of the stock and control; both sides to the Hull litigation are to pay their own costs; the receiver, who did not undertake any duties, is dismissed, and the Clark supersedeas bond of $1,000,000 is dissolved. A new board of directors, giving representation to the United Verde Extension and the minority stockholders, as well as the United Verde, takes charge of the Hull affairs at once. The board consists of Robert E. Talley, president; George Kingdon, general manager of the United Verde Extension Co., vice president; Leroy Anderson, of Prescott, attorney for the United Verde Co., secretary; and these, together with Thomas Taylor, superintendent of the United Verde Co. smeltery at Clarkdale, and John H. Page, of Phoenix, constitute the directorate.

CALUMET, MICH.—Sept. 5

Copper Mining Companies of the Lake Superior district have less than three months in which to ship their refined product East by the lake route, for the inland channels and canals cutting through the Keweenaw peninsula will be locked by ice by Nov. 20, or a week later at best. Shipments of copper have been almost entirely by the lake route this year, which has given the producing companies a considerable saving as compared with the all-rail routes. Some small shipments have been made via the Welland Canal and directly to ocean points, these consignments being destined for overseas ports eventually. There has been some increase in lake freights this season, but the increase in rail freight rates, especially since the new schedule of the Government became effective, has been greater, up to 30% in fact, due to the rule making operative the rating of the nearest multiple of 10 after 25% increase is figured. This has not only hit many of the copper-producing companies as regards rates on rock shipments to the mills, but will affect them when it becomes necessary to ship by rail, instead of boat, in forwarding their product to Eastern points. Because of increased rail rates, it is probable that most of the producers will store more copper on their docks this winter, to await the reopening of lake navigation next spring, than in several years past. In order to do this they must rush every possible pound of the metal East this summer and autumn to meet their over-winter contracts, and will therefore handle by rail only such amounts of the metal as may be absolutely necessary during the winter months. Several cargoes of from one million to three million pounds of refined copper have been sent down the lakes by boat this summer, and many more are to be shipped. Most of the silver product of the local mines goes East by express.

CLEVELAND, OHIO—Sept. 3

Iron Ore Shipments from upper lake ports during August totaled 9,725,331 tons, according to "Iron Trade Review." This is a decrease of 933,872 tons from July shipments, which amounted to 10,659,872 tons. Heavier coal and grain shipments and a dock strike at Superior held down the August total. The total amount of ore shipped this year to Sept. 1, is 39,334,264 tons. In 1917 shipments for the same period amounted to 39,221,149 tons.

SPOKANE, WASH.—Sept. 5

"The Gold Situation and Its Remedies" was the subject of an address by Frank A. Ross before the Gold Conference held here today. He emphasized the fact that there is a vast difference between granting a bounty for the production of gold and decreeing an increase in the standard value of an ounce of gold. The following conditions, he stated, should govern the bounty to be granted on all new gold that this country may produce: "1. That the bounty shall be paid only upon identification of the possessor of bullion and after satisfactory explanation of its origin, payment to be made at such places as shall be designated by proper authorities, notably at the mint or its branches. 2. That, in lieu of bullion, the applicant for bounty shall present certificates from the mint that bought his bullion, or from the public mill or smelter that bought his ores. 3. That all such certificates from public mills or smelters shall be officially endorsed by a Government inspector of ore shipments."

TORONTO—Sept. 5

A Notable Increase in Crude-Oil Production in Ontario is shown for the first six months of 1918, as compared with those for the corresponding period of 1917. The output of the principal Ontario fields for the first half of the present year was 132,248 bbl. as against 94,492 bbl. during the first six months of last year. The increase is due largely to the development of the Mosa field, the production from which has increased from 2712 bbl. in January to 12,395 bbl. in June. The Plympton-Lambton field, however, shows a great falling off, the production for the first six months of 1918 being only 191 bbl., as compared with 65,379 bbl. during the first half of 1917.

Gold Mine Operators are considering the advisability of making an appeal to the Canadian government for an investigation in regard to the high cost of blasting powder, which is a prominent factor in increasing the cost of production. As shown by a statement prepared by one of the gold-mining companies, the price has doubled during the last five years. The ruling quotation on 40% powder, the kind chiefly used, was on Feb. 12, 1913, $13.10 per 100 lb. in car lots f.o.b. the mine. Since that time it has risen steadily, until on July 10 last it was advanced to $26.70. The question is regarded as of hardly less vital importance to the gold-mining industry than that of labor shortage.

Hon. Edward Brown, provincial treasurer of Manitoba, has announced that a line of railway is to be built soon north from The Pas, to open up the rich copper country, giving access to the Flin Flon and Mandy mines. At the Flin Flon, the copper deposit indicated by diamond drilling comprises approximately 25,000,000 tons, of an estimated value of $250,000,000. No work is now being done, the construction of a railway being regarded as an essential preliminary. Smelteries must be built at the mine, as the ore is of lower grade than at the Mandy, and this will involve an expenditure of upward of $4,000,000. Mr. Brown states that the railroad, which will be about 70 miles long, will cost approximately $2,000,000, and will connect with the Hudson Bay Railway.

The Canadian Government has issued an order-in-council prohibiting the export of Canadian silver coin, silver bullion and fine silver bars, excepting under license issued by the Minister of Finance. The reason assigned is the urgent need of silver for coinage by the Allied governments. The regulations governing the issue of licenses provide that they shall be given only in cases where the silver is to be used for civil or military purposes of importance in connection with the war, and where the exporter certifies that it has been purchased at a price which does not directly or indirectly exceed $1.01½ per oz. 1000 fine at the point where the silver is refined, or at the point of importation in the case of imported silver. As certain silver mines have been able to sell their output for prices above the figure specified, the order has caused some dissatisfaction in mining circles.

VICTORIA, B. C.,—Sept. 4

Prospecting and Development of those minerals in British Columbia which are needed by the Munition Resources Commission of Canada is well under way, according to G. C. Mackenzie, of the geological survey branch of the Canadian Department of Mines. In the Tulameen River district no drilling has been done, but some gravel has been washed, and it has been established that platinum can be obtained. Several claims that are being worked are producing gold and platinum and all making wages. Clean-ups from these claims are to be taken either to the Bank of Montreal or the Bank of Commerce, at Princeton, B. C., whence the mineral will be forwarded to the Dominion Assay Office, Vancouver, B. C., for treatment. Mr. Mackenzie says, in this connection, that the refinery for the handling of platinum and gold, which is being installed at the Vancouver Assay Office, is almost complete and that it will be prepared to take all platinum, with or without gold, that may be offered, paying the market price for the latter and $105 an ounce for the former. The prices offered for palladium, iridium and osmiridium have not yet been decided, but quotations have been cabled for and will be known soon. With regard to recent manganese discoveries in the Cowichan district, Vancouver Island, Mr. Mackenzie, who just returned from an inspection of one of these properties, situated on the summit of the divide between the Chemainus and Cowichan rivers and within easy reach by aërial tramway of the Esquimalt & Nanaimo Ry., speaks enthusiastically of its possibilities. Although no development work has been done, samples from the surface ran high in recoveries. As it had been proposed to import ferromanganese from India for use in the manufacture of munitions in Canada, Mr. Mackenzie thought that the situation of these properties on Vancouver Island was of first importance. He thought it likely that the War Trade Board of Canada, in coöperation with the locaters and owners, would arrange for their early development, in which event, owing to their accessibility, it would not be long before ore was being shipped.

The Mining News

ARIZONA

Cochise County

HUACHUCA TUNGSTEN (Huachuca)—Testing process in new 20-stamp mill.

ARIZONA UNITED (Johnson)—Shipping 100 tons daily to El Paso, mainly from upper levels of [illegible] [illegible].

CENTRAL BUTTE (Pearce)—Cut commercial ore in deep crosscut and will start ore shipments soon.

Gila County

AMERICAN SMELTING & REFINING (Hayden)—[illegible] complete and coal crushing plant adjusted for full operation.

INSPIRATION CONSOLIDATED (Miami)—August production was 9,000,000 lb. of copper.

Greenlee County

ARIZONIA COPPER (Clifton)—Copper produced in August was 4,300,000 lb. July production was 4,000,000 pounds.

Mohave County

CHLORIDE QUEEN (Chloride)—Operating new hoist and four-drill compressor equipment. Drifting on 220 level, and will enlarge stoping area. To ship within 60 days.

SCHUYLKILL (Chloride) — Retimbered old Tennessee shaft and extended tracks on 900 level. Plans have been made for large mill.

GOLD TRAILS (Little Meadows)—Sinking shaft 300 ft. to drift under known orebody. D. A. McMillen in charge.

CYCLOPIC (White Hills)—McDonald, Ramsey and Wright are operating 75-ton mill. Dry crushing and cyaniding securing a recovery of 90 per cent.

Santa Cruz County

EXPOSED REEF (Patagonia)—Leased by Sullivan, Dawson & Harrington, who are installing new surface equipment.

WORLD'S FAIR (Patagonia)—Installing 100-ton tube mill transferred from the abandoned Montana camp in Ore Blanco district.

COMET (Washington)—Shipped first carload of high-grade manganese.

CONSOLIDATED ARIZONA COPPER (Washington)—Received hoist and other surface equipment. Shaft down 100 feet.

MORNING GLORY (Washington)—Experimenting with new process for treatment of complex low-grade ores.

MOWRY (Washington) — Developing large bodies of low-grade manganese. Concentrating machinery has been ordered.

Yavapai County

CALUMET & JEROME (Jerome)—Number five drill-hole down over 250 ft. in schist containing copper ore; also quartz and hematite.

ARKANSAS

Boone County

COON HOLLOW (Zinc)—Active operations started after some months' shutdown.

GLORIA (Zinc)—Milling tailings pile.

Independence County

EUREKA (Batesville)—To build 50-ton log washer and will purchase pumps and piping.

POLK-SOUTHARD (Batesville) — To build 50-ton log washer and will purchase washers, belts, pumps, engine and piping.

Marion County

O'MEARA (Buffalo)—Started active mining and milling operations after several months' shutdown. Produces high-grade carbonate of zinc.

PARADISE (Dodd City)—Purchased by Salina Mining Company.

MORNING STAR (Rush)—Prospecting manganese outcrop recently found overlying zinc strata.

LONE STAR (Yellville)—Two of three drill holes have cut rich bodies of carbonate and jack at shallow depths. To thoroughly drill ground and develop.

CALIFORNIA

Butte County

SURCEASE (Oroville)—Cave-in of shaft disclosed rich vein or ore, indicating a second gold-bearing ledge. Under development by Goldfield Consolidated, of Nevada.

Del Norte County

CHROME DEPOSIT discovered near Owl Chrome mine in French Hill district by Silas White.

CHROME ORE mined at French Hill to be hauled to Crescent City in motor trucks by M. M. Boutz.

NEW CHROME DEPOSITS, including five claims on Patrick's Creek, to be developed by Fred Beam, of Smith River.

RED MOUNTAIN (Requa)—To ship chrome ore by burro pack train. New discoveries of chrome reported.

Eldorado County

RISING HOPE (Placerville)—Ventilation by use of water from tunnel for driving compressed air a distance of 3100 ft. up a 7% grade, installed by George W. Englehart, superintendent, is proving successful.

Humboldt County

CHROME ORE SHIPMENTS from Eureka average three cars a week, from Low Divide district, in Del Norte County, and Pecwan Creek district, in Humboldt County.

Plumas County

TRASK & COFFER (San Francisco)—To install mill and drive 500-ft. tunnel on vein showing copper and silver. Situated in Moonlight mining district.

San Luis Obispo County

MANGANESE DEPOSIT near Berros, in Los Berros mining district, discovered by W. D. Murray, of San Luis Obispo, and E. E. Murray, of Jolon. Wear brothers have also discovered manganese in the same district while operating a chrome mine.

LOS ANGELES MANGANESE (Los Angeles)—To mine and reduce manganese ores from deposits operated under lease.

Sierra County

HILO (Downieville)—Extensive gravel cut by 100-ft. drift. Sluicing to begin with first rains. Produced profits for some years.

Siskiyou County

EASTERN MINING (Gottville)—Chrome deposits discovered at Donnemore, in Siskiyou Mountains, near Oregon line. Four-mile motor road built from mine through Klamath forest. Soft formation will reduce cost of mining.

Trinity County

CHROME DEPOSITS discovered near South Fork Mountain and Elpaton Creek by W. Pelletreau and associates. U. S. Forestry Service contemplates road into district provided 2000 tons of ore can be promised for hauling. Manganese and lime rock also reported.

Yuba County

CENTRAL SOUTH YUBA (Grass Valley)—To develop property near Jones Bar and install mill. Ore carries copper, high sulphur content and some gold and silver. J. A. Coley and J. E. Craig are owners.

COLORADO

Clear Creek County

GEORGETOWN TUNNEL (Georgetown)—New four-drill compressor and electric equipment have been installed, but company is experiencing difficulty in securing air pipe, on account of slow delivery.

SCEPTRE (Georgetown) — Temporarily closed down on account of negotiations between lessor and lessee. Development during the last year was: Sceptre tunnel cleaned out and retimbered; 300 ft. of drifting done in east stopes; main raise of 370 ft. to Grant tunnel completed and 60 ft. of drifting was done on 275 level. Small vein of good silver-lead ore has been opened. Property recently equipped with bunk houses to accommodate 60 men, and the new 7000-ft. Broderick & Bascom wire-rope tramway has been completed. New railroad spur from the Colorado & Southern track has been completed to the lower tramway terminal.

CROWN POINT AND VIRGINIA (Idaho Springs)—Old workings have been cleaned out and retimbered and 70 ft. of drifting has been done on oreshoot 400 ft. east of shaft. New orebody contains pockets of high-grade ore. Ninety feet of stoping ground remains over the new drift.

San Juan County

BULLION KING (Silverton)—Has been leased to local operators, who have reopened mine and plan active development. Surface plant to be overhauled and remodeled. The tunnel will be cleaned out and retimbered.

San Miguel County

RADIUM ORE SAMPLING (Montrose)—Has completed a rare-ore custom sampler at a cost of 12,000, and is prepared to receive and sample all kinds of rare metal-bearing ores and concentrates. Company does not assay ores nor buy them, but samples the ores for the owners, charging for this service a suitable fee for handling. In connection with the sampler the company has provided a storage warehouse in which lots of ore can be held for a short period, either for the purpose of taking advantage of variations in market quotations or in order to await favorable shipping facilities. This company is probably the pioneer in rare-metal custom sampling. O. Barlow Willmarth is manager.

BELMONT-WAGNER (Ophir)—Recently transported the ten-ton bed plate of a compressor in sections and will rejoin them by the use of oxy-acetylene welding apparatus.

Summit County

TONOPAH PLACERS (Breckenridge)—No. 1 dredge now working through old ground to new Magnum Bonum placer, which, it is expected, will take several years to dredge. No. 2 dredge is working ground leased from Farncombe Hill Gold Dredging Co. Lewisohn interests had a contract to work this ground on royalty basis, and lease was acquired by Tonopah company from them. No. 3 dredge working adjoining ground that belongs to company. Large areas of dredging ground not contiguous are owned, as well as rights of way between them now acquired.

Teller County

BIG TOAD (Cripple Creek)—Mill has been remodeled and has resumed operations.

IDAHO

Bonner County

FALLS CREEK (Sandpoint)—To build concentrator to cost $40,000.

Shoshone County

NABOB CONSOLIDATED (Kellogg)—Hauling ore to railroad. Orebody cut in Nabob raise followed 30 ft. to lower tunnel of the Denver.

JACK WAITE (Union)—To resume shipments. Idle for some time awaiting completion of road. To use motor truck.

KANSAS

Joplin District

MISSISSIPPI QUEEN (Baxter Springs)—To build 250-ton mill and expect to purchase tables, belts, ore cars, crushers, conveyors and compressor. W. H. Berry is manager.

INSPIRATION (Joplin)—Drilling before proceeding with operation of mill.

MICHIGAN

Copper District

SENECA (Calumet)—Shaft sunk to 1080 ft. and progressing rapidly.

FRANKLIN (Demmon)—Averaging 1000 tons per day. Extended work planned at No. 2 if men can be secured.

MOHAWK (Gay)—Turbine installed at mill site. Shaft down 30 ft. and expected to reach limit of 125 ft. in September. When complete, drift will be extended 2000 ft. into lake to provide water for mills.

QUINCY (Hancock)—Rich pocket of mass and stamp copper extends from 65 to 67 level.

ISLE ROYALE (Houghton)—Electric haulage is keeping up daily tonnage.

NEW BALTIC (Houghton)—Shaft sunk 60 ft. below second level.

NORTH LAKE (Houghton)—Operations confined to two exploration openings.

AHMEEK (Kearsarge) — Shipping 90 cars daily and has full quota of men.

WHITE PINE EXTENSION (Kearsarge)—Has pulled pumps which were worked two months after mine closed down.

MICHIGAN (Rockland) — Shipments stopped temporarily owing to water trouble at Winona mill.

MINNESOTA

Cuyuna Range

SULTANA (Ironton)—Washing plant in operation and treating 1900 tons per 24 hours.

Mesabi Range

STATE MINE SHIPMENTS for the week ended Aug. 17 were: Hanna "A" mine; 3010 tons; Helmer, 9917; Leonidas, 18,675; Pool, 1300; Smith, 5850; Deacon, 820; Wacootah, 11,592; Shiras, 1610; Wanless, 2760; Woodbridge, 4730; Frantz, 9360; Thompson, 11,376; Philbin, 9954; Grant, 17,708; Missabe Mountain, 51,024; Hill Annex, 8610, and Majorca, 9880 tons. Total 178,176 tons.

REPUBLIC IRON AND STEEL (Gilbert)—Company planning agricultural exhibit for its Mesabi range employees.

OLIVER (Hibbing)—Contract let to move 60 houses from old town site to new Oliver addition at Alice.

MISSOURI

Joplin District

SHARP & CO. (Aurora)—To build 150-ton mill on Bonanza lease, and will purchase tables, crushers, compressers, drills and conveyors.

STANLEY & CO. (Aurora)—To build 150-ton mill and will purchase tables, boilers and crushers.

UNION (Aurora)—Mill sold and being moved to Hockerville, Oklahoma.

BANKERS (Bell Center)—Contract let to James A. Jeffcott, Joplin, to build 250-ton mill. Need, but have not purchased, boilers, tables, compressors, conveyors and ore cars.

LUCKY GIRL (Carthage)—To build 300-ton mill near Baxter Springs, Kan., and will purchase tables, ore cars, compressors, engine, boilers and conveyors.

SILVER PLUME (Duenweg)—To remodel 200-ton mill, and expect to purchase tables, compressors, ore cars and track. W. H. Logan is superintendent.

JULIAN (Joplin)—To build 150-ton mill and will purchase tables, compressors drills, ore cars and conveyors.

MANSFIELD (Mansfield)—To build 250-ton mill, and expect to purchase tables, crushers, ore cars, conveyors and compressors. J. R. Sandage is superintendent.

BUTLER BROS. (Waco)—To build 250-ton mill at an estimated cost of $65,000. Will purchase crushers, boilers, ore cars, track, tables, compressors, pipe and conveyors.

FRANK DANGLADE (Waco)—To build 250-ton mill, and will purchase tables, crushers, conveyors, compressors, engine boilers and drills

MONTANA

Beaverhead County

BOSTON AND MONTANA DEVELOPMENT (Elkhorn)—To begin shipments upon completion of spur from Divide to the mine. A 500-ton mill is to be built at the mine when material can be shipped in.

Jefferson County

ALTA (Corbin)—New electric plant installed. Pumping water from old workings.

MT. WASHINGTON (Wickes)—Shipping 30 ton of galena ore per day to railway at Wickes.

Lewis and Clark County

HELENA (Helena)—Recently purchased by Cruse Consolidated Mining Co. Crosscutting and drifting on 400 level.

SCRATCH GRAVEL GOLD (Helena)—New vein cut by lessees. Company expects to resume operations.

BALD BUTTE (Marysville)—Shaft on new vein in good-grade gold ore.

Silver Bow County

DAVIS DALY (Butte)—Has cut new vein in Hibernia mine 200 ft. north fissure on 150 level, which shows good ore. To crosscut for new vein on 400 level.

TUOLUMNE COPPER (Butte)—Enlarging of ore bins at Butte Main Range delayed by slow delivery of material.

NEVADA

Churchill County

NEVADA HILLS (Fairview) — Entire equipment to be sold. Material includes 20-stamp mill cyanide plant, hoist and headframe, compressor plant, blacksmith and machine shop, assay office, office and equipment, boarding house and 14 cottages.

NEVADA WONDER (Wonder)—Mill treating 150 tons daily. Some ore being mined on 2000 level. Best ore stoped between 500 and 700 levels.

Esmeralda County

GAILLAC-KUSICK GROUP (Goldfield)—Manganese claims to be developed under lease by Carl Fuetch, of Goldfield.

LONE STAR CONSOLIDATED (Goldfield)—Company refinanced and development to be resumed soon on larger scale. G. B. Hartman is manager.

RED HILL FLORENCE (Goldfield)—Ore from development on 400 and 500 levels awaiting shipment. Crosscut on 400 level has opened new vein.

Lyon County

MINING REVIVAL IN COMO, an old gold-silver camp near Dayton, is under way. Some properties being worked again, and examinations recently made in district.

COMO CONSOLIDATED (Como)—Ten-stamp mill operating steadily on good-grade gold ore.

NEVADA-DOUGLAS (Ludwig) — Shipments from mines to be increased to 300 tons daily at the Ludwig mine. Shaft to be sunk to 900 level.

MASON VALLEY MINES (Thompson)—Ore receipts at Thompson smelting plant for week ended Aug. 21 were: Mason Valley Mines, 1673 tons; Bluestone, 1573; Nevada-Douglas, 958; miscellaneous, 398 tons. Receipts lower than average.

Mineral County

AURORA CONSOLIDATED (Aurora)—In spite of low-grade rock, scarcity of labor and shortness of supplies, mill is handling 400 to 500 tons per day, contrary to report that property had closed down.

Nye County

NORTH STAR (Tonopah)—Ore opened recently on 900 level.

TONOPAH EXTENSION (Tonopah)—Concrete work for new pump installation on 1680 level nearly complete. After pump is installed new headframe will be built, and shaft sinking resumed. Station now being cut on 1750 level.

NEW MEXICO

Grant County

LUCKEY AND McKEEGHAN (Lordsburg)—Opening fluorspar property in Mayflower district of Arizona and making shipments from Duncan, Arizona.

MAPLE AND LISSO SYNDICATE (Lordsburg) — Consolidation of interests operating the following properties: Bounds and Rice, O. T. Phillips, and T. Edwards fluorspar properties, and the Willow Spring, Cap Rock and McKeeghan manganese properties, consisting of 27 claims. J. P. Porteus, is consulting engineer.

OKLAHOMA

Joplin District

UNION (Hockerville)—To remodel 200-ton mill, and expect to purchase tables, compressors and crushers.

AMALGAMATED (Miami) — To build 250-ton mill near Picher and will purchase tables, motors, crushers, conveyors and ore cars. H. T. Huddeston, Webb City, is superintendent.

ATOKO (Miami)—Building 300-ton mill near Bob White lease. Need, but have not purchased, tables, crushers, compressors, drills, ore cars and conveyors. E. W. Applegate is superintendent.

BUCK SHOT (Miami)—To remodel 250-ton mill and expect to purchase tables, belts, conveyors and ore cars.

MOGUL (Miami)—To build 250-ton mill near Picher, and will purchase tables, crushers, compressors, conveyors and ore cars. A. E. Dunlap is superintendent.

ZUNI (Miami)—Sinking shaft east of Leadville in Lincolnville district.

GOLDEN ROD (Picher)—To build two concentration plants, capacity 250-tons. Will purchase crushers, tables, compressors and drills. George Smoyer is superintendent.

CANTON (Quapaw)—Started new mill at old Mission mine after several months' idleness. Otis White is superintendent.

DULUTH-MIAMI (Quapaw)—Shaft in ore. Drifting preparatory to building mill.

SPELTER (Quapaw)—To build 250-ton mill at an estimated cost of $65,000. In the market for crushers, compressors, tables, drills and belts. Whit. M. Grant, Oklahoma City, is manager.

SUMMIT (Quapaw)—Has installed 75 hp. oil engine in shaft to operate pump.

SOUTH DAKOTA

Lawrence County

DEADWOOD LEAD AND ZINC (Deadwood)—Concentrator to be placed in commission this month. Orebody of sufficient size to assure a steady production.

TITANIC (Deadwood)—Contract let to drive 1200 ft. of tunnel, and work has started. New work will explore virgin ground and act as drainage for old workings. Property at one time a large silver producer.

TENNESSEE

Hamilton County

CHATTANOOGA ELECTRO-METALS (Chattanooga)—To manufacture ferrosilicon. Had planned to manufacture ferrochrome, but changed at request of War Industries Board. Company subsidiary of Southern Ferro-Alloys Company.

TEXAS

Brewster County

QUICKSILVER PRODUCERS situated in the Terlingua district are: Chisos, Marfa & Mariposa and Big Bend mines at Terlingua and the W. K. Ellis mine near McKinney Springs.

UTAH

Juab County

EAGLE & BLUE BELL (Eureka)—Work resumed on 200 level to follow continuation of orebodies at higher levels.

TINTIC STANDARD (Eureka)—Main working shaft to be extended below 1300 level, which it has now reached.

COLORADO CONSOLIDATED (Silver City)—Development work being done. Foundations laid for new Ingersoll-Rand 1700 cu. ft. compressor.

Salt Lake County

ALTA TUNNEL & TRANSPORTATION (Alta)—Tunnel in 3500 ft. Increased mineralization and larger flow of water showing.

LITTLE COTTONWOOD TRANSPORTATION (Alta)—Line running between Wasatch and Alta carrying about 175 tons daily.

HOWELLS (Salt Lake)—Boarding house completed and arrangements for winter work being made.

Summit County

PARK CITY SHIPMENTS for the week ended Aug. 31 amounted to 3,301,050 pounds.

PARK CITY KING (Park City)—Main working tunnel in 500 ft.; and mineralization increasing. Thought to be approaching expected orebody.

VERMONT

Lamoille County

AMERICAN MINERAL (Johnson)—Completed installation at hydro-electric mill. Power supplied by Village of Morrisville, over an eight-mile transmission line. Power to be supplied to company's talc mines.

VIRGINIA

Giles County

STANGE (Narrows)—Building mill to handle manganese ore; also camps and railroad tracks. Will purchase 300-ton jaw crusher and 15 four-yard narrow-gage, side-dump cars. O. Stange is superintendent.

WASHINGTON

Okanogan County

JENKINS-HAMMOND (Nespelem) — Completing construction of 100-ton concentrator and flotation plant to treat ores of Great Metals Mining and Milling Co. and the Double Header mines, of Nespelem, Wash. Will also conduct a general milling business for other ores produced in the Moses mining district.

Stevens County

UNITED COPPER (Chewelah)—Has signed three-year contract with Tacoma smeltery. Heavy exchange rate on money one of reasons for ceasing shipments to Trail smeltery.

SPOKANE CONSOLIDATED TUNGSTEN (Loon Lake)—Organized to take over 320 acres belonging to Tungsten King, Blue Grouse and Spokane Tungsten companies. F. E. Parks, Deer Park, Wash., is president. To start 50-ton mill before Sept. 15. Shaft unwatered and down 115 ft. in ore.

ELECTRIC POINT (Northport)—Development of ore on 800 level proceeding. To complete aërial tramway soon.

WISCONSIN

Zinc-Lead District

HERCULES (Cuba City)—Valuable discovery of zinc ore made on the Henry Kettler farm, one mile east of Elmo. Erecting small milling plant. Otto Seemiller and others, of Dubuque, are interested. R. A. Fox is general manager.

LITTLE PLATTE (Platteville)—Completed 50-ton mill on the James Tracey land, six miles west of Platteville. Raymond Piquett is general manager.

VINEGAR HILL ZINC (Platteville)—New Jefferson mill at Hazel Green placed in operation producing zinc concentrates. To sink new shaft on Copeland land at Shullsburg, where ore range has been proved by drilling.

CANADA

Ontario

WHITE RESERVE (Elk Lake)—Has again suspended operations.

MINING CORPORATIOIN (Cobalt)—Has taken over development of Ophir Cobalt Co. under option.

GIROUX CLAIMS (Lorrain)—Have been leased by J. J. Anderson, Gordon Cameron and George Watts, who will mine high-grade ore and ship to Cobalt.

ONTARIO-KIRKLAND (Kirkland Lake)—Plant to be installed and ready for operation by November 1.

MEXICO

Hidalgo

SANTA GERTRUDIS (Pachua)—A 29-year lease has been acquired on three groups of mines by Beneficiadora Mexican Milling Co., a subsidiary. Properties are El Bordo, Malinche and Christo.

PERU

Junin

CERRO DE PASCO (Cerro de Pasco)—August production was 2893 tons of blister copper.

SOUTH AFRICA

Witwatersrand

MEYER & CHARLTON (Doornfontein)—Shaft accident caused death of 21 miners on July 13.

The Market Report

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
5	4.7550	101⅛	49½	9	4.7550	101⅛	49½
6	4.7550	101⅛	49½	10	4.7550	101⅛	49½
7	4.7550	101⅛	49½	11	4.7550	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Sept.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
5	*26	†	8.05	7.75	8⅞@9
6	*26	†	8.05	7.75	9.05@9.15
7	*26	†	8.05	7.75	9.05@9.15
9	*26	†	8.05	7.75	9⅛@9¼
10	*26	†	8.05	7.75	9¼@9½
11	*26	†	8.05	7.75	9⅜@9⅝

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Sept.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
5	122	122	137	349½	349½	29½	28	54
6	122	122	137	347½	347½	29½	28	54
7	...	...	...	...	...	...	...	...
9	122	122	137	343½	343½	29½	28	54
10	122	122	137	343½	343½	29½	28	54
11	122	122	137	343½	343½	29½	28	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29¼ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Sept. 11, 1918

The metal markets have arrived at the stage where there is nothing in the way of price movements to be reported, zinc being the only one of the major metals in which there is now a free and fluctuating market.

Copper—The refinery production in July showed a large increase, which created the feeling that the situation was becoming easier, but it appears that the statistical increase in that month was due to the arrival of an accumulation of Chile copper and certain other abnormal conditions, the total therefore reflecting no real step ahead in the refining situation. According to preliminary estimates, the August production was materially less than the July figures. Of course, the hot weather of August was a retarding factor. The statistics of mine production show a decreasing tendency.

Miners, smelters and refiners are all alarmed over the prospects of further diminution of their working forces by military draft, and will do everything possible to cause their employees to be placed in deferred classes.

Copper Sheets—The base price of copper sheets has been advanced 1c. and is 35¼c. per lb. Copper wire is quoted at 29 and 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Lead—The tightness continues. At the request of the War Industries Board the Lead Producers' Committee has now undertaken the full management of the lead business on the same lines as the Copper Producers' Committee, but in addition thereto is attending to all sales, the several producers having put their supplies in the hands of the committee.

The August production was a trifle larger than that of July. There is understood to be considerable supply of lead in ore and base bullion at the smelteries and refineries, at which congestion, due especially to shortage of labor, is preventing its conversion into refined lead.

The Lead Producers' Committee for War Service issued the following notice under date of Sept. 7, 1918: "Until further notice, retail dealers must limit their prices for virgin, re-melted and scrap lead, to the following amounts in excess of the ruling wholesale price for virgin pig lead, delivered at the same destination: One ton or over, $0.50 per 100 lb. (ex warehouse); less than one ton, $0.75 per 100 lb. (ex warehouse). Dealers are to make no new sales, nor shipments under existing contracts, of virgin pig lead in carload lots. Unless cleared by this committee, no sales for export of retail lots must be made. Retail dealers may be supplied by the producers solely on condition that they govern themselves accordingly, and also that they will endeavor to prevent the use of lead for non-essential work."

Tin—There was very little business, owing to the report that tin buying and distribution are to be handled by the Allied governments through a committee sitting in London. This committee is to comprise two members from the United States, two from Great Britain, and one each from Holland, China and Japan. It is understood that the American members will be Messrs. Hughes and Armsby.

As an index to the market, Chinese and Banka tin were mentioned at somewhere around 77@78c. Singapore quoted £349½, c.i.f., London, on the 5th; £347½ on the 6th; £343½ on the 9th; £341½ on the 10th; £339½ on the 11th.

Zinc—After the decline last week, resulting from free offerings from Western smelters, the market stiffened up very suddenly and very sharply, apparently in anticipation of a large Government order to be placed. Inquiries from France indicated also that that country is desirous of buying American spelter.

Zinc Sheets—Unchanged at $15 per 100 lb. less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—The situation is very strong, and it is nothing but the existence of unsold stocks that prevents the price from rising in this market. We quote spot at 14@14¼c. The Chinese producers complain of their inability to ship antimony here, owing to silver exchange being very high. Unless we can export silver to the East we may not be able to import antimony.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50, $1.75 per pound.

Nickel—Market quotations: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—We quote $125@130, with a stronger tone than last week. San Francisco reports, by telegraph, $118, steady.

Gold, Silver and Platinum

Gold—Notice of new regulations governing the withdrawals of gold bars has been issued by Verne M. Bovie, superintendent of the New York Assay Office. The notice follows new regulations drafted by the Director of the Mint, and provides:

1. Gold bars for use within jurisdiction of the United States may be withdrawn only upon presentation of an industry priority certificate issued by the War Industries Board.
2. Bars intended for exportation may be withdrawn only upon presentation of an exportation license issued by the Federal Reserve Board.
3. In all other cases a special order of the Secretary of the Treasury is necessary.
4. The withdrawal of gold bars against the deposit of gold bullion may continue unrestricted, not being affected by the order.

Silver—Market unchanged, with continued inquiry from abroad for supplies for London and India. Domestic demands have fallen off owing to disposition of silversmiths to purchase more moderately than is usual at this season of the year. Shipments to London for the week ended Sept. 7 were 1,288,000 ounces.

Mexican dollars at New York: Sept. 5, 78; Sept. 6, 78; Sept. 7, 78; Sept. 9, 78; Sept. 10, 78; Sept. 11, 78.

Platinum—According to Washington dispatches, Ray Baker, Director of the Mint, will act as Platinum Administrator. His duty will be to collect all platinum, refine it and deliver it to the War and Navy departments as they require it.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 7.—Blende, per ton, high, $77.50; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $50; calamine, basis 40% zinc, $38@33; Average selling prices: blende, $52.61; calamine, $36; all zinc ores, $51.69.

Lead, high, $105.50; basis 80% lead, $100@102; average selling price, all grades of lead, $100.84 per ton.

Shipments the week: Blende, 12,719; calamine, 670; lead, 1218 tons. Value, all ores the week, $815,980.

Light orders were in the hands of a majority of buyers this week, affording an opportunity to those buying to further reduce the basis price $2.50 per ton, with spelter stronger. Sellers were slow to accept the reduced price, but some had to meet first-of-month accounts and sold. The large shipment is the result of heavy buying two weeks ago, the car situation just bringing relief to shippers.

Platteville, Wis., Sept. 7—Blende, basis 60% zinc, highest settlement price reported $71.25. Base price for premium grade, $75; base price for high-lead blende, $50 to $52.50 per ton. Lead ore, basis 80% lead, $95 per ton. Shipments reported for the week were 2339 tons blende, 84 tons galena, and 703 tons sulphur ore. For the year to date the totals are 89,511 tons blende 5028 tons galena and 33,846 tons sulphur ore. During the week 2511 tons blende were shipped to separating plants.

Other Ores

Chrome Ore—Easier. Ore of 40% grade is quoted nominally at $1.40 per unit, but business was reported at concessions from that price.

Manganese Ore—Unchanged.

Molybdenum—There seems to be a little more inquiry.

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight; but no sulphur imports are being received. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines f.o.b. mines. Unchanged.

Tungsten—The market continues very strong, and high-grade ores are in demand. The low-grade ores are marketed with more or less difficulty. High-grade scheelite has been sold for $25.50 and high-grade wolframite at $24.50 per unit. Low-grade ores have sold for $18 to $24, according to grade and amount of impurity

Iron Trade Review

PITTSBURGH—Sept. 10

The new preference list issued at the beginning of the week by the War Industries Board does not interfere with the preference list which has controlled the distribution of pig-iron and steel products for several months, apart from the material distributed by priorities. The new preference list, with its four classifications, will to an extent govern the distribution of supplies, fuel and transportation to the iron and steel industry, and it will perform the more important function of governing draft boards in decisions as to granting exemptions. Steel plants, as a class, are placed in the first class and blast furnaces in the second, this, perhaps, reflecting the fact that on an average blast-furnace labor is much less skilled than steel-works labor.

The Steel Corporation's unfilled tonnage decreased 124,759 tons in August, this being entirely in line with the showing for several months preceding, except that June had shown an increase, because of the second-half tin-plate contracts having been entered in that month.

The Railroad Administration has called for 60,000 tons of rails per week, this representing work that can hardly be delayed longer, though it is doubtful whether the full tonnage can be furnished, particularly as the demands of the A. E. F. are on a much larger scale than formerly by reason of the line advancing almost daily. The fact that General Pershing desires a hundred thousand 3-inch shells a day furnishes a hint of the amount of material for which it will be desirable to furnish transportation.

Production of both pig iron and steel is increasing, with more favorable weather. Pig-iron production in August was at the rate of about 40,300,000 tons a year, the lowest rate since May, but a new record rate is expected in October if not in this month. August ingot production, in the absence of the monthly ingot report, may be estimated at an annual rate of about 42,000,000 tons. Production of finished rolled steel in the two months was about 6,000,000 net tons, against the War Industries Board's estimate of half-year requirements at not less than 23,000,000 tons, but the last four months of the year ought to show 13,000,000 tons at least, making 19,000,000 tons for the half year, against the board's estimate, conservative for prudential reasons, of 17,000,000 tons.

Pig Iron—There is nothing new in the situation, but it is expected that some furnaces will soon be ordered off foundry iron, ferromanganese and spiegeleisen, and put on bessemer or basic iron, as the steel works are shorter of pig iron than ever. There is no market activity, apart from sales that result through allocation. The market remains quotable at the set limits: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight from the Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less

Steel—There is no soft steel available, and only occasional lots of shell-discard steel, nearly all the latter having found a place in the manufacture of war material. Set prices remain: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys and Coke

Ferroalloys—Both ferromanganese and spiegeleisen are quiet, consumers being evidently fairly well covered, and without the fears as to the future formerly entertained. We quote 70% ferromanganese at $250, delivered with $4 per unit for higher manganese contents and 16% spiegeleisen at $75, furnace.

Coke—No reports come from furnaces as yet regarding improvement in quality of coke as a result of the efforts of the Fuel Administration in the various coke regions. Few furnaces are short of coke, in point of tonnage. Byproduct ovens are adding little to coke stocks, to provide against winter, but conditions may be better when lake shipments are wound up. The market remains quotable at the set limits, for Connellsville: Furnace, $6; foundry, 72-hour selected, $7; crushed, over ¾-in., $7.30 per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1916	New York 1917	New York 1918	London 1916	London 1917	London 1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb	56.755	77.585	85.716	26.975	37.742	42.792
Mar	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740	......	32.584	50.920	......
Oct	67.855	87.332	......	32.361	44.324	......
Nov	71.604	85.891	......	34.192	43.584	......
Dec	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1917	New York Electrolytic 1918	London Standard 1917	London Standard 1918	London Electrolytic 1917	London Electrolytic 1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	......	117.500	......	135.250	......
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York 1917	New York 1918	London 1917	London 1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	......	244.038	......
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(a) No average computed.

Lead	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	......	8.611	......	30.500	......
October	6.710	......	6.650	......	30.500	......
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.373	8.473	8.338	54.000	54.000
August	8.360	8.670	8.190	8.635	54.000	54.000
September	8.136	......	7.966	......	54.000	......
October	7.983	......	7.813	......	54.000	......
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡ 1917	Bessemer‡ 1918	Basic‡ 1917	Basic‡ 1918	No. 2 Foundry 1917	No. 2 Foundry 1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co

STOCK QUOTATIONS

N. Y. EXCH.†	Sept. 10
Alaska Gold M.	2⅞
Alaska Juneau	1⅝
Am.Sm.& Ref.,com.	77
Am. Sm. & Ref., pf.	103
Am. Sm. Sec., pf., A	91½
Am. Zinc	16
Am. Zinc, pf	50
Anaconda	67¼
Batopilas Min	1
Bethlehem Steel	82½
Butte & Superior	25½
Butte Cop. & Zinc	10⅝
Cerro de Pasco	34
Chile Cop	16
Chino	40
Colo. Fuel & Iron	46½
Crucible Steel	65
Crucible Steel, pf.	90½
Dome Mines	9¾
Federal M. & S.	10
Federal M. & S., pf.	38
Great Nor., ore ctf.	31¾
Greene Cananea	45
Gulf States Steel	83
Homestake	75
Inspiration Con.	53
International Nickel	29¼
Kennecott	32¾
Lackawanna Steel	82
Mexican Petrol	102⅝
Miami Copper	28
Nat'l Lead, com.	58½
National Lead, pf.	101¼
Nev. Consol	20⅝
Ontario Min	9
Ray Con	24
Republic I.&S.,com.	89⅞
Republic I. & S., pf.	102
Sloss-Sheffield	60
Tennessee C. & C.	17½
U. S. Steel, com.	109⅜
U. S. Steel, pf.	110¼
Utah Copper	83
Va. Iron C. & C.	71

BOSTON CURB*	Sept. 10
Alaska Mines Corp.	‡.12
Boston Ely	.60
Boston & Mont.	.40
Butte & Lon'n Dev.	.14
Calaveras	1
Chief Con.	3½
Contact	.15
Corbin	10
Cortez	.08
Crown Reserve	.15
Crystal Cop.	.41
Eagle & Blue Bell	2¼
First Nat. Cop.	1⅝
Houghton Copper.	.75
Intermountain	‡.05
Iron Cap	19¼
Mexican Metals	.35
Mines of America	1
Mojave Tungsten	.12
Nat. Zinc & Lead	.15
Nevada-Douglas	.42
New Baltic	.70
New Cornelia	17¼
Oneco	.20
Pacific Mines	‡.35
Rex Cons.	.06
Yukon Gold	.90

SAN FRAN.*	Sept. 3
Alta	.03
Andes	.04
Best & Belcher	.02
Caledonia	.04
Challenge Con.	.03
Confidence	.04
Con. Virginia	.24
Gould & Curry	‡.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.07
Mexican	.16
Occidental	.40
Ophir	.01
Overman	.01
Savage	.03
Sierra Nevada	.11
Union Con	.39
Utah Con	.01
Belmont	2.80
Jim Butler	.52
MacNamara	.31
Midway	.06
Mont.-Tonopah	.10
North Star	.05
Rescue Eula	.10
West End Con.	1.05
Atlanta	.03
Booth	.03
Comb. Frac.	‡.02
Florence	.10
Jumbo Extension	.09
Kewanas	.01
Nevada Hills	.02
Nevada Packard	.26
Round Mountain	.18
Silver Pick	.04
White Caps	.16
Big Jim	‡.75
United Eastern	4.00

COLO. SPRINGS*	Sept. 3
Cresson Con.	4.68¾
Doctor Jack Pot	.03¾
Elkton Con.	.04¾
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.67
Granite	.19
Isabella	.04¼
Mary McKinney	.07
Portland	.80
United Gold M.	.13
Vindicator	.38

BOSTON EXCH.*	Sept. 10
Adventure	‡.60
Ahmeek	78½
Algomah	‡.15
Allouez	50
Ariz. Com., ctfs.	15½
Arnold	‡.20
Bingham Mines	10
Bonanza	‡.16
Butte-Balaklava	‡.25
Calumet & Ariz.	66¾
Calumet & Hecla	450
Centennial	12½
Copper Range	46
Daly West	2½
Davis-Daly	5¼
East Butte	9⅞
Franklin	4⅛
Granby	‡81
Hancock	6
Hedley	‡12
Helvetia	‡.15
Indiana	‡.60
Isle Royale	25½
Keweenaw	‡.87
Lake	‡5¼
La Salle	‡2½
Mason Valley	‡3½
Mass	4⅛
Mayflower	2½
Michigan	‡2½
Mohawk	56
New Arcadian	‡1⅛
New Idria	‡13
North Butte	14
North Lake	.70
Ojibway	‡.65
Old Dominion	‡39½
Osceola	52
Quincy	66¾
St. Mary's M. L.	49
Santa Fe	‡.60
Seneca	12
Shannon	3 7/16
Shattuck-Ariz	‡15½
So. Lake	‡1
So. Utah	‡.16
Superior	‡4¾
Superior & Bost.	3⅛
Trinity	2¾
Tuolumne	‡1
U. S. Smelting	42
U. S. Smelt'g, pf.	43
Utah Apex	1⅞
Utah Con.	10
Utah Metal	1⅞
Victoria	‡2
Winona	‡1¾
Wolverine	23½
Wyandot	.50

N. Y. CURB†	Sept. 10
Big Ledge	11/16
Butte & N. Y.	‡.75
Butte Detroit	.05
Caledonia	.44
Calumet & Jerome	11/16
Can. Cop. Corpn.	1 11/16
Carlisle	‡2
Cashboy	.06
Con. Ariz. Sm.	1½
Con. Coppermines	5¼
Con. Nev.-Utah	‡3/16
Emma Con.	‡.10
Goldfield Con.	.20
Goldfield Merger	.01½
Greenmonster	‡7/16
Hecla Min.	4¾
Howe Sound	‡4⅛
Jerome Verde	‡.50
Louisiana	‡3/16
Magma	28
Majestic	.15
Marsh	.04½
McKinley-Dar-Sa.	.44
Milford	‡.75
Mother Lode	.34
Nixon Nevada	.36
Ohio Cop.	11/16
Rawley	‡2¼
Ray Hercules	4½
Richmond	‡.56
Rochester Mines	.36
St. Joseph Lead	15
Standard S. L.	3/16
Stewart	.14
Success	.12½
Tonopah	2¾
Tonopah Ex.	1½
Tribullion	‡3/16
Troy Arizona	.10
United Cop.	‡3/16
United Verde Ext.	37½
United Zinc	1⅛
Utica Mines	‡.08

TORONTO*	Sept. 10
Adanac	.06
Bailey	.03
Beaver Con	.27
Chambers Ferland	.10
Coniagas	2.50
Hargraves	.03
Kerr Lake	4.62½
La Rose	.37½
Min. Corp. of Can.	2.00
Nipissing	8.75
Peterson Lake	.08
Temiskaming	.29
Wettlaufer-Lor.	‡.03
Davidson	‡.30
Dome Exten.	.14
Dome Lake	.12
Hollinger	4.75
McIntyre	1.37½
Newray	.10
Porcu. Crown	12½
Teck-Hughes	.15
Vipond	12
West Dome	10

* Bid prices. † Closing prices. ‡ Last Quotations.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	4.25	5.52	5.52	6.50	5.495	9.50
No. 12	4.30	5.57	5.57	6.55	5.545	9.55
No. 14	4.35	5.62	5.62	6.60	5.595	9.60
Black						
Nos. 18 and 20	4.80	6.32	6.32	7.40	6.295	9.80
Nos. 22 and 24	4.85	6.37	6.37	7.45	6.345	9.85
No. 26	4.90	6.42	6.43	7.50	6.395	9.90
No. 28	5.00	6.52	6.52	7.60	6.595	10.00
Galvanized:						
No. 10	5.25	6.97	6.97		6.845	
No. 12	5.35	6.97	6.97	7.95	6.795	
No. 14	5.35	6.97	6.97	8.10	6.945	
Nos. 18 and 20	5.65	7.17	7.17	8.25	7.245	11.40
Nos. 22 and 24	5.80	7.32	7.32	8.40	7.295	11.55
No. 26	5.95	7.47	7.47	8.55	7.445	11.70
No. 28	6.25	7.77	7.77	8.85	7.745	12.00

STEEL RAILS—The following quotations are per gross ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$55.00	$38.00	$65.00	$38.00
Standard openhearth rails	57.00	40.00	67.00	40.00
Light rails, 8 to 10 lb	3.13½*	83.00	3.13½*	68.00
Light rails, 12 to 14 lb	3.09*	82.00	3.09*	67.00
Light rails, 25 to 45 lb	3.00*	75.00	3.00*	65.00

* Government price per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, 9/16-in. and larger	$3.90	$5.00	$4.50	$5,30	$6.70
Track bolts	4.90	6.25	5.50	Premium	8.00
Standard section angle bars	....	3.65	4.45	Premium	5.15

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$4.245	$5.25	$4.27	$4.27	$5.25	$5.50
Channels, 3 to 15 in.	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Angles, 3 to 6 in. ¼ in. thick	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Tees, 3 in. and larger	3.00	4.245	5.30	4.27	4.27	2.55	5.50
Plates	3.25	4.495	9.00	4.52	4.52	5.50	6.50

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4.5	$4.50

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
¾-in. and larger	$4.65	$5.65	$7.00	$5.57	$5.55	$7.15	$8.00
CONE HEAD BOILER							
¾ in. and larger	4.75	5.75	7.10	5.67	5.65	7.25	8.00
⅝ and 11/16	4.90	5.90	7.25	5.82	5.80	7.40	8.15
½ and 9/16	5.25	6.25	7.60	6.17	6.05	7.75	8.50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	List + 20%
Galvanized cast steel rigging	Net List
Bright plow steel	30%
Bright cast steel	17½%
Bright iron and iron tiller	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$5.25	$7.50	$6.50	$6.25	$8.00	$7.50
Assorted	5.40	7.50	6.50-7	6.40	8.25	7.75

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh:

Iron bars	3.5c.	Steel bars	2.90c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
$0.12	$0.16	$0.18	$0.18	$0.17	$0.16½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	16c.	14c.	15c.	16c.
Hollow	24c.	25c.	.	..

PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Butt Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	44%	17%	¾ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

Lap Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

Butt Weld. Extra Strong Plain Ends

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

Lap Weld. Extra Strong Plain Heads

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
¾ to 3 in. butt welded	33%	43%	41.9%
3½ to 6 in. lap welded	15%	39%	37.9%

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
¾ to 3 in. butt welded	16%	28%	26.9%
3½ to 6 in. lap welded	3%	25%	23.9%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 5 and 5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$2.50*	List	$1.20	$1.65	$1.05	$3.00
Hot pressed hexagon	2.50*	List	1.00	1.50	.85	3.00
Cold punched square	2.50*	List	.75	1.25	1.00	2.00
Cold punched hexagon	2.50*	List	.75	1.25	1.00	1.60

* List plus

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅜ by 4 in. and smaller	30%	45%	37%
Larger and longer up to 1 in. by 30 in.	15%	37%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York	$2.50	Cleveland	$3.00	Chicago	$2.50

For cast-iron washers the base price per 100 lb. is as follows

New York	$5.00	Cleveland	$4.00	Chicago	$3.50

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tarfelt (14 lb. per square of 100 sq. ft.)	$64	$65
Tar pitch (in 400-lb. bbl.)	21	22
Asphalt pitch (in barrels)	40	45.50
Asphalt felt	72.50	77.20

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.35	$1.60	$1.70	$1.95	$2.05	$2.30
No. 2 grade	1.20	1.45	1.50	1.75	1.80	2.05

Asbestos asphalt-saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.20 per roll in carload lots and $2.45 for smaller quantities.

Shingles, red and green slate finish, cost $5.50 per square in carloads, $5.75 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
Boston	$0.11	$0.15	$0.24
St. Paul	.056	.11	.162
Cincinnati	.07275	.1361	.1834
Chicago	.07	.12	....
Kansas City	.0786	.15	.205
Denver		No quotations	
Seattle	.10	.175	.30
Los Angeles	.074	.139	.213
New Orleans	.15	.19	.29

LUMBER—Price per M in carload lots

	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Y. P.	Fir	Hemlock	Spruce	Y.P.	Fir
Cincinnati	$39.00	$38.00			$43.00	$42.00
Kansas City	38.00	40.50	$40.50	$38.50	43.00	42.50
Seattle	24.50	24.50	24.50	24.50	24.50	24.50
New Orleans	55.00				60.00	....
St. Paul	....	52.00	48.00	48.00		60.00
Denver	35.00	36.50	......	......	...	40.50
Los Angeles	....	40.00			...	45.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y.P.	Fir
Cincinnati	$45.00	...	$41.00	$44.00	$40.00
Kansas City	45.50	$54.75	54.75	52.25	60.00
Seattle	24.50	24.50	24.50	24.50	24.50
New Orleans	49.00	....	.....	65.00	.....
St. Paul	62.50	45.00	43.00	.....	48.50
Denver	35.00	30.75	30.75	...	30.75
Los Angeles	..	35.00		.	.....

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.50	$4.50	$4.75	$4.32	$5.05
Cut	4.00	5.40	....	4.47	6.40

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Current	One Month Ago	One Year Ago
New York	$3.35	$3.20	$2.22
Jersey City	2.99	2.99	2.16
Boston	3.00	2.90	2.77
Chicago	2.45	2.45	2.21
Pittsburgh	2.55	2.85	2.21
Cleveland	2.72	2.32	2.31
Denver	3.07	3.07	....

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.00	$13.50	$2.35	$2.10
Kansas City	22.00	20.00	2.20†	2.10†
Chicago	18.00	17.50	1.80†	1.10†
St. Louis	22.00	16.00	.....	1.75
Boston	21.50	16.50	3.35	3.05
Dallas	16.50	.....	.....	....
San Francisco	20.00	..	.....	2.05
Los Angeles	22.00	.....	18.00(a)	14.50(a)
St. Paul	24.00	18.00	1.50†	1.40†
New Orleans	.....	. .	.....	2.00*
Cincinnati	14.20	. .	13.20(a)	11.95(a)
Denver	.....	26.25‡	.....	2.40†

* 180-lb. barrels. † Per 200-lb. barrel. ‡ 40–50-lb. bags. (a) Per ton.
Note—Refund of 10c. per bag, amounting to $2 per ton.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$1.91	$1.26	$2.10	$1.30	$2.05	$1.20
5-gal. cans	2.01	1.36	2.25	1.40	2.25	1.30

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14.00	14.50	13.25	13.50	14.00	13.00
25- and 50-lb. kegs	14.25	14.75	13.50	13.75	14.25	13.25
12½-lb. keg	14.50	15.00	13.75	14.00	14.50	13.50
5-lb. cans	.....	.....	15.25	15.50	16.00	15.50
1-lb. cans	.....	.....	....	....	17.00	....

MINING AND MILLING SUPPLIES

HOSE—

Fire

	50-Ft. Lengths
Underwriters 2½-in	75c. per ft.
Common, 2½-in.	40%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.60	$0.35	$0.30

Steam—Discounts from List

First grade	25%	Second grade	30%	Third grade	40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	[40+5%]	35%
Chicago	45%	40 + 5%
Birmingham	35%	35%
Denver	40%	30%
Cincinnati	40—10%	40%

RAWHIDE LACING—40–5% off list.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3⅓; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.34½	Denver	$0.35½
New York	.36	Kansas City	.34
Cincinnati	.33¼	San Francisco	.32
Chicago	.35	Seattle	.34
St. Paul	.34	St. Louis	.34

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Chrome brick	net ton	$175.00
Chrome cement	net ton	75.00
Clay brick, 1st quality fireclay	per 1000	50.00—$55.00
Clay brick, 2nd quality	per 1000	35.00— 40.00
Magnesite, raw	ton	30.00— 35.00
Magnesite, calcined	ton	32.00— 35.00
Magnesite, dead burned	net ton	32.00— 35.00
Magnesite brick, 9 x 4½ x 2½ in	net ton	110.00—125.00
Silica brick	per 1000	50.00— 60.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade, $55; St. Louis grade, $40.
Birmingham—Fire clay, $55–60; silica, $55–60.
Chicago—Second quality, $25 per ton.
Denver—Silica, $35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
St. Louis	No. 3 White Oak, plain	$1.45	$0.72
Chicago	Plain	1.26	1.15
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2.70	1.92

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

	Cincinnati	Chicago	St. Louis	Birmingham	Denver
Cup	7	5¼	13.	8½	12½
Fiber or sponge	8	6	13.	8½	20
Transmission	7	6	13.	9	20
Axle	4½	4	4.1	3¾	5¼
Gear	4½	4½	7.0	8	9
Car journal	22 (gal.)	3½	4.3	5¼	8½

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	$0.58	$0.65	$0.30	$0.27
Pure destructively distilled pine oil	.58	.52	.30	.....
Pine tar oil	.35	.34	.24½	.19
Crude turpentine	.45	.60	.44	.38
*Hardwood creosote, sp. gr. 0.96-0.99	.23	....	.34½	.31

* F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	$52.00	$58.00
Chicago	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder*
New York	.....	$0.28½	$0.35½	...	$2.50
Boston	$0.25¾	.28¼	.35¼	.42¾	2.50
Cincinnati	.19¾	.23¾	.29¾	....	2.45
Kansas City	.21½	.27¾	.34¾	.44¾	2.55
Seattle*	.15¼	.22½	.29½	....	2.35
Chicago	.19¾	.23¾	.34	.44	2.45
St. Paul	.20	.27¾	.34¾	....	2.45
St. Louis	.20	.27½	.34½	.44¼	2.35
Denver	.18¾	.26	.33	.43	2.55
Dallas	.24	.31¼	.38¼	.48¼	....
Los Angeles	.23	.29	.37	....	3.05
San Francisco	.19¼†	.26	.33¼	.43¼	2.35

* Price for 100 tons or over.

CHEMICALS

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 44c.; Chicago, .31½c.; St. Louis, 40c.

SODIUM SULPHIDE—In New York the price per pound is 8½c. for concentrated, 4½c. for crystals. The Denver price for 60% is 6 to 10c.; the St. Louis price, 5c. for concentrated; the Chicago price is 7½c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb.; Chicago, 16c.; Denver, 13c. f.o.b. Pueblo; St. Louis, 14½c.

ALUMINUM DUST—Chicago price is $1.65 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drums Per Drum
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo.	124.00	119.00	1.74
West Coast	129.00	124.00	1.81

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THIS IS LIBERTY SPEAKING——
BILLIONS OF DOLLARS ARE NEEDED
AND NEEDED NOW

Engineering and Mining Journal

September 21, 1918

Volume 106

Number 12

BUMALO PIT, HAILE MINE, KERSHAW

HAILE PIT, SHOWING DIABASE DIKE

Pyrite Mining at Kershaw, South Carolina

BY JOEL H. WATKINS*

The old Haile gold mine, at Kershaw, S. C., is being worked by a newly organized company for the production of pyrite ore. The mill has been remodeled and is producing about 25 tons per day of concentrates running 47% S, labor shortage hampering operations. The pyrite ore occurs as lenses in schist and in zones of mineralized schist. Several hundred thousand tons of milling ore has already been proved, and surface indications in unproved ground are excellent.

IN THE last 12 months the attention of every patriotic engineer has been directed toward an increase in domestic production of a group of essential materials popularly known as war minerals. The shortage in these minerals has been due to increased consumption and to decreased imports. Efforts to remedy this condition, which in some instances has become serious, are being concentrated along several lines, and the situation is demanding the coöperation of both the Federal and state geological surveys, as well as the U. S. Bureau of Mines and the War Industries Board. Operating mines are being equipped to handle a greater output; some abandoned mines have been reopened, and a number of undeveloped deposits are being explored. One of the most interesting and promising of recent developments is the conversion of the old Haile gold mine, near Kershaw, S. C., into a pyrite mine.

The Haile gold mine is of historic interest to the engineering profession, as it is the most systematic and successful gold-mining operation, as well as the largest single producer of gold, in the Appalachian region. It was at the Haile mine, also, that Adolph Thies, for many years the manager, invented and established the barrel-chlorination process, which was afterward successfully operated in other parts of the country. Actual mining was begun about 1830, and the mine was operated almost continuously from that time until 1908, when Ernest Thies, then mine manager, was killed by a boiler explosion. The Haile mine has been visited by many geologists and engineers, who may therefore be interested in its present condition.

The rocks of this area are for the most part extremely old volcanic tuffs and porphyry, which have been mashed and recrystallized until they now appear as alternating bands of almost pure sericite and highly siliceous quartz-sericite schists. The strike of these schists varies between 50 and 70° east of north, the dip being from 50 to 65° northwest. These rocks have been cut at about right angles by a series of large and small diabase dikes, though a few small dikes cut the schists at oblique angles. The only other eruptive rock that I saw is a feldspar porphyry exposed in a road about a quarter mile southeast of the Haile pit. The width of this porphyry could not be determined, but it is older than the diabase dikes. It is parallel with the schist, and is slightly mashed.

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*Mining geologist, 200 Fifth Ave., New York.

Overlying the high ground in this area are Cretaceous sands which cover a large part of the country rock. The schists are highly jointed, and some movement has occurred along shear zones parallel with the strike, but only one well-defined fault plane was observed. This fault is vertical and cuts the rocks at the north end of the Bumalo pit in a direction about N 20° E. There seems to have been considerable movement along this fault, and, though the exact direction of the throw has not been determined, it is probably from northeast to northwest. The formations on Red Hill, which is northeast of the fault, do not seem to conform to those worked in the Haile and Bumalo pits, which are on the southwest side, although they are directly in line. It was from these two pits, together with the Beguelin pit, that most of the ore mined by the Haile Gold Mining Co. was taken.

Graton has described the orebodies of the Haile mine as replacement deposits similar in origin to those which occur associated with the older volcanic rocks in other parts of the Appalachian region. Such deposits are more common in the fragmental tuffs, which afford easy passageways for ore-bearing solutions. In the recrystallization of the interbedded volcanic tuffs and porphyry flows under pressure, these rocks have been squeezed into alternating parallel bands of almost pure slaty sericite, and highly silicified schists. Pyritization, which has taken place in both the sericitic and siliceous rocks, is widespread and deep seated.

Some have been led to believe that the presence of intrusive igneous rocks, in the form of large diabase dikes, which cut the schists at right angles to the strike, has played an important part in ore deposition. Though these dikes may have influenced the secondary enrichment of the ore to a limited extent along their contact with the inclosing rocks, the original deposition of the pyrite in the form of disseminated crystals, which has partly replaced the schists over a wide area, is probably much older than the dikes. In the foot walls of the Haile and Bumalo pits, the strike and dip of the schists vary a few degrees from the strike and dip of the original bedding planes of the tuffs. Here the outlines of large and small fragments of tuff are well preserved, and in some places the fragments are completely replaced by pyrite, exhibiting a striking example of selective replacement.

OLD HAILE STAMP MILL, REMODELED BY KERSHAW COMPANY TO PRODUCE PYRITE CONCENTRATES

It is natural to suppose that in an old series of mineralized schists, which have been subjected to the processes of weathering and erosion over a long period of years, descending solutions, which have always kept the weathering well ahead of the erosion, have acted as agents of secondary enrichment in the sulphides. The increase of sulphides with depth, as revealed in a general way by the development work and by the filling in of small crevices and partings along joint planes with pyrite at the depth of 100 ft. below the surface, is strong evidence that there has been secondary enrichment.

ANOTHER VIEW OF KERSHAW COMPANY'S MILL

SCHISTS ALL IMPREGNATED WITH PYRITE

The whole series of schists is more or less impregnated with pyrite, and along some zones this mineral is highly concentrated. Gold, however, seems to favor the more siliceous zones, whereas sulphides are richer in the sericitic zones. In some places, the schists will yield from 25 to 30% sulphur, though wide belts may contain from 15 to 20% sulphur. In a few spots, massive pyrite occurs in lenses around which the schists are folded. These lenses, as far as they have been developed, are short, thick bodies which pinch abruptly both laterally and vertically. Two of these lenses on Red Hill, which were stoped out by A. K. Blakeney, measured roughly 20 x 30 ft. and 18 x 25 ft., respectively, in horizontal section, and pinched out at a depth of about 100 ft. below the surface. Together, they are reported to have yielded 8500 long tons of lump pyrite which carried an average of slightly more than 48% sulphur.

Quartz lenses and stringers which conform roughly to the strike of the schists are frequent, but carry neither gold nor sulphur, except in small quantities. According to Graton,[1] the gold-bearing orebodies are lenticular in form, and are influenced in their positions by the structure of the rocks in which they occur. Their longest horizontal dimension lies in a northeast-southwest direction, and they dip to the northwest. The gold content of these bodies has proved variable, ranging from $2 to $40 per ton. Records of the old workings show that the quantity of gold was larger in the zone of oxidation and decreased steadily with depth in the sulphides. In 1883, the average value of the gold, which was then mined to a depth of 75 ft., is reported to have been $11 per ton; in 1887, it was $6; in 1900, $4; and in 1904, about $3 per ton.

An interesting occurrence of molybdenite with plates of free gold is noted in both the Haile and the Bumalo pits. The molybdenite seems to be concentrated along an almost vertical shear zone parallel with the strike of the schists and shows in highly slickensided faces, upon which thin plates of native gold have been deposited. I also observed small groups of needle-like crystals of rutile, associated with pyrite and inclosed in sericite, and occurring in the northeast end of the Bumalo pit.

As already stated, where the pyrite contents was high, especially in the soft sericitic schists, gold was in general correspondingly low. For this reason, the highly pyritic zones have been avoided, and little mention has been made of them, even as a possible source of pyrite. Recent developments, however, have shown that on Red Hill, on the northeast side of the 192-ft. diabase dike and in line with rocks of the Haile and Bumalo pits, the schists are less siliceous and are highly pyritized. In fact, it is difficult to orient the rocks of Red Hill with those of the Haile pit, and a study of the surface exposures in this area, as stated, leads me to believe that there has been a horizontal displacement of the rocks from northeast to northwest between Red Hill and the Bumalo pit.

Red Hill has been so named on account of the large amount of gossan float in the form of red hematite. The decomposed schists, wherever uncovered, are stained with iron oxide, but the indications of the presence of rocks rich in pyrite are more abundant on Red Hill than elsewhere. Another hill about 400 ft. southeast of the mill also has gossan outcrops, but has not been drilled or developed. North of the reservoir and northwest of Red Hill, a third and similar outcrop, which has not been developed, occurs.

The Haile and Bumalo pits are now about half filled with water, but by using a boat I could examine the walls of the pits just above the water line. In the southeast corner of the Haile pit is a belt of sericite and pyrite, about 20 ft. wide, which will yield about 25% sulphur, and which grades into leaner material on either side. This belt does not appear north of the 32-ft. diabase dike, which cuts the pit about midway. Near the hanging wall in the Bumalo pit is another zone of soft sericite, about 15 ft. wide, which will probably yield about 30% sulphur. Old records of the underground workings show that this last body of ore is about 25 ft. wide at the 200-ft. level and is rich in pyrite.

OFFICE AND MACHINE SHOP, KERSHAW MINING CO., KERSHAW, SOUTH CAROLINA

NEW OREBODIES FOUND ON REOPENING OLD MINE

In the summer of 1915, A. K. Blakeney, a resident of Kershaw, reopened an old shaft on Red Hill which had been sunk to a depth of about 100 ft. on a body of massive pyrite before it was abandoned. As this was about the vertical limit of the pyrite lens, the shaft was not continued below this depth. This mine was operated by Mr. Blakeney continuously from August, 1915, until June, 1917, during which time he stoped out the orebody developed by the shaft as well as another massive pyrite lens which was discovered by crosscutting on the 50-ft. level about 50 ft. to the southeast. As stated, about 8500 tons of pyrite was taken from these two lenses. After the lump ore was worked out, underground development work was continued on the 50-ft. and 100-ft. levels in the hope of striking another lens of massive pyrite. This work, which consisted of about 600 ft. of crosscuts and drifts, did not encounter new lenses, but developed a zone of good milling ore about 130 ft. wide, which has a general northeast-southwest trend and conforms roughly to the strike and dip of the inclosing sericitic schists. During this period, 28 Calyx-drill holes, varying in depth from 75 to 140 ft., were also put down on Red Hill. These holes penetrated some small bodies of lump ore and partly developed another zone of good milling ore about 110 ft. wide, running parallel with the 130-ft. zone developed from the Blakeney shaft and separated from it by about 50 ft. of pure sericite, low in sulphides.

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[1] Graton, L. C. U. S. G. S. Bull. 293, "Gold and Tin Deposits of the Southern Appalachians."

OLD DRILL-HOLE RECORDS AVAILABLE

A Keystone-drill hole, put down on Red Hill by Ernest A. Thies in 1904, was started in the lean zone which separates the two parallel bodies of mill ore, and reached the orebody developed from the Friday shaft about 125 ft. below the surface. From this point to a depth of 275 ft., which is the bottom of the hole, the daily records read as follows:

Aug. 30—Well No. 7, 125 ft.; material harder, with more pyrite; no free gold.

Aug. 31—135 ft.; heavy sulphurets resembling material taken from 60-ft. shaft.

Sept. 1-2—No progress.

Sept. 3—157 ft.; quite heavy in pyrite, but no free gold.

Sept. 5—163 ft.; still quite heavy pyrite; resembles ore, but carries no free gold.

Sept. 6—178 ft.; quite heavy pyrite; hard and soft streaks.

Sept. 7—195 ft.; from 180 to 190 ft., very heavy sulphurets and quite soft; at 195 ft., somewhat harder and not so heavy in pyrite.

Sept. 8—207 ft.; material continues soft and quite heavy in pyrite, at times as high as 50 per cent.

Sept. 9—221 ft.; material continues about the same; soft, heavy sulphurets.

Sept. 10—235 ft.; heavy sulphureted material; same as it has been.

Sept. 12—251 ft.; material is soft and very heavy in pyrite.

Sept. 14—275 ft.; material soft and very heavy in pyrite.

This is as deep as 300-ft. rope will permit. Drill has been moved to place for No. 8 well. It looks very much as if we have here a vein of pyrite material of immense size.

Keystone-drill hole No. 9, situated about 300 yd. southwest of Haile pit, daily records read as follows:

Sept. 22, 1914—23 ft.; very heavy sulphurets; resemble those of No. 5 shaft.

Sept. 23—53 ft.; very heavy sulphurets, but not so hard.

Sept. 24—85 ft.; very heavy, somewhat harder, carrying at least 90% sulphides. If it does not contain any gold and continues heavy in sulphides, it may be of value as a sulphuric acid proposition.

Sept. 26—105 ft.; from 80 ft. on, the material has been very changeable, hard and then soft, but at all times very heavy in sulphurets.

Sept. 27—120 ft.; material is of medium hardness, quite heavy in pyrite.

Calyx-drill hole No. 28, situated between Bumalo pit and 192-ft. diabase dike:

Aug. 26, 1917—Well No. 28, 20 ft.; heavy oxidized material.

Aug. 27—60 ft. deep. From 20 ft. down to 60 ft. very heavy sulphides, with some good bodies of massive pyrite. Material quite soft.

Aug. 28—87 ft. deep. Continues in heavy pyrite, with some lump pyrite. Bottomed at 87 feet.

HAILE PROPERTY TAKEN OVER BY NEW COMPANY

In June, 1917, the Kershaw Mining Co., a close corporation, was organized for the purpose of mining and milling pyrite ore. The new company took over the entire Haile gold-mine property and began development work at once. By this time, the stopes in the Blakeney workings, which were poorly timbered, had caved badly from the surface, leaving two large open pits and crushing the shaft timbers. A new shaft, known as the Friday shaft, was started about 200 ft. south of the Blakeney shaft, from which a crosscut was driven to the southeast at the 80-ft. level for a distance of 100 ft., and to the northwest for a distance of 50 ft. Parallel drifts were driven to the northeast and southwest from the crosscut, making in all, up to this time, about 750 ft. of development work on the 80-ft. level. A crosscut is now being driven from the north end of one of these drifts to connect with the Blakeney workings. All this work has been in the 110-ft. zone, which was partly developed by the Calyx-drill holes. In the new work, several lenses of massive pyrite were encountered, but none of them has as yet proved to be of large dimension. Five raises have been put up from the 80-ft. level to the oxidized zone, and one raise was driven through to the surface. On Red Hill, the zone of oxidation varies from 10 to 30 ft. in thickness, the contact with the underlying schists and sulphides being sharply defined.

CLEANING UP DUMP AT FRIDAY SHAFT, KERSHAW MINING COMPANY

The Haile gold mine, which was operated successfully for such a long period, had accumulated a large amount of equipment, such as boilers, engines, hoists, compressors, stamp batteries, crushers and tables, besides about one mile of light rail, one small saddle-tank locomotive, a number of ore cars, a machine shop and a number of good houses. Much of the material is in good repair and is being used, though a large amount is obsolete and has gone to the scrap heap. The stamp batteries in the old 60-stamp mill have been replaced by jigs, rolls and crushers, the new mill now having a capacity of 300 tons of ore in 24 hours. On account of a labor shortage, however, the mill, which was started on Mar. 18, 1918, has been running only about nine hours out of every 24 since that time.

The mill thus far has been fed entirely with ore taken from the Blakeney shaft and from the Friday shaft in development work, all of the run-of-mine material going to the mill, which has been producing about 25 tons of concentrates in nine hours. The run-of-mine ore from the development work has yielded about 25% pyrite. The sulphur content of the concentrates has been about 47%, and the fines, which are not dusty, are giving entire satisfaction. The pyrite, being disseminated in large and small crystals, separates readily from the soft sericitic schist and makes an ideal mill ore. The sludge from the jigs is recovered in two large settling tanks, from which it passes over four Wilfley tables. Each of these tables is making about one ton of concentrates in nine hours.

An interesting feature of the milling operation is that the overflow from the settling tanks is a finely divided white powder that feels like talc powder. This material represents the sericite in the schist after most of the free silica has been taken out, and is fairly high in potash. The potash, of course, is in the form of a silicate and is insoluble, but the material is a byproduct, and, being extremely finely divided, should be in about the right condition for heat or chemical treatment by some of the potash-extraction processes. When the mill is running 24 hours a day, there will probably be produced from 50 to 75 tons of this finely divided sericite daily. An analysis of these tailings, made in the McCandless Laboratory, of Atlanta, Ga., is as follows: Moisture on air-dried sample, 0.78%; SiO_2, 47.25%; Al_2O_3, 35.30%; K_2O as silicate, 8.52 per cent.

The mine is about three miles from the railroad, but the sand-clay road is good most of the year, and the concentrates are now being hauled with two three-ton trucks. By direct line on an easy grade, a spur connection could be made with the Southern Ry. at Kershaw, which would not be more than two and one-half miles long, but this is not contemplated at present.

MINING BY STEAM SHOVEL PROBABLY BEST FOR THE RED HILL DEPOSITS

All of the development work on Red Hill leads to the conclusion that the most economic way of mining the ore will be by an open-cut method involving stripping and mining with steam shovel, though for the present some ore may be taken from the Friday shaft by millhole operations. The ore is so badly jointed and is of such a greasy talcose character that it has been found dangerous to stope except in limited volume. An open cut has been started over the old Blakeney workings, taking advantage of the two large surface caves, which have carried the overburden to several feet below the zone of oxidation, making an excellent entry for the steam shovel. As the ore varies somewhat in richness within the workable orebodies, open-cut mining will make possible easy selection of the better grades, allowing the low-grade streaks to be sent to the dumps.

Good mill ore now blocked out on the two parallel zones of mineralized schists is estimated to be not less than 300,000 tons. In this estimate no allowance was made for ore below the 100-ft. level, or beyond the horizontal limits of the development work. An additional ore reserve is partly developed in the highly pyritized sericite belts, mentioned previously, in the Haile pit and in the Bumalo pit. This ore is known to reach a depth of more than 250 ft., but has not been sufficiently developed to warrant a fair estimate of tonnage. Besides this, I feel that the ground underlying those heavy gossan outcrops which have not been developed must represent a large tonnage of workable ore.

A significant feature of the work thus far is the fact that all of the material taken from crosscuts and drifts in the Blakeney shaft and the Friday shaft has been sent to the mill without selection, and has yielded about one ton of concentrates to four tons of ore. There is every reason to believe that if care be taken to waste some of the leaner streaks, the ore sent to the mill can be made to average one ton of concentrates to three tons of ore with little additional cost.

So far as is known, there is no other body of pyrite in this country, or certainly in the East, which can be worked profitably from open cut and be made to produce high-grade concentrates. Now that the shortage in pyrite has become critical, the factor of great importance in connection with this mine is that the daily output can be doubled or tripled on short notice.

Novel Method of Making Copper Plate*

As the export of copper from Great Britain was practically prohibited soon after the outbreak of the war, goods manufactured from this metal have become scarce in Rhodesia, and the price has advanced greatly. The difficulty of obtaining copper plates for amalgamation purposes in batteries is an instance. The attention of the Rhodesia Munitions and Resources Committee was called to the shortage in connection with the requirements of a mine which consumes a large number of battery plates per annum. Crushing is conducted in cyanide solution, and a considerable proportion of pulp passing over the plates is coarse, the result being that the plates wear away, partly by attrition but largely by the action of cyanide.

Inquiries showed that one or two small pieces of copper plate had already been produced experimentally at the Falcon mine. These, however, had been made by the ordinary electrolytic refining method, and, on account of the coarse crystalline and striated deposit, would have been unsuitable for battery purposes.

The Falcon company is the only producer of blister copper in Rhodesia, and with its large electric power plant was therefore best able to produce the finished article.

It was considered that the making of the plates on a revolving mandril offered the best prospects of success, and this method was decided on. It was first introduced by the Elmore brothers about 1888 for the making of copper tubes and other hollow copper articles by electrodeposition. In their scheme the mandril, which was the cathode, was revolved in the electrolytic bath, and the smooth dense deposit obtained by agate burnishers traveling slowly backward and forward over the length of the mandril.

The first experiment at the Falcon mine was made with a revolving mandril. Finely ground silica was used in the electrolyte to obtain the necessary skin friction, but the result was not satisfactory. Hide hanging over the mandril was next tried, but with unsatisfactory results.

The third experiment was made on the same principle as the original Elmore process, but, instead of using agate burnishers, an oil-stone was kept traversing to and fro along the mandril.

This was successful, and the first plate was produced at the end of April of this year. The dimensions are 5 ft. x 4 ft. x ⅛ in. thick, which is the size required for the copper plates. The electrolyte is kept in sufficient agitation by the action of the revolving mandril, which is coated with a mixture of stove polish, turpentine and a small quantity of beeswax. This allows the finished copper to be removed from the mandril without difficulty. It is cut longitudinally and rolled flat ready for use.

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*Abstract from 1918 Report of the Rhodesia Munitions and Resources Committee.

Ore Car Designed at Hecla Mine

BY C. T. RICE

A car having a capacity of 82 cu.ft. that can be lowered through a 4 x 5-ft. shaft compartment and pass around a 28-ft. curve on a 24-in. track is described in detail. It can be built with the equipment ordinarily found in the machine shop of a mine large enough to be using train haulage underground and is economical and efficient.

THE best car for train haulage at shaft mines that I have ever seen is the one designed by J. B. Sloan, master mechanic, and C. H. Foreman, engineer, of the Hecla Mining Co., which has now been in use at the Hecla mine, Burke, Idaho, for several months. This car not only has a capacity of 82 cu.ft., and holds approximately 5½ tons of Hecla ore, but is so built that it can readily be taken down a 4 x 5-ft. shaft compartment, and yet will easily go around a 28-ft. curve on a 24-in. track.

The car is of entirely new design. The body, instead of being carried on longitudinal sills with the trucks fastened to the latter, is mounted, so as to lessen the height, directly upon the wheel trucks by means of truck plates. Extraordinary flexibility, though the car is about 10 ft. long and 24-in. gage, is obtained by using a bolster and turntable truck at each end. This, together with the use of 14-in. wheels, makes it possible to keep the top of the car 4 ft. 8 in. from the rails, and prevents the car from being top-heavy. By a slight modification of the truck and the use of 12-in. wheels, the same body is used on an 18-in. track and works equally well.

Owing to the absence of longitudinal sills, the car body is reinforced in several ways to prevent telescoping in case of wreck. This reinforcement comes partly from a 2 x 2 x ⅜-in. angle iron top rim of the body, partly from 1¼-in. bumper rods and 2½ x 2½ x ⅜-in. angle irons riveted to the side plates of the body to carry the hinges of the bottom doors, but mainly from the 3-in. lapping of the top and bottom side plates upon each other about one-third way up the car body.

METHOD OF LOWERING CAR INTO MINE

In lowering the car down a shaft, the body is dismounted from the trucks, which are placed on the cage. Suspended from a yoke by chains, it is then swung under the cage and slowly lowered in that manner. The dismounting of the car body is simple. The cotters are removed from the king pins that hold the trucks and body together, and the body is lifted off. The assembling is almost as easy. When the level is reached, the trucks are properly positioned on the turn sheets, and the car body is swung into place on them as the cage is slowly lowered. By doing away with sills, full advantage is taken of free space in the shaft to obtain car capacity.

The bottom doors of the car, as shown in Fig. 1, are closed by means of chains passing around a ratchet shaft. A quick discharge of ore is obtained by pulling the locking arm and releasing the ratchet wheel. A keep on the chains stops the doors when they are almost flush with the inside faces of the rails. In this way the ore, as it discharges, is kept from getting on the track and causing subsequent derailment.

By using four wheels on each truck and cottering the king pins so that the bolsters have a half-inch vertical play on the turntables of the trucks, enough flexibility is provided between body and truck to make the car ride well even when the track is very uneven. Consequently the car is not easily derailed. This is important, as the car weighs, when loaded, about eight tons, and, when empty, about 2½ tons. But compared to its capacity the dead weight is not large for a mine car intended for train haulage.

In building the car no machining of parts is required, as trucks and bolsters are rough-cast and used in that form, being bolted together with two-ply belting between to insure a tight fit. Moreover, except for the wood blocks that are put between the truck plates and the bumping blocks to act as shock absorbers, all work on the car is ordinary blacksmithing. True, the end plates and the bottom side plates of the car body must be bent to shape, but this is easily accomplished in any shop having power shears, such as the 26-in. Improved Doty, with the aid of a few special tools that I will describe later.

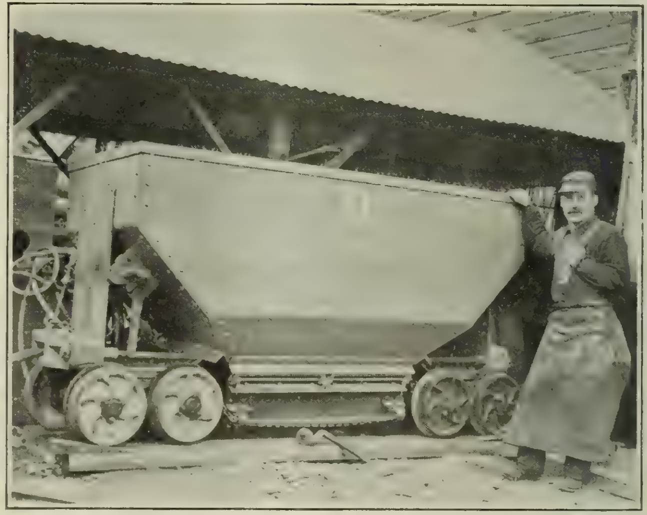

FIG. 1. HECLA ORE CAR—BOTTOM DOOR OPEN

The body of the car is made up mainly of ¼-in. plates. Each end plate is a single piece bent to shape. Each side consists of a bottom and top side plate lapped and riveted together so as to obtain a double thickness for stiffening the car body lengthwise and to enable ordinary sizes of plate to be used. The side and end plates are brought together by means of 3 x 3 x ⅜-in. angle irons. Ninety-degree angle irons are used for fastening the end and top side plates together. Special angles are needed to join the end plates and the bottom-side plates. All rivets are driven hot.

The hinges for carrying the bottom doors are bolted to angle irons riveted to the side plates of the car body near their bottom edge. The doors consist of

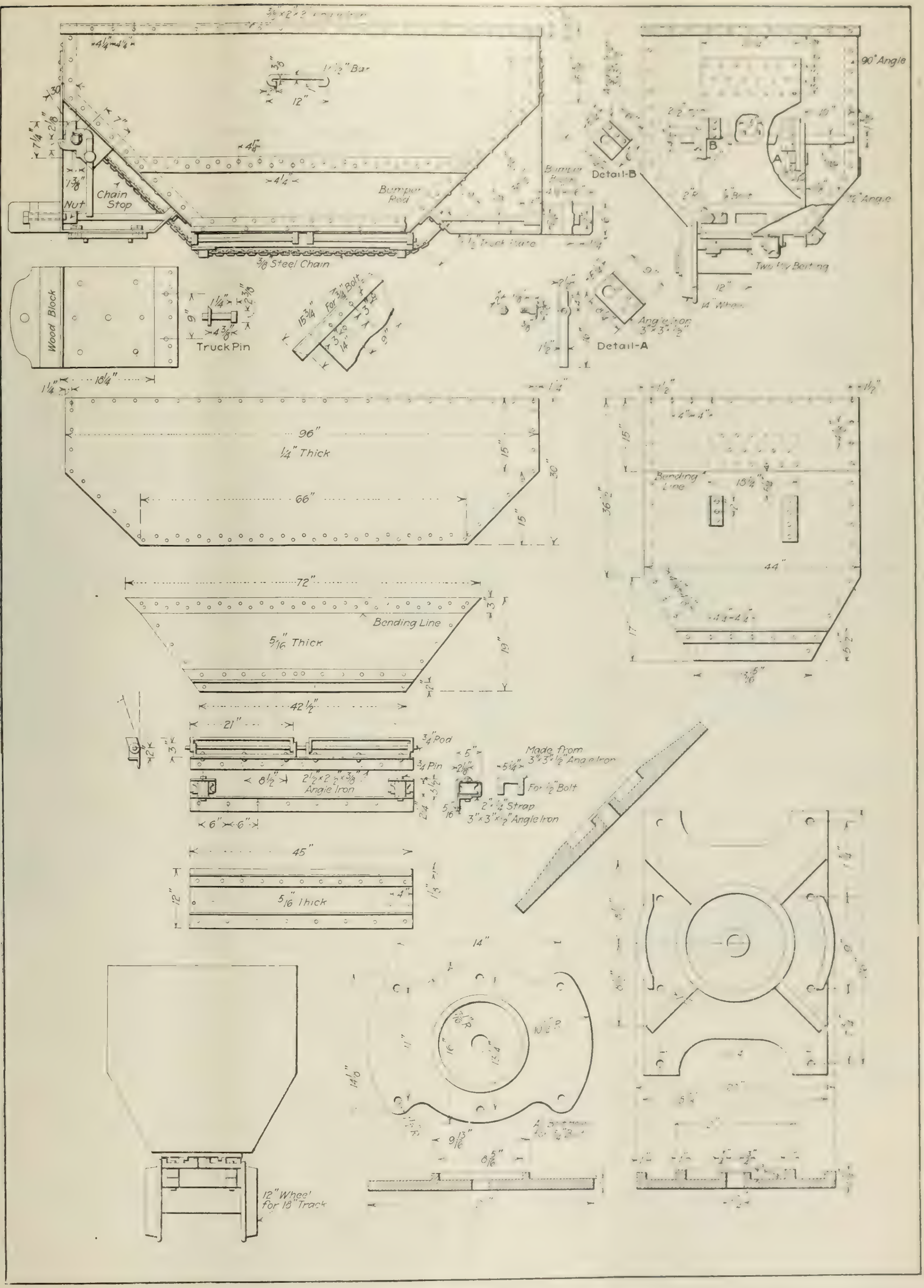

FIG. 2. DETAILS OF ORE CAR DEVELOPED AT THE HECLA MINE, BURKE, IDAHO

The car has a capacity of 82 cu.ft., but can be taken down a 4 x 5-ft. shaft compartment. It will take a 28-ft. curve on a 24-in. track

$\frac{5}{16}$-in. plates reinforced by riveting pieces of angle irons along both edges. The outer piece carries the hinges, and the inner one, with the aid of short lengths of angle iron, as shown in Fig. 1, carries the wheels over which the door chains run. Straps over the wheels hold the chains in position. At one end the chains bolt to the truck plate. At the other they pass through holes in the truck plate and bolt to the chain shaft, which is carried on the end plate.

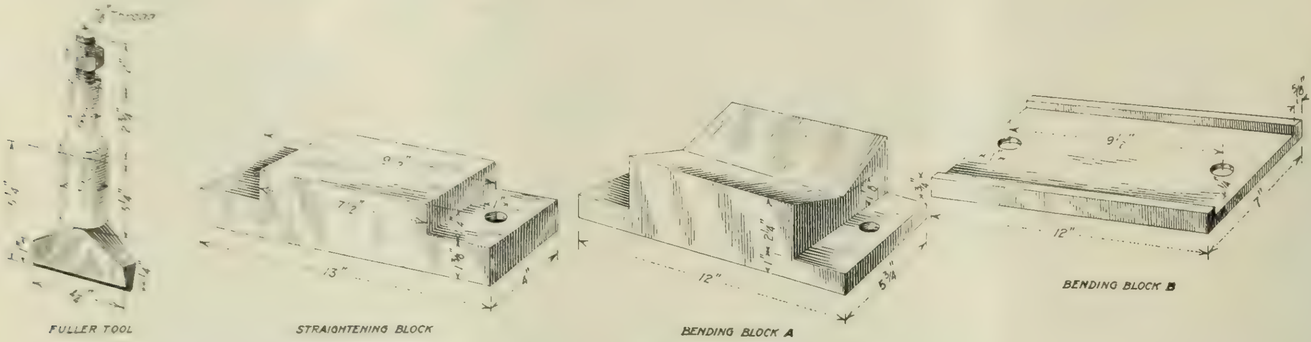

FIG. 3. TOOLS USED FOR BENDING END AND BOTTOM-SIDE PLATES WITH POWER SHEARS EMPLOYED

The only thing to be noted in the design of the turntable truck is that the outer ribs for catching the bolster plate, as well as the king-pin boss, are made ¼ in. lower than the turntable ring. This enables the bolster to rock on the turntable, the king pin being cottered to give ½-in. vertical play between the two plates, just enough to give flexibility between car body and truck, and yet keep the turntable ring of the bolster from jumping out of its seat on the truck.

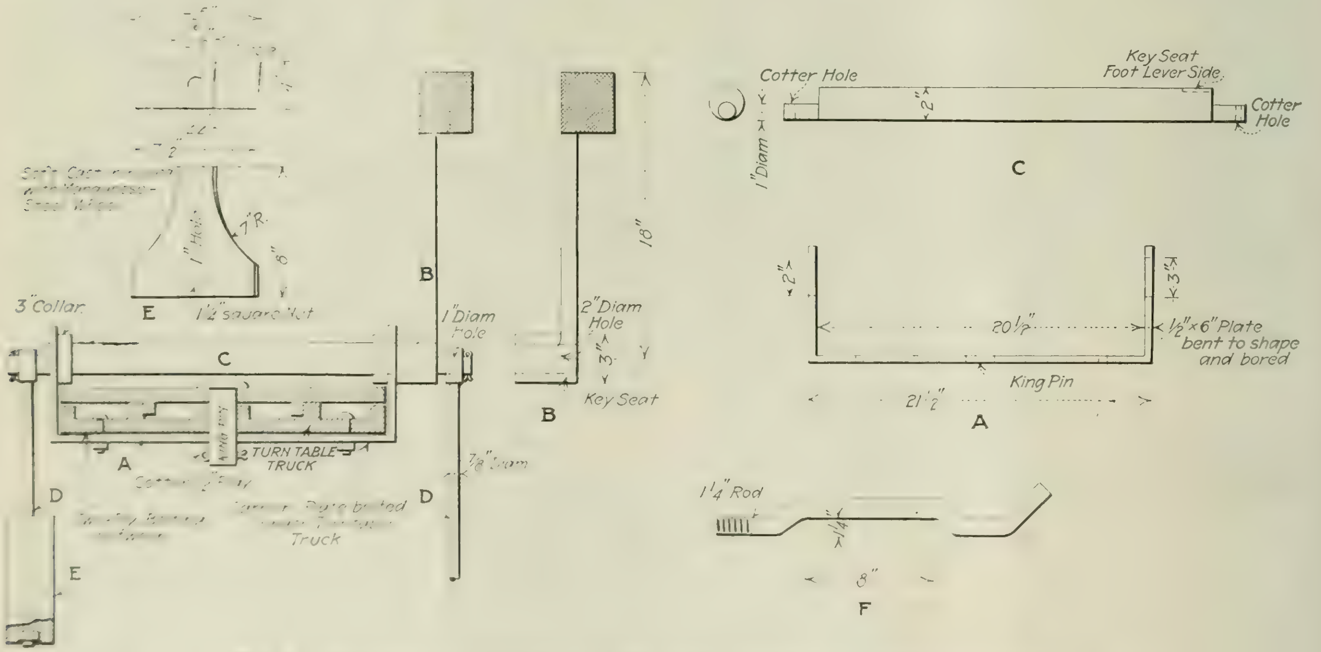

FIG. 4. DETAILS OF SPECIALLY DESIGNED BRAKE FOR HECLA ORE CAR

A—Carrier plate. B—Foot lever. C—Brake shaft. D—Brake rod. E—Brake block. F—Bumper rod on brake car as bent to clear brake shaft

The bolsters of the car shown in the drawing, which is made for a 24-in. track, are bolted crossways to the truck plates. But when the car is to run on an 18-in. track, the bolsters are bolted lengthwise to the truck plates with 2-in. plates between the wheel housings and the turntable plates, and 12-in. wheels are used, their tops coming flush with the top of the trucks. This enables the trucks to swing under the bolsters on sharp turns. Slight recesses for receiving the wheels are also ground in each truck.

The bending of the end and bottom-side plates is done in a 26-in. improved Doty power shears by means of specially designed forming tools that are bolted to its jaws. The fuller tool used is shown in Fig. 3. When bending the plate, this fuller is bolted lengthwise to the upper jaw of shears; on the other hand, when taking out the fluting that develops in the plates while the bend is being formed, it is fastened at right angles to the jaw. In the same cut are shown the bending and straightening blocks, which are used by bolting them to the lower jaw of the shears. As the jaws of the 26-in. Doty shears that are used have a maximum movement of only 1¼ in., the bending block used is made in two parts, *A* and *B*, to make it possible to get sufficient bend in the plates. First the plate is bent as much as it can be, using block *A*, the bending block proper. Then block *B*, the shimming block, is put under block *A* to raise it higher with respect to the jaws, and the desired bend in the plate is finally developed. The first bend in the plate is, of course, carried clear across from side to side before the shimming block is put under block *A*.

In such a makeshift method of bending the plates with the machinery available, a fluting tends to develop in them. This is taken out by replacing the bending block with the straightening block and turning the fuller tool at right angles to its former position. Then the plate is worked back and forth under the jaw, and the fluting worked out. The wings often tend to warp or bend at the point where they overhang the bending block, and this kinking is also worked out of the plate at the same time that the fluting is removed.

Specially Designed Brake Used on Hecla Car

The cars described are run in trains of seven or eight at the Hecla mine. The last car of the train is therefore provided with a brake at its rear end, which is of rather clever design. It consists of a carrier plate *A*, Fig. 4, that bolts under the rear truck with a piece of two-ply belting between. One arm of this carrier plate is bored to receive the 2-in. brake shaft. The other wing is bored to receive the 3-in. collar of the foot lever *B*, which is keyed to the brake shaft *C* in such a way as to be positioned properly for being carried by the carrier plate with minimum overhang. The brake shaft is turned down at each end to form a 1-in. arm, having an eccentricity of ½ in., for carrying the brake rods. As the foot lever is 18 in. long, a strong braking action is obtained. The brake rods *D* are cottered on the eccentric arms of the brake shaft. Each rod screws into a nut carried in a square recess cast in the brake block *E*. These blocks, which are made of soft cast iron to permit a good braking action on the manganese wheels of the car, have two brake faces, so that all four wheels of the truck are braked at the same time. By screwing up the brake rods, wear is taken care of in the brake blocks.

In order to permit the brake truck to swing sufficiently in making turns, the bolster at that end of the car is machined down to 20 in., and the carrier arms are kept as far apart as possible; for as the carrier plate is made of ½-in. iron, little play would be left to the truck on a 24-in. track if the bolster remained full width.

The carrier arms are bored so as to carry the brake shaft just clear of the top face of the truck plate of the car. This necessitates a bending of the bumper rods at that end, as shown at *F* in Fig. 4, so that they will clear the brake shaft. In order to give the truck ample play, this offset in the bumper rods is made 8 in. long.

The advantages of a bottom-dump car, having a capacity of 82 cu.ft., for underground train haulage at shaft mines are so many and so obvious that it is unnecessary to enumerate them. When the car is so simple in its design and construction and is so carried on its trucks that it can go around curves of 28-ft. radius, as is possible with the Hecla car, it will be apparent that an almost ideal car for train haulage has been developed. Moreover, the car runs easily and smoothly, as it is fitted with Taylor-Hyatt roller-bearing axles, and it should find favor at larger shaft mines where electric haulage is employed, as its use will reduce the man-power required to handle the ore, as well as the cost of haulage. At a time of labor shortage such as now confronts the mining industry, this is no small recommendation.

Enemy Technical Periodicals Available

Following the passage of the Trading-with-the-Enemy Act, the enemy publications committee of the American Library Association was granted a license by the War Trade Board, whereby universities, colleges, and public bodies of approved character might secure enemy publications of importance to research in science and scholarship, provided the Department of State approved the method and the Censorship Board sanctioned the admission of such material. Two hundred and fifty-five magazines have been approved by these bodies, and approved institutions may enter subscriptions for any of them through the secretary of the committee of the American Library Association, M. L. Raney, Johns Hopkins University, Baltimore, Md. The list of periodicals of interest to technical men here given is abstracted from the report of the committee:

CHEMISTRY

Annalen der Chemie.
Chemisches Zentralblatt.
Deutsche chemische Gesellschaft, Berichte.
Journal für praktische Chemie.
Kolloid-Zeitschrift.
Zeitschrift für analytische Chemie.
Zeitschrift für angewandte Chemie.
Zeitschrift für anorganische und allgemeine Chemie.
Zeitschrift für physikalische Chemie.

GEOLOGY

Deutsche geologische Gesellschaft, Zeitschrift.
Geologische Rundschau.
Geologisches Zentralblatt.
Internationale Mitteilungen für Bodenkunde.
Internationale Zeitschrift für Metallographie.
Mineralogische und petrographische Mitteilungen.
Neues Jahrbuch für Mineralogie.
Zeitschrift für Gletscherkunde.
Zeitschrift für Krystallographie und Mineralogie.
Zeitschrift für praktische Geologie.
Zeitschrift für Vulkanologie.
Zentralblatt für Mineralogie.

TECHNOLOGY

Archiv. für Eisenbahnwesen.
Archiv. für Elektrotechnik.
Armierter Beton.
Beton und Eisen.
Die chemische Industrie.
Deutsche Bauzeitung.
Dingler's polytechnisches Journal.
Elektrotechnik und Maschinenbau.
Elektrotechnische Zeitschrift.
Ferrum.
Gesundheits-Ingenieur.
Glückauf.
Journal für Gasbeleuchtung.
Metall und Erz.
Der Oelmotor.
Prometheus. Illustrierte Wochenschrift über die fortschritte in Gewerbe, Industrie und Wissenschaft.
Rauch und Staub, Zeitschrift für ihre Bekämpfung.
Stahl und Eisen.
Verein deutscher Ingenieure, Zeitschrift.
Zeitschrift für Architektur- und Ingenieurwesen.
Zeitschrift für Bauwesen.
Zeitschrift für das ges. Turbinwesen.
Zeitschrift für Elektrochemie.
Zeitschrift für Instrumentenkunde.
Zeitschrift für komprimierte und flüssige Gäse.
Zeitschrift für Transportwesen.
Zeitschrift für wissenschaftliche Photographie.
Zentralblatt der Bauverwaltung.

It is impossible to secure these publications through any other source than that above indicated.

Mechanical Screening of Wet Pulp

BY H. E. MEGRAW*

In this paper the author discusses screening and classsifying, draws attention to the desirability of preparing feed for table concentration by direct screening, rather than by any system of hydraulic separation, and outlines the features to be adopted or avoided in design of apparatus.

ALTHOUGH mechanical screening has been practiced for a long time, and the principles involved are by no means new, results have not reached the height of perfection that might have been expected from such an extended experience. There are, it is true, reasonable excuses for such lagging; and, however much one may differ from conclusions reached, the conditions must be recognized.

Screening is, of course, a form of classification. It is the separation of ore or rock particles according to size, in contradistinction to hydraulic classification, which arranges according to the specific gravity. Hydraulic classification has been much more popular during the last few years than screening. This is due largely to the excellence and simplicity of the classifiers, mechanical and purely hydraulic, that have been invented and widely adopted. Hydraulic classification does away with the wear of the screening medium, and, with the simple mechanical arrangements now in use, is a system that can be adopted at an exceedingly low per-ton cost.

Though the applicability of hydraulic classification in certain cases must be recognized, there is also a field for definite particle-size classification. This question has not been investigated to any considerable extent, however, because it has been difficult to induce operators to depart from long-established practice, which is unfortunately more expensive than it ought to be.

There can be no argument about the necessity for coarse screening. The utility of the grizzly, the trommel, and other appliances for classifying ores between steps in breaking and crushing operations is widely recognized and sanctioned; and, in some form or other, such devices are practically universally used. There is little objection to them, because the particles to be separated are comparatively large and correspondingly large apertures must be used; and it is easy to construct the necessary apparatus in so substantial a manner that the wear is small when calculated upon a per-ton basis.

Coarse screening is usually a dry process. It is when the screening of finely divided wet ore pulp is attempted that difficulties arise that lead the operator to prefer hydraulic classification whenever it is possible to substitute that method for screening.

Hydraulic classification separates the particles in a pulp according to their specific gravities—the product is a pulp with particles which fall at approximately the same rate through water, are of approximately equal weight, and may be, and usually are, of widely varying sizes. Though such a product may be admirably suited for some purposes, it is most inappropriate for further separation by gravity concentration, which is designed to separate gangue particles from mineral-bearing particles on the basis of their different rates of falling through a water medium. Of two particles of equal size, that which has the greater specific gravity will fall the more rapidly; of two particles of equal specific gravity, the larger will fall the faster. It follows, then, that a product separated from a run-of-mill pulp by hydraulic classification will consist of particles of various sizes. Mineral-bearing particles of a certain size will be mixed with gangue particles, of much greater size, but falling through water at the same rate as the mineral-bearing particles. Evidently such a product is not well adapted to securing efficient results from gravity concentration, where the particles fed to the same concentrating machine should be of approximately the same size; consequently the mineral-bearing and non-mineral-bearing particles could be sharply separated by taking advantage of their different rates of falling through water. As practically all gravity-concentration appliances depend upon this principle, it is evident that a screen-separated product is better adapted for efficient concentration than a material separated by hydraulic means. This, then, is the reason for screen separation.

CAPACITY OF SCREENS

A point of importance in considering screens and screening machines is capacity, which does not depend in any way upon the machine, its form, or, in general, the manner of its operation. Capacity depends upon the screen-aperture size and the character of the feed, the percentage of oversize and undersize and the dilution being important factors. A screen of given aperture size will have one capacity on feed of a certain class, and an entirely different one upon a different feed. Of course, if the screen becomes blinded, its capacity is reduced, but that is a matter of efficiency, and not of capacity. The tonnage capacity of a screening machine or a unit area of screen surface cannot be stated except in terms of undersize and oversize percentages of pulp of certain dilution and particle-size character.

IDEALS OF SCREEN SEPARATION

Screen separation of finely ground wet pulp has not been an unqualified success, because there are several mechanical defects in the machines that have not been overcome. These have been such that efficient separation is difficult and costly. It has been difficult to prevent screen-aperture blinding, which, beginning with the first application of pulp, gradually increases to such a point that the capacity of the screen is seriously reduced. Attempts to provide means for preventing blinding have led to the utilization of vibrating devices and other schemes for minimizing the lodgment of particles in the screen apertures. These, however, inevitably induce wear and promote the more or less rapid deterioration of the screening medium, or the machine, or both.

Without a discussion of wet-screening appliances in greater detail, it may be possible to outline the ideal characteristics of a perfect screening machine. The rate and manner of feeding the wet pulp to the surface of the screen should be a primary consideration. In the first place, the feed should be delivered gently, to prevent forcing particles into the apertures of the screen, and thus blinding it. This point is disregarded in many screening devices, with results that are detrimental to the maintenance of uniform capacity. The second essential in feeding is the rate, and this is a detail that seems to have received an extremely small amount of study. At any rate, I have never seen a discussion of what I believe to be the only sound theoretical basis.

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It will probably be generally admitted that perfect separation can be obtained only by taking each particle and separating it from the mass, a result that can be approximated by mechanical means. The principle is the delivery of a bed or layer of the material or pulp just one particle thick, on the surface of the screening medium. There must be no piling up of the particles, one above another, because this condition would inevitably obstruct the passage of the undersize through the screen apertures. After depositing the layer of feed one particle thick, which would permit the undersize particles to pass freely through the screen, the oversize must be removed before another layer of feed is delivered to the same screen surface.

In order to appreciate the desirability of the single-particle thickness of bed in feeding screens, it is only necessary to consider the properties of the sand filter, so largely used in the cyanide process, as well as other engineering undertakings, where a clear effluent is desired. A comparatively thin bed of sand will hold back appreciable quantities of slime and find sand. In a similar way, a thick bed of feed to a screen defeats the purpose for which the screen has been designed. A bed one particle thick will permit each particle to move freely—the undersize passing through the screen and the oversize being held upon the screening medium. The oversize must be removed before further feed is delivered, in order to avoid building up a bed, by successive applications of feed, that will act as a filter and retain a proportion of the undersize.

MECHANICAL QUALITIES OF THE SCREENING MACHINE

In order to approximate the theoretical ideal of screening, which has been outlined in the preceding paragraphs, it is necessary, in addition, properly to design the machine so that it will accomplish the desired method of feed delivery and oversize removal, and, in addition, embody simplicity of operation with low cost. The latter includes the cost of the attention required, labor, and also that of repairs and renewals.

To comply with the feeding requirements, it is necessary that the screening machine be so designed that either the feed delivery or the screen surface be movable, so that the rate of feed may be correlated in the proper proportion to the screen surface. In this way the thin bed may be obtained. Then the mechanical arrangement must be such that the oversize may be discharged and the screen surface cleaned before another charge of feed is delivered.

After this has been accomplished, it is essential to assure a low maintenance charge, which means that the wear, both on the machine itself and on the screen, should be reduced to the minimum. It is obvious, of course, that any screening material used for separating finely ground wet pulp will eventually wear out. What must be assured, however, is that the unit cost for screen cloth shall be low enough to compare favorably with the maintenance costs of hydraulic-classifying apparatus.

This is not easy to accomplish. A traveling-belt screen is efficient, so far as actual performance is concerned, but the constant bending leads to breaking of the wires. Particularly with a fine-screen cloth, where the wires are very small, the screen will soon crack or break, making renewal necessary. A traveling screen belt made upon the conveyor-pan system, consisting of a number of units in each of which the screen cloth is stationary (with regard to that particular unit), occasionally performs useful service. In such cases, however, it has been found that the design is complicated, and that the wear on link-belt pins, links, etc., is high, owing to the abrasive character of the sand customarily handled.

Screening machines of the type that require oversize material to slide or roll over the screening surface for considerable distance or for an appreciable length of time are faulty in that this procedure tends to wear out the screen surface. Because of the inherent characteristics of freshly crushed or ground ores, sharp edges predominate in the pulp; and the abrasive quality of an oversize consisting of hard, sharp-edged rock can well be imagined. The ordinary trommel-type machines and inclined screens have this fault, as, in general, have all of those in which oversize discharge is effected by sliding it over the screen cloth to a discharge point.

A third source of wear arises from the shaking, bumping, or vibrating methods sometimes employed with the object of keeping the screen apertures open. Often these alternatives lead to an aggravation of the condition they are designed to avoid. Shaking or bumping may result, rather, in wedging particles of rock firmly in the screen openings. Even when this possibility is reduced to a minimum, such methods decrease the life of the machine and of the screen material. To secure minimum maintenance costs, any movement which leads to damage ought to be eliminated, and this applies with even greater force to cases where exceedingly fine screening media are used to make separations on finely ground wet pulp.

SUMMARY

In summarizing, it is possible to lay down at least a few of the requirements for a satisfactory machine to be used for the fine screening of wet pulp, and features to be avoided. They are: (1) the delivery of a bed of pulp one particle thick to the screening machine; (2) the removal of the oversize before delivery of additional feed; (3) elimination of sliding the oversize on the screen; and (4) elimination of shaking, bumping, or vibrating devices.

There are, of course, other items of convenience or economy, or both, that may be incorporated in a machine to be used for the purposes now under consideration. In such measure as they succeed in promoting screening efficiency and reducing maintenance costs, they will be successful; but they must include, at least in some degree, the essentials discussed in this paper.

Differential Flotation of Lead-Zinc Tailing at a Small Plant

One of the few instances in which differential flotation has been practiced successfully in the United States is at the small plant operated by George Crerar and C. L. Hewitt with an accumulation of lead-zinc tailing impounded years ago at South Fork, between Wallace and Mullan, Idaho. Several attempts had been made to treat the material when flotation was less understood than it is today, but all resulted in failure until Crerar and Hewitt tackled the problem in the summer of 1917.

Approximately 10,000 tons of tailing assaying 5.5% lead, 5.5% zinc and 2 oz. silver per ton had been caught in a pond having an area of about 18,000 sq.ft., but in the years that had intervened since it was first impounded a considerable amount of oxidation had taken place, which added considerably to the difficulty of treating it. It was found, however, that by adding enough sodium sulphide to the feed whenever the material was so oxidized that trouble resulted in flotation, the difficulties were minimized and that the lead and zinc could be saved by differential flotation.

The tailing, 10% of which was plus 48 mesh and 60% minus 200 mesh, is hydraulicked directly to the boot of a small bucket elevator at a dilution of about 6½ to 1, and raised high enough to flow by launder directly to the 8 x 10-ft. equalizing tank which feeds the mill. The pulp is agitated slightly in this tank to keep it in suspension; and at the same time just enough No. 5 G.N.S. pine oil and occasionally a little hardwood creosote are added to give a good stiff froth in the lead machine.

Modified K. & K. Machine Used

The lead-flotation machine used is of the general K. & K. type, but has been divided into five cells, so that the entire feed flows through these in series. The collecting chambers of the machine are equipped with scrapers to take off the top three inches of lead froth, which is carried 14 in. deep in treating this material. Ample stratification of froth is thereby insured. This depth of froth is maintained constant, as the water level in the cells is regulated by means of a gooseneck overflow. A fairly well-defined differential separation of the galena froth on top of the blende froth is obtained, and most of the blende is kept down by choosing the proper oil to lift the galena. Some of the finer blende would lift almost as readily as would the coarser galena particles, so that a proportion of the former would find its way into the lead float; whereas the coarser and less flotable lead had to be left to come up later with the zinc float on the next machine.

Lead Froth Goes to a Deister-Overstrom

The lead froth is broken down with a little No. 5 pine oil and high-pressure water sprays, and then sent, at a dilution of 7 to 1, to a Deister-Overstrom table for cleaning. The tailing from the lead machine is taken by launder to the zinc machine. Enough No. 350 Pensacola and coal-tar oil is added to the pulp in the launder to make a thin, emollient froth in the zinc machine; and a little copper sulphate was also dripped into the pulp to encourage the lifting of the zinc blende.

The zinc machine is of the same general construction as the lead frother, with the exception that the float is permitted to overflow continuously from the five collecting cells, instead of being scraped off (as was done in the lead machine) with the top of the lead froth. This zinc froth is not carried as deep as the lead froth, being purposely made more unstable. Enough water is added at the overflow launder to dilute the zinc concentrate to a consistence of about 7 to 1, and it is then taken to a Deister-Overstrom table to be cleaned. The tailing from the zinc frother, assaying about 1.2% zinc and 1% lead, goes directly to the creek.

Froth Concentrates Cleaned on Deister-Overstrom Tables Suitably Adjusted

Much of the success of the operation, from a commercial standpoint, is due to the fact that the galena and blende could be separated from one another fairly well on the Deister-Overstrom tables by giving them proper slope and by adjusting the speed and character of the stroke. It is impossible to obtain very clean froth concentrates, either of lead or zinc, when raising the float only once.

The lead table is set so that the front end of the table is about ½ in. higher than the feed end, thus forcing the concentrate to travel slightly uphill. The table is run with a short and sharp stroke, and at a high speed, so as to throw the lead ahead of the zinc. Frayed burlap is tacked along the edge of the feed box, to submerge the froth concentrate as it drops on the table. Little trouble has been experienced from floating of the concentrate on the surface of the table water.

At the front of the lead table a fairly broad band of galena, assaying from 70 to 75% lead and 3% zinc, is made. Then a middling streak assays 40% zinc and 10% lead, and the back water of the table carries 30% lead and 12% zinc. The back water and the lead band from the front of the table are settled together in concrete bins near the railroad track, together with the lead band that was taken from the front of the zinc table. The zinc band joins the zinc band from the zinc table and is settled in the zinc bins.

The table taking the froth from the zinc machine is set about level and given a medium-speed, long stroke. From this table a narrow lead band is obtained, assaying 60% lead and 3% zinc, which is sent to the lead bin. The zinc band, which was fairly broad, carries about 35% zinc and 12% lead. The zinc concentrate is granular, and little trouble is experienced in settlement; but the lead concentrate is very slimy and difficult to settle to a reasonably low moisture content suitable for shipment.

Capacity of Plant and Operating Cost

The plant can treat about 90 tons of tailing a day, and produce about 4½ tons of lead concentrate and five tons of zinc concentrate. Water power is used, and two men are needed on each of the three shifts to operate the plant—one to do the hydraulicking at the settling pond, and the other to attend to the flotation machines. The entire cost of treating the pulp was 52c. per ton in 1917. The consumption of oil was, approximately ½ lb. coal-tar oil, ½ lb. No. 5 Pine oil and ½ lb. No. 350 Pensacola per ton of feed. About two pounds of copper sulphate was used per ton of ore treated. The concentrates were shipped to Anaconda, and about $40,000 gross was obtained for them during the year.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

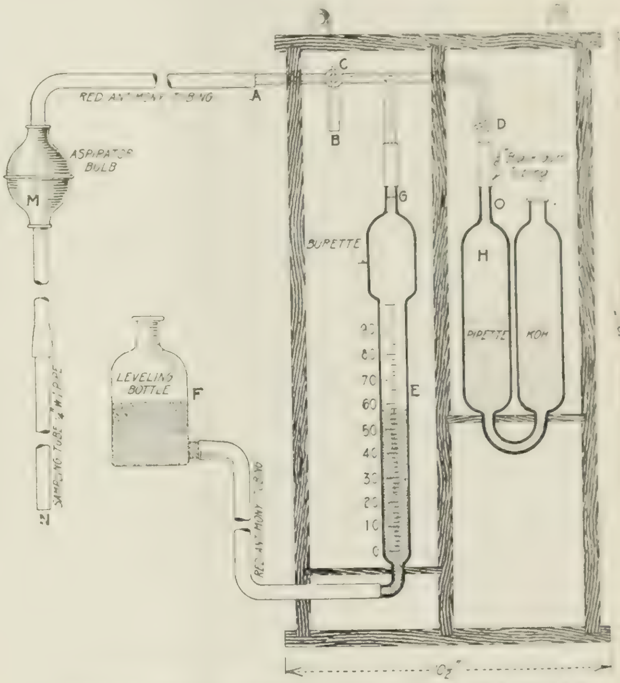
Coal Economy in Mine Boiler Firing*

The question of scientific control of flue gases receives scant attention in the majority of plants. The comparatively few large mining installations have complete organizations for control and research, and engineers who attend to such details; the small mining proposition cannot give the matter the attention it would deserve if operations were being conducted on a large scale; but among the number of medium-sized plants there are many installations where economical firing is little understood and scientific control believed to be an outside consideration. The following account of the underlying principles of fuel combustion and the description of a carbon dioxide recording apparatus should lead to a better realization of the feasibility of closer fuel control.

THE combustion of coal in a furnace is essentially a chemical process. The combustible in coal consists of carbon, hydrogen and sulphur. During the progress of combustion these elements unite with oxygen to form carbon dioxide, steam and sulphur dioxide, respectively. The air, which furnishes the oxygen for this process, consists of a mixture of 21% by volume of oxygen and 79% of nitrogen. Oxygen is the active element as affecting combustion, the nitrogen being inert and taking no part in the process. Every cubic foot of oxygen used in the combustion of carbon is replaced by one cubic foot of carbon dioxide. For this reason, the percentage by volume of CO_2 in the flue gas is an indication of the amount of excess air present in the furnace. A given amount of CO_2 will be formed for every pound of carbon burned. If just enough air is used for the complete combustion of the carbon, the oxygen will be replaced by the CO_2 formed and the latter will be the same percentage, by volume, of the mixture as the original oxygen. If twice as much air as necessary is used, the same volume of CO_2 will be formed as before, but this will replace only one-half of the oxygen used, and hence its percentage of the mixture will be only one-half as great as in the former case. These relations are affected somewhat by the fact that hydrogen and sulphur are present, but their amounts are too small to have an important bearing on the result.

If less than enough air is furnished for complete combustion, part of the carbon in the coal, instead of being burned to carbon dioxide, will form carbon monoxide. Under these circumstances the amount of heat liberated per pound of carbon, instead of being 14,600 B.t.u., will be only 4500 B.t.u. The difference, 10,100 B.t.u., will represent the heat lost for every pound of carbon burned to carbon monoxide.

A study of the amount of carbon dioxide (CO_2) in the flue gases affords the only practical means of obtaining a knowledge of conditions existing within the furnace on the basis of which correction or regulation to obtain the best results may be made. The importance of making CO_2 determinations, therefore, warrants a discussion of the methods by which these determinations may be made. Every plant should be equipped with some form of CO_2 analyzing apparatus, and the fireman or other employee taught to use it. As it is comparatively inexpensive, the outlay will be returned many times by the gain in efficiency and the consequent saving of fuel. For this purpose an Orsat apparatus or some of its modified forms should be used. The complete Orsat apparatus provides a means of analyzing for carbon dioxide, oxygen, and carbon monoxide; but as the CO_2 content gives a sufficiently accurate indication of the amount of excess air passing through the fire, the analysis for the other two gases may be omitted and the apparatus used in its simplest form, as shown in the accompanying illustration. This consists merely of a pipette, *H*, to hold the solution (potassium hydroxide), a measuring burette, *E*, of 100 c.c. capacity, a leveling bottle, *F*, containing water, and an aspirating bulb, *M*. The solution may be made by mixing equal weights of potassium hydroxide (KOH) and water. In the absence of this chemical, concentrated lye may be used.



APPARATUS TO DETERMINE CO_2 IN FLUE GAS

METHOD OF OPERATING THE RECORDER

In using the CO_2 apparatus, the liquid in the pipette, *H*, is first brought to the mark, *O*, just below the cock, *D*. This can be done by lowering the leveling bottle, *F*, after which the cock, *D*, should be closed. The three-way cock, *C*, is then opened to the burette, *E*, and to *B*, and by raising the leveling bottle, *F*, the water in the burette is brought to the mark, *G*, and the cock, *C*, closed to the burette, and opened through *A* and *B*. The aspirating bulb, *M*, is now worked, drawing gas from the sample tube, *N*, in the setting and forcing it out through *B*. When sufficient gas has been forced through to clean out the air and dead gas from the sample tube, the cock,

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*Abstracted from Circular No. 7, April, 1918, issued by the University of Illinois Engineering Experiment Station.

C, is turned so that *B* is closed, and *A* is in communication with the burette, *E*. The sample is then pumped into the burette, thus driving the water into the leveling bottle and more than filling the burette. The leveling bottle is then raised until the water in the burette stands exactly at 100 c.c., the rubber tubing between the leveling bottle and the burette is clamped between the thumb and finger so that no change in the level at 100 c.c. can take place, and the cock, *C*, momentarily opened to the atmosphere, through *B*, and then closed to the burette. If this has been done correctly when the two surfaces, *E* and *F*, are brought to the same level, *E* should stand at 100 c.c. An alternate method of obtaining 100 c.c. at atmospheric pressure is to have the three-way cock open through *A* to *C* and closed to *B*. The gas may now be forced out through the liquid in the leveling bottle, *F*. The water at *F* and *E* may now be brought to the same level and the cock closed to the burette, *E*. The cock, *D*, is now opened and the gas driven into the pipette, *H*, by raising the leveling bottle. It should be driven back and forth between the burette and pipette several times, and then the liquid in the pipette brought back to the mark, *O*, and the cock, *D*, closed. The surfaces, *F* and *E*, are again brought to the same level, and the amount of CO_2 in the gas sample is read from the burette at *E*. This operation is easily performed, and a fireman of ordinary intelligence can analyze a sample in about two minutes.

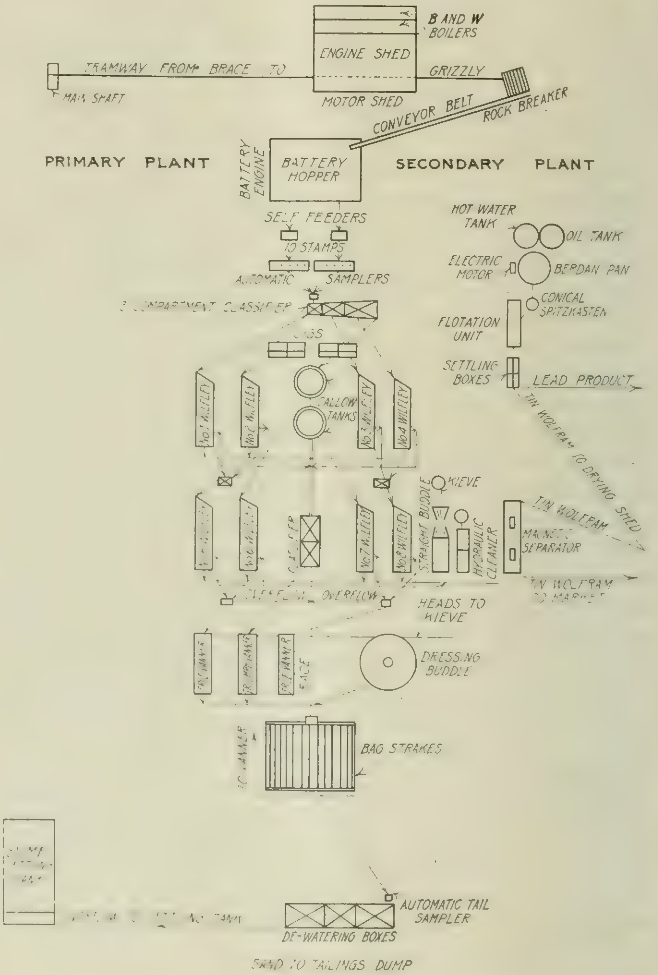
DETAILS TO BE OBSERVED

There are several precautions which should be observed in taking samples. There must be no leaks in the rubber tubing or connections. If air leaks in during the analysis, it invalidates the result. The sole object in making an analysis is to determine what the fire is doing at the time the sample is taken; hence the apparatus should be hung on the setting at a point as near as possible to where the sample is taken, in order to reduce the amount of piping and rubber tubing between the sampling tube and the analyzer, and to insure a sample representative of conditions at the time. If the sample is conveyed through tubes of considerable size and length, as is usually the case with a CO_2 recorder or even with a CO_2 indicator, the analysis is made from 5 to 15 min. after the sample is taken. Thus a hole in the fire may be disclosed by the analyzer 5 or 10 min. after its initial occurrence and even after its disappearance by filling up. The CO_2 recorder, therefore, is useful for giving an idea of the average operation over a long period, but is not satisfactory as a means of determining the proper relation between load, draft, fuel-bed thickness, and other conditions. The determination of such relations involves simultaneous readings.

Tube-Mill Pebbles, Linings and Dimension Blocks are made from a fine-grained, hard quartzite, quarried near Jasper, Minn., and containing, besides quartz, only very small amounts of silicates and a little iron oxide, according to the U. S. Geological Survey. This is worked into cubical or roughly rounded blocks comparing favorably in hardness, toughness, specific gravity and grinding efficiency with imported flints. Use of a full load of such blocks undoubtedly reduces the capacity of a tube mill until the square edges are worn off, subsequent reduction being rather slow. By feeding such blocks in small quantities, they may undoubtedly be used more efficiently.

Triple Concentration Practice For Tin-Wolfram-Lead Ore*

Three methods of concentration—table, flotation, and magnetic—are in use at the Butler mine, near Torrington, N. S. W., where a tin-wolfram-lead ore is being treated. The lode is worked by an adit level 920 ft. long, and also by a main shaft. The deepest point in the workings is 315 ft. from the surface. Payable ore has been opened up above Nos. 1 and 2 levels and at No. 3 intermediate level, 300 ft. A considerable amount of development had been done before the company now operating the mine took over the property and started to erect the plant for the treatment of tin ore. When milling began in July, 1916, it was found that the percentage of lead in the ore made the concentrates unsalable. The average assay of the concentrates was 53% Sn, 12% WO_3 and 5% Pb. In order to overcome the trouble, it was decided to install a Minerals Separation flotation unit for the recovery of the lead, and a magnetic separator to take out the wolfram. The accompanying flow sheet shows the complete course of treatment in the mill.



FLOW SHEET OF TRIPLE CONCENTRATION PLANT AT THE BUTLER MINE

The primary treatment section includes a 10-head battery of 1250-lb. stamps. The crushed ore, after passing the automatic sampler, goes to a three-compartment classifier. The first compartment feeds Nos. 1 and 2 Wilfley tables, the second compartment No. 3 Wilfley, and the third compartment No. 4 Wilfley. The overflow from the classifier goes to two Callow tanks, from which the thickened product is fed to Nos. 5, 6 and 7 Wilfleys. The overflow goes to the setting box and thence to the vanners. The heads from 1 and 2 Wilfley go to hydraulic cleaners, and the heads from 3 to 4 to keeve. The seconds from 1 and 2, also 3 and 4, are re-treated on Nos. 5 and 8 Wilfleys. The heads from Nos. 5, 6, 7, 8 tables go to keeve on buddle, the seconds to vanner, and the tails to race.

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*Abstracted from "Chemical Engineering and Mining Review."

The tails from the race pass into a V-box with 1½-in. opening 3 in. from the bottom for the escape of coarse sands, and the overflow is distributed over bag strakes. The fine material from the strakes is re-treated on the Triumph vanner. Below the strakes the overflow joins the coarse sand discharged from the V-box, before passing through the tail sampler and into the three-compartment dewatering box, thence going to the slime-settling tank. The overflow from the slime tank is returned by pump to the battery feed tank. The extraction given by the wet-concentration plant, Wilfley tables, Frue and Triumph vanners, is 80.0% Sn, 67.7% WO_3, 66.0% Pb. Owing to the high percentage of slime, the result is considered excellent.

In the secondary treatment, after being dressed, the tin-wolfram-lead concentrates are sent to a Minerals Separation flotation unit. The leady concentrates are floated off into settling boxes for subsequent re-treatment, and the tin-wolfram product remaining is dried and treated by magnetic separator. A Berdan pan is installed for regrinding any portion of the leady concentrates considered too coarse for flotation. The flotation unit gives a lead extraction of 98%. The magnetic separator, which is of the motor type, gives a marketable product when working on a fairly coarse tin-wolfram concentrate, but it not comparable to the Wetherill type in dealing with fines, owing to the amount of re-treatment required.

C. Lonsdale Smith is the mine manager, and James Mackay, of Melbourne, is legal manager.

Amalgamation as a Preliminary To Cyaniding*

One of the chief advantages accruing from the practice of milling in cyanide solution is the intimate contact resulting between coarse metal and solvent, caused by the action and operation of the grinding machinery. This advantage shrinks in importance in the case of amalgamable ore when consideration is paid to the fact that milling in cyanide precludes the possibility of the practice of amalgamation, or renders its function only partly effective. If any quantity of the metal in an ore can be obtained by a simple and direct method, an explanation is needed for the substitution of a complicated solution alternative which actually recovers only a proportion.

In the case of gold ores, and in spite of clear enunciations of the actual facts disclosed by milling results, a good deal of misapprehension exists; and the question has been complicated and the issue beclouded by reference to the efficiency of amalgamation with unamalgamable gold ores. Such considerations do not affect the question. If a proportion of the gold in an ore is amalgamable, then practically 100% of this proportion is recoverable. If cyanidation replaces amalgamation as a treatment process for this proportion, then only from 90 to 95% is usually recovered.

The arguments advanced in favor of part amalgamation have, as far as I am aware, been used only as referring to amalgamable gold; and it is therefore untenable to claim that this gold may not amalgamate. In special but exceptional cases the recovery of gold by cyanidation may reach 97%, but in no single instance has a recovery of 100% been recorded with any professional claim to verisimilitude. These facts may be substantiated by milling barren material similar in physical characteristics to the ore usually found in gold-treatment plants, and mixing with this a proportion of coarse gold recovered by the amalgamation process. No matter how fine the ultimate division of the mixture, there will remain a small percentage of the original amount of gold, associated with the gangue, after complete milling in cyanide and filtration treatment on a working scale.

A second method of beclouding the issue is to draw attention to the total amount of gold dissolved or extracted by cyanide and to ignore the question of recovery. Finely divided gold may be completely dissolved in a cyanide solution, and thus completely extracted from the ore; but when associated with gangue as an average grade material, such extracted gold cannot be completely recovered by any combination of known metallurgical processes operating on a working scale. All or nearly all the gold may be dissolved and a high percentage may be recovered as bullion. The loss of the balance influences the contention in favor of efficient amalgamation of gold ores.

Negligence in Blasting Operations

By A. L. H. Street*

Under the general rule of law that an employer is bound to provide his workmen with reasonably safe places in which to work, considering the inherent dangers incident to the work carried on, the South Dakota Supreme Court holds in the recent case of Peterson *vs.* Otho Development Co., (*166 Northwestern Reporter, 147*), that failure to furnish reasonably good fuses for blasting operations, thereby increasing the danger of shots remaining unexploded and of miners afterward accidentally exploding them, may be found to be actionable negligence which renders the mine owner liable for resulting injuries. But the same opinion holds that, under the laws of South Dakota, any such negligence is wiped out as a ground for a personal-injury action when it appears that the injured miner was experienced, and voluntarily remained at work with full knowledge that fuses used were poor and that there had been many misfires in the mine. Under such circumstances, the miner is held to have assumed the risk thus voluntarily encountered.

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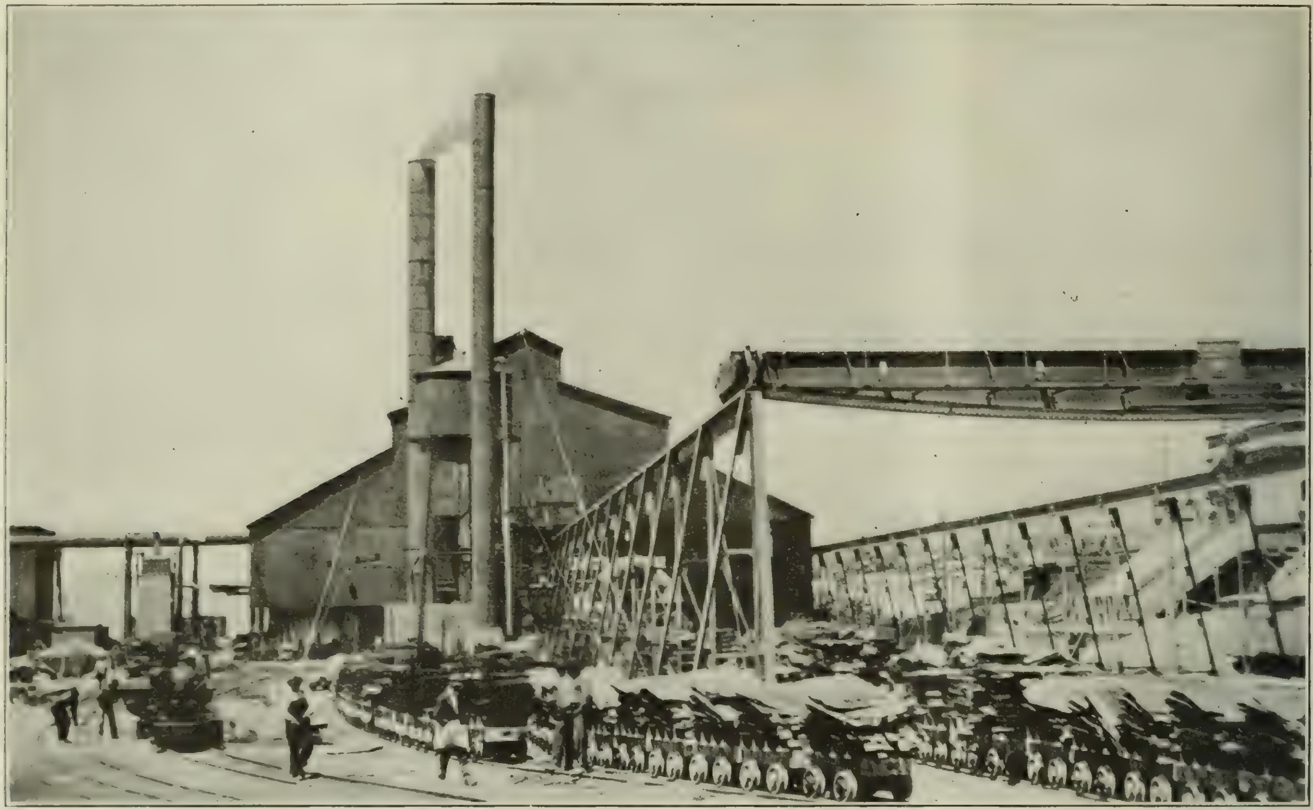
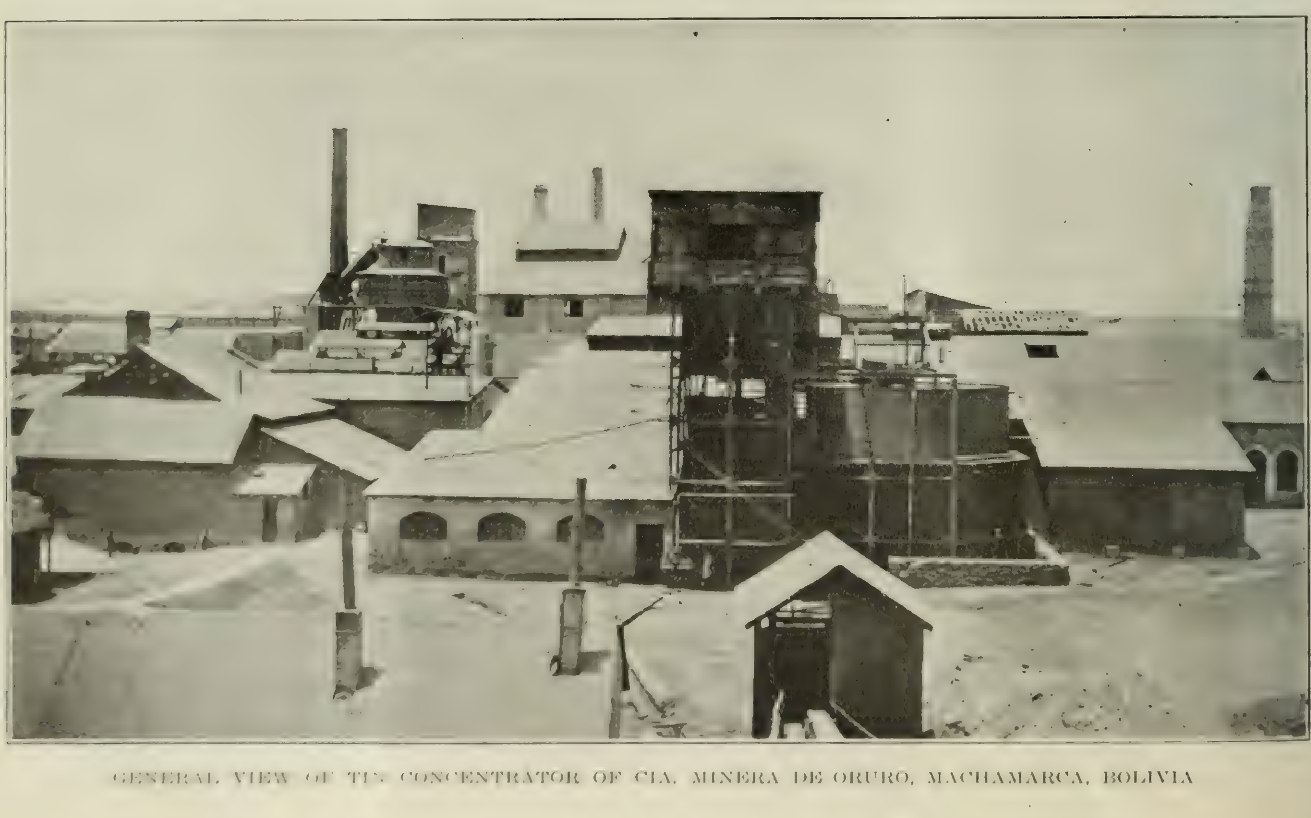
*Excerpt from an article on "Milling in Cyanide Solution," by A. W. Allen, Met. and Chem. Eng., May 15, 1918.

*Attorney at law, 820 Security Bldg., Minneapolis, Minnesota.

Cottrell Precipitation in South America

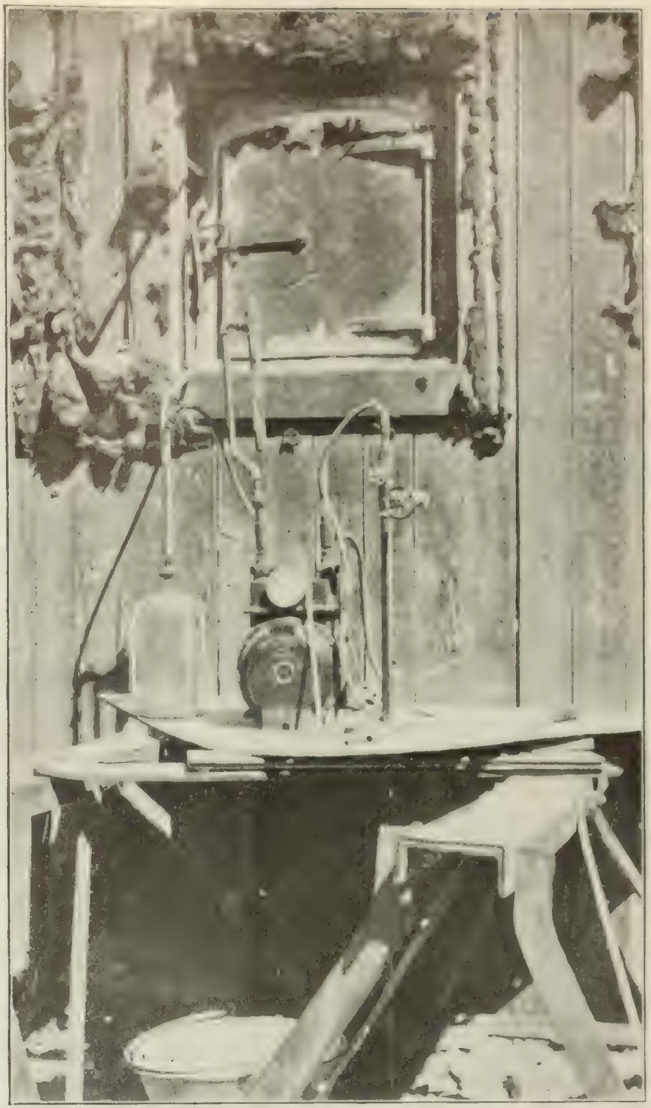


PRECIPITATION PLANT OF CHILE EXPLORATION CO. AT CHUQUICAMATA, CHILE, SHOWING STACK AND FUME

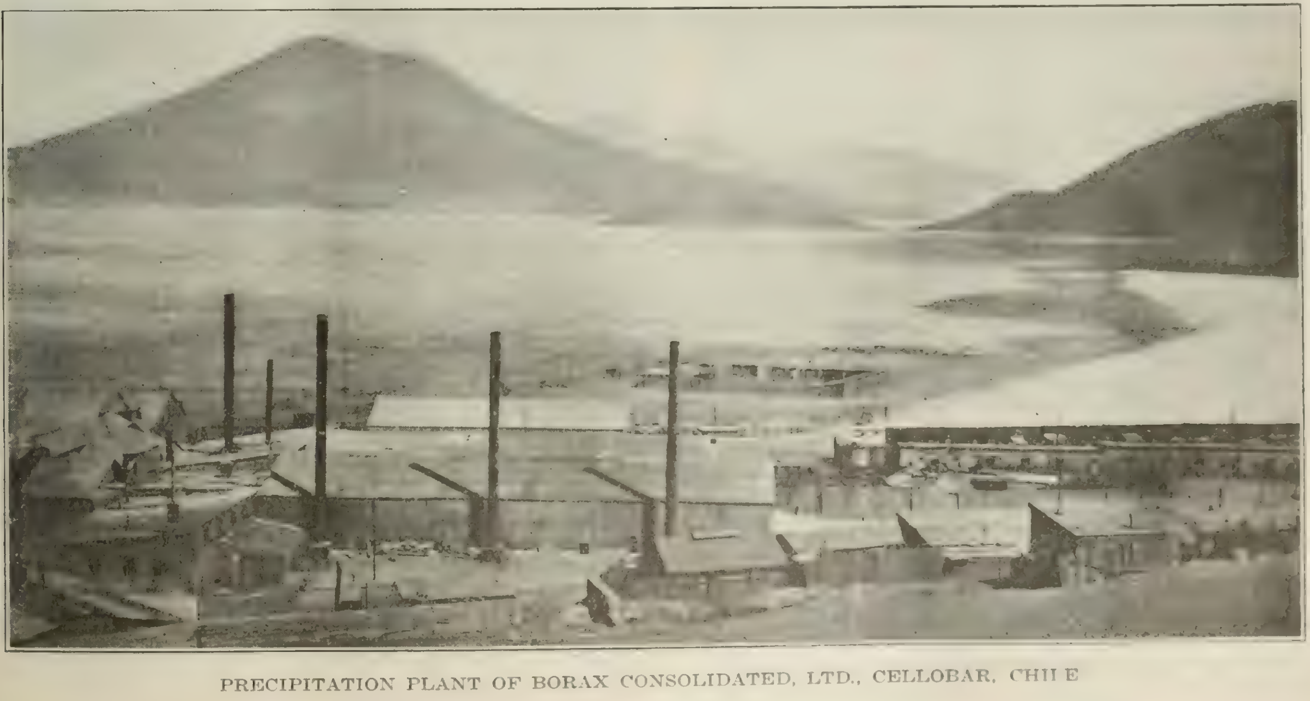


GENERAL VIEW OF THE CONCENTRATOR OF CIA. MINERA DE ORURO, MACHAMARCA, BOLIVIA

TESTING REVERBERATORY STACK GASES AT CIA. MINERA DE ORURO, MACHAMARCA, BOLIVIA



DUST DETERMINATIONS AT DUST CHAMBER, BORAX CONSOLIDATED, LTD., CELLOBAR, CHILE



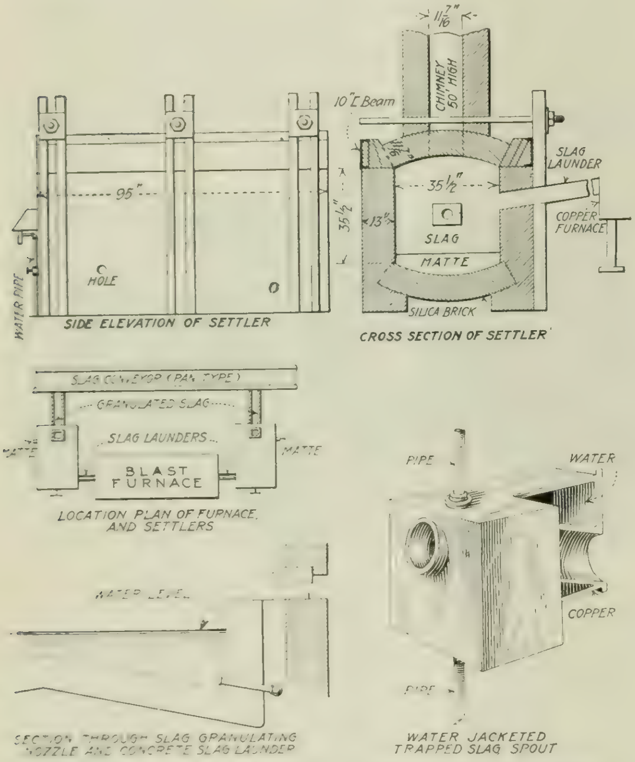
PRECIPITATION PLANT OF BORAX CONSOLIDATED, LTD., CELLOBAR, CHILE

Reverberatory Fore-Hearths

By Lindsay Duncan[*]

The copper ores treated in the blast furnaces of the smeltery of the Compagnie du Boleo at Puerto Santa Rosalia, Mexico, are exceedingly refractory, running high in silica and alumina and low in iron and sulphur. Furthermore, no fluxing ores are available at reasonable cost, nor have the company's engineers been able to discover any barren flux within a convenient distance from the plant. These conditions were partly overcome by maintaining a narrow smelting zone in the furnaces and a high temperature (1500° C.) of the slag.

The cuprous products are mattte containing 62% copper and black copper assaying about 96%. It was inevitable that slag losses under these conditions should be high, as particles of matte were entrained in the viscous slag. Settlers of the ordinary type were of little use, on account of the high temperature at which the slag solidified. At times the copper in the slag ran higher than 2%, and the general run was between 1.2% and 1.8%, with an average, over a considerable period, of 1.35%. It occurred to me that it would be possible to build a settler in the form of a small reverberatory, and extract a considerable part of the copper which was entrained in the slag in the form of matte and black copper globules.



SIDE ELEVATION OF SETTLER

CROSS SECTION OF SETTLER

LOCATION PLAN OF FURNACE AND SETTLERS

SECTION THROUGH SLAG GRANULATING NOZZLE AND CONCRETE SLAG LAUNDER

WATER JACKETED TRAPPED SLAG SPOUT

DETAILS OF REVERBERATORY FORE-HEARTHS

The installation was absurdly simple and resulted in reducing the copper content of the slag to 0.9%, with a metal recovery of between 5000 and 6000 lb. of copper per day for the entire plant. The fuel oil consumed was insignificant in amount, and no additional labor was required. The slag flowed continuously from the furnace through a trapped water-jacketed outlet made of cast copper and was led through a cast-iron launder directly into the settler.

Under good conditions the furnaces handled 250 tons of charge per day and made 180 tons of slag in that period. There were two slag spouts, one at each end of the furnace; and a settler was built at each end to handle 90 tons of slag per day, or 3.75 tons per hour. The molten slag weighed about 80 lb. per cu.ft. The settlers were designed to contain $\frac{9}{10}$ ton of slag, giving an average settling period of about 15 min. A water-jacketed orifice was built into the settler, and the slag flowed continually from the settler into the granulating launder. The matte recovered was dirty, and it was necessary to recharge it into the blast furnaces.

A diagram of the general arrangement of the plant is reproduced, together with details of the settler, slag granulating nozzle and water-jacketed slag spout.

New 7000-Ft. Shaft for a Transvaal Mine

The question of the best method of working the lowest portion of the City Deep mine, a considerable area at 6000 ft. or more, has received careful consideration by the technical advisers and by the board, stated the chairman at the recent annual meeting. There are two methods—the first to develop the area by continuation of the present inclines, and the second to sink a new vertical shaft from the surface in the southern portion of the property. Experience has shown that the sinking, equipment and operation of long incline shafts at great depths are extremely expensive; in fact, there is doubt as to the practicability of keeping a large incline shaft open at a depth of 6000 ft. or thereabouts. The problem of ventilation is difficult of solution, and, further, it would be extremely difficult—probably impossible—to get a sufficient volume of air through the incline to the lowest workings of the mine to keep the temperature down satisfactorily. It would be necessary, to achieve this essential object, to have direct communication to the surface. The incline shafts are designed to work to a depth of 3500 ft. on the incline—that is, at No. 2 shaft to the 21st level, and at No. 1 shaft to the 24th level, leaving in each case a further length of about 3000 ft. on the dip to reach the southern boundary.

It has been decided that, on the score of both cost and efficiency, a new circular shaft from the surface is the best method of dealing with the problem. The cost of sinking and temporary equipment is estimated at £239,000; and for permanent equipment for a large tonnage a further £192,000 would be required. The exact depth of the shaft cannot be estimated until the reef is intersected, but provision will be made to reach a depth of 7000 ft. if necessary. The time required for sinking the shaft will be about five years, and another two years beyond that will be necessary for development connections—that is, a period of seven years will elapse before stoping operations can be started. Any attempt effectively to develop this southern area with the present inclines would fail. The slowness of incline-shaft sinking, and its eventual expense; the cost of added equipment underground for the rehandling of the ore; the heavy maintenance costs of the shafts at depth, and the ventilation difficulty are all factors which, combined, point to the distinct advantage of a new vertical shaft from the surface.

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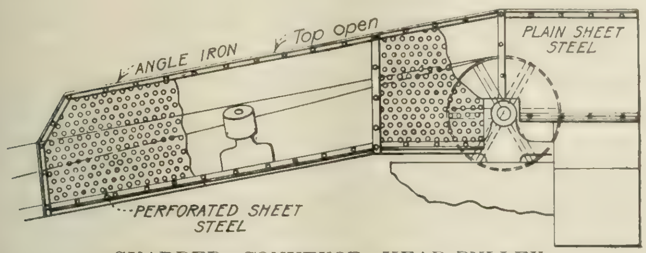
[*] Mechanical engineer, Nevada Consolidated Copper Co., McGill, Nevada

Conveyor Pulley Guards

By George M. Douglass[*]

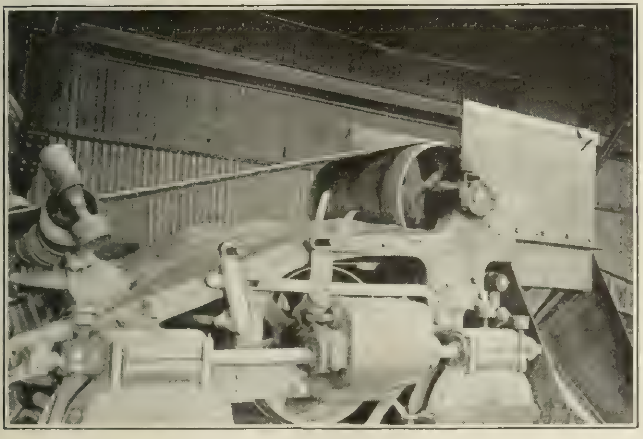
Conveyor-belt head pulleys and trippers should always be carefully protected. An unguarded intake or point of contact between pulley and belt is a menace to life and limb of not only the ignorant workman but of those who are considered expert and familiar with their work. It is not that a workman places his hand or any other part of his body near these danger points knowingly or purposely. He may be so intent on his work that he is oblivious to any danger. He may stumble; and it is common knowledge that when a person stumbles he invariably and involuntarily throws out his arms to protect himself, often with disastrous results.



GUARDED CONVEYOR HEAD PULLEY

It is well to cover the surface of head pulleys with a layer of rubber or leather belting, securely riveted, especially where there may be possibility of slippage. When the belt slips on the head pulley there is something wrong with the design, or the belt is being improperly fed or loaded.

It is a simple matter to guard such a danger point. There is seldom any condition, restricted space, for example, that would interfere, but this cannot always be the case when it comes to the guarding of drives for conveyor belts. Often these seem to be put in as an afterthought and jammed into as small a space as possible, which may create an unsafe or dangerous condition. Plans should be laid out in such a way that there will be ample room for attendants to get at every part in perfect safety; and this can be accomplished only when plenty of room is allowed. A simple and efficient type of conveyer pulley guard is shown in the accompanying cut. The halftone illustrates an unguarded and dangerous tripper.



UNGUARDED TRIPPER

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[*] General safety inspector, American Smelting and Refining Co., 120 Broadway, New York.

Madagascar Graphite Exports

Shipments of graphite from Madagascar to France are now prohibited, except on notice to the contrary, and inasmuch as there is no indication that they may be resumed soon, considerable anxiety is felt in graphite-mining circles, says a consular report. Practically no purchases or new contracts are being made, and mining operations are being greatly curtailed.

Several weeks ago it was officially stated that 2000 tons of graphite per month would be needed for the national defence before the quantities for direct exportation to the United States could be considered. Subsequently, the restriction in the importation of graphite into the United States was announced in Madagascar. This has had a discouraging effect upon the local industry, inasmuch as it had been expected for some time that the prohibition of the direct shipment of graphite to America would be raised.

Although it would not appear that any authorization for the exportation of graphite to the United States has yet been given, the governor general states that of the 2000 tons of this mineral to be reserved monthly, 1450 tons is intended for England, to be shipped by the Graphites Maskar Co., affiliated with the Morgan Crucible Co., of London, and the remainder is to be shipped to Marseilles. He also advises that requests for shipment to the United States will receive, as far as the quantities are available, favorable consideration from the French Ministry of Armaments, provided such requests are sustained by the War Trade Board.

The estimated production of graphite in Madagascar in 1917 was 35,000 tons, and the exports amounted to 27,838 tons, of which 16,506 went to England and 11,332 tons to France. Although no direct shipments have been permitted to go forward to the United States, it is understood that 8000 tons reached that country from Marseilles in 1917, and a considerable quantity has also been shipped from that port during the present year, principally through a consortium of French firms which, up until now, has controlled the bulk of the output of Madagascar graphite other than that shipped to England. Inasmuch as the French firms belonging to this consortium are represented in Madagascar, it is not unlikely that they will endeavor to control such graphite as may be now shipped to the United States direct from the island, though it would appear that various independent producers are endeavoring to form direct connections with the American importers.

The present state of the industry does not warrant the belief that large quantities of the 1918 production of graphite will be available for shipment to the United States. On the other hand, 10,000 or 15,000 tons of graphite is said to be available in the colony from the 1917 production, and may be exported to America. If the French authorities continue, for any considerable time, to prohibit the exportation of graphite to France, and release the 550 tons per month said now to be reserved for that country, the quantity available for exportation to the United States will be even greater, provided that there is a demand for it in the United States and that licenses may be obtained for its importation. Direct shipments continue to go forward to England at the rate of about 1500 tons per month, and this rate will no doubt be maintained.

Correspondence and Discussion

Recent Developments in the Chilean Nitrate Industry

Since the autumn of 1917 important events have occurred with regard to the production and marketing of nitrate. The price of oil has continued to rise, so that users have been looking to the possibility of burning Chilean coal. The selling price of nitrate rose likewise, which developed a local "bull" market. This quickly carried the price to impossible figures; and the Allied governments decided to centralize their purchases by means of one agency in Chile. The effect was instantaneous in reducing the price. The "bull" contingent was demoralized, and the head of it, a wealthy Chilean, was badly hit financially.

Production cost and selling price have been coming nearer; in the case of some nitrate plants they are identical. This is due to the high cost of supplies. The exchange ratio of the Chilean peso in terms of foreign money during the last year has greatly increased, so that costs of labor and local supplies are liquidated in Chilean currency, purchased by drafts on London, for example, at a serious discount. Those oficinas which are not prepared to meet the situation by technical improvements and greater general economy are now faced with the prospect of closing their plants, if conditions do not soon change.

During the last winter an interesting transaction took place in Chile whereby a large tonnage of refined nitrate was sold, involving the Chilean government, the du Pont powder company (through its Chilean branch, the du Pont Nitrate Co.), the German government, and the Allied governments. In 1914, Chile had a reserve of gold in Germany, and after the war broke out was unable to obtain its release until recently, when Chile arranged to purchase the stock of accumulated nitrate in the idle German oficinas, paying for this by means of the gold in Germany. This nitrate was then resold to the du Ponts for use in making munitions for the Allied governments.

The erection of synthetic-nitrate plants in the United States is said to be proceeding rapidly, and in a reasonable time there will probably be a supply of nitrate within the United States for military needs. The German nitrate plants are now idle, without fuel, means of transport, or possibilities of resuming work. The Chileans have become disturbed over the serious situation, and Chilean publicists are today much concerned over the future of the Chilean nitrate industry and how they may reduce operating costs so as to compete with the much-dreaded synthetic nitrate and at the same time permit the Chilean government to live its previous life of ease, with money derived from the heavy export tax (and, lately, the super-charge) on nitrate.

The latest proposal is that the nitrate producers are to pool their production, to be disposed of by one selling agency, operated under the supervision of the Chilean government, in order to counteract the effect of the purchasing agency maintained by the Allied governments. The results will be awaited with interest. Unless radically altered, most oficinas can effect only minor economies, but the adoption of more modern treatment methods would provide a great increase in nitrate recovery for a small increment in cost of operation. Oficinas taking this step will be on a war footing and can continue safely; the rest either hope to "find a big nugget," figuratively speaking, or an opportunity to appeal to the government for legislative action and subsidy. Within the last six months the complacency of the Chilean nitrate producers and the Chilean government has been shaken, and there is much searching of soul among those who hitherto have confidently trusted in a so-called "natural monopoly" that is rapidly losing its characteristic of monopoly before the threat of an artificial product. DONALD F. IRVIN.

Antofagasta, Chile, June 12, 1918.

Protect Mining and Smelting Enterprise

A short time ago a representative of the Magnolia Metal Co. was granted an interview at Washington by Senator Charles B. Henderson, of Nevada, who is chairman of the Mines and Mining Committee of the Senate. We were anxious to know what hopes there were for smelters who are not in the protected class.

For several years we have been endeavoring to discover a way to smelt antimony in competition with the Chinese, and we are about to enter the field of tin smelting in this country. Before doing so, however, we wanted to know, if possible, whether such a large investment of capital would be justified. As most miners and smelters know, a bill of vital importance to the industry, No. 11,259, has been passed by the House. This bill is now in the Senate, being considered in committee under the chairmanship of Senator Henderson. Our reception by Senator Henderson was most cordial, and we could plainly see that, if he has his way, the American miner and smelter of the metals controlled by the above bill will have nothing to fear as a result of investing capital and time in trying to increase the supply of the several much-needed metals that the bill mentions. Senator Henderson patriotically gave up all hope of a vacation, and consented to remain in Washington during the summer to whip the bill into shape for early consideration.

It occurs to me that the producers and smelters of the ores and metals under discussion should help Senator Henderson's committee to the utmost by gathering the fullest information concerning these metals. It is only by united action that true help can be given. Each individual, when acting alone, can only hope to treat the matter inefficiently; but if the miners of all these ores and the smelters could get together and form an association, it would be possible to maintain a secretary at Washington whose business it would be to gather the minutest details of the whole question, and be ready at any minute to answer a call from Senator Henderson or from Congress itself, and furnish immediate information on any part of the subject. This would be immensely helpful to Congress, and, at the same time, no good argument in favor of these metals would be allowed to escape notice.

I recommend this idea to the earnest and immediate consideration of miners and smelters of antimony, tin, arsenic, bromine, chromium, abrasives, graphite, magnesite, manganese, molybdenum, mercury, platinum, pyrite, potash, sulphur, tungsten, vanadium, and mica, and to any others who may take a personal interest in the great helpful work now being undertaken by Senator Henderson. E. C. MILLER,

President, Magnolia Metal Co.

New York, Sept. 6, 1918.

Mine Sampling and Mining Method

Mine sampling is interesting in its details, but one point of view has to a considerable extent escaped attention, although it is of primary importance in such mines as the Alaska Gold and the Alaska Juneau. In some mines the nature of the ore is such that the grade of ore mined must approximate the grade shown by the sampling, but in other deposits the grade of the ore that comes from the mine is determined by the man in charge of the stoping. For example, in such deposits as those in the Cœur d'Alene, the grade of ore sent to the mill depends almost entirely upon the method of mining used and the man who is in charge of the work.

My personal experience leads me to believe that examining engineers are too prone to sample an orebody without first having decided upon the method of mining that will be best suited to winning the ore. I believe that the "method of mining" should be decided upon before sampling begins, as unless the ore can be mined so as to obtain an approach to the grade indicated by the sampling, the results based upon the examination are of doubtful value.

It would not only be interesting but also highly important if readers of the *Journal* would send in data showing how the grade of ore sent to the mill compares with the grade indicated by the sampling of the stope when different methods of mining are used.

Salt Lake, Utah, June 16, 1918. C. T. R.

Drill-Steel Punching Machine

Several years ago an article was published in the *Journal* describing a drill-sharpening shop which had been established at the Gardner shaft of the Copper Queen mine. In that article a machine was described, operated by compressed air, for punching out the bits of hollow steel, which was first built in our shops. This has since been copied by other manufacturers, and I note particularly in your issue of Aug. 3 a description of one made by the Denver Rock Drill Manufacturing Co. I believe both the Ingersoll-Rand Co. and the Sullivan Machinery Co. manufacture others of generally similar design for the same purpose.

This device was originated and built at the Gardner shop. It is impossible to say now who was the inventor, but the credit should lie mainly with George Mieyr, master mechanic at that time, although it is probable that studies made by two engineers, A. F. Simpson and E. R. Rice, in calling attention to the time spent in punching by hand and the need of such a machine, may have led to it.

In none of the articles describing other punching machines have I seen credit given to the men who developed a device of great importance to every user of hollow drill steel. As it was not patented, the inventors made a present of it to the mining industry. I believe they have credit due them from the mining profession. If some reference could be made, in the same department of your publication, to the first article, with the date, and others following it, I believe it would be very acceptable. An article on the tool-sharpening shop at Jerome might be compared with the original.

It is interesting to note that most of the manufacturers perpetuate an unnecessary feature of the machine. The machine for the Gardner shop was made from a pair of cylinders from a hoisting engine, used in operating brakes, and consisting of an air or steam cylinder and an oil-cataract cylinder. That was used for no other reason than that it was available. Equally good results could be obtained with the single cylinder.

Bisbee, Ariz., Aug. 21, 1918. GERALD SHERMAN.

Use of Coke-Oven Gas in Zinc Smelting

I have read with a great deal of interest the description of the zinc-smelting works of Vado Ligure in the *Journal* of Aug. 3, and the editorial note regarding the use of coke-oven gas for heating zinc furnaces.

In the early part of 1914 I was in Germany, and while there visited the Hamborn works of the Actien Gesellschaft für Zink-Industrie, where a Rhenania roasting furnace was being operated, as well as a distilling furnace, with coke-oven gas. This gas was piped several miles from the coke ovens of the Gutehoffnungs Hutte. The retort furnace in use was a typical Rhenish furnace, the gas and air burning up between the center walls, and the products of combustion coming down around the retorts and thence into counter-current recuperators, where the air for combustion was preheated. The furnace, as I remember it, contained 240 retorts. A gas holder was used, as in the Italian works, but even with this gas holder, which acted more as a pressure regulator than as a reservoir, great difficulty was experienced with changes of pressure, which increased or deceased the flow of the gas. Though this would not be so important with ordinary producer gas of relatively low calorific value, it was much magnified with the coke-oven gas, which contained something over 500 B.t.u. per cubic foot.

The furnace when I saw it had been operating about six months, and it was planned to equip the entire works, containing 12 such furnaces, with coke-oven gas, if the difficulties in regulation of temperature in the laboratory could be satisfactorily overcome. There was considerable talk in Upper Silesia of this same method of firing, and, I believe, with the tremendous development of the byproduct coke oven in Germany primarily for the byproducts, that it is not at all improbable that some of the large producer gas-fired Silesian smelteries have gone over to the use of coke-oven gas.

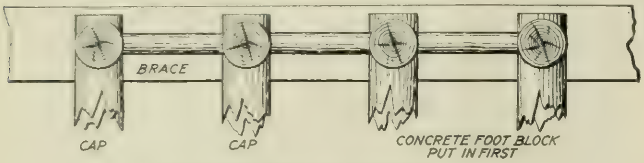
New York. Aug. 7, 1918. J A. SINGMASTER.

Details of Practical Mining

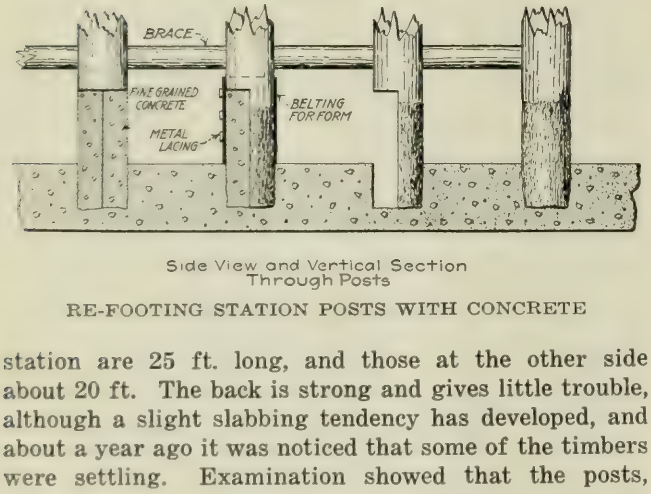
Concrete Foot Blocks for Station Posts

By C. T. Rice

The station at the 1200 level of Hecla shaft, Burke, Idaho, is 35 ft. wide, 80 ft. long and 20 ft. high, and in the rear are situated the pumps and the charging station for the storage-battery motor, used in hauling ore trains. This station is timbered with round posts and caps put in with 5-ft. centers. Center posts are placed about 20 ft. out from the shaft to reinforce those sets that extend across the full width of the station in the pump portion. The posts at the shaft side of the station are 25 ft. long, and those at the other side about 20 ft. The back is strong and gives little trouble, although a slight slabbing tendency has developed, and about a year ago it was noticed that some of the timbers were settling. Examination showed that the posts, which were about seven years old, had started to rot at the foot, and, in some instances, the wood was badly affected as high as 18 in. up on the post. The problem of re-footing this timbering throughout the station in a permanent manner, without disturbing it, finally led to the placing of cement under the lines of posts.



Plan Alongside of Station



Side View and Vertical Section Through Posts

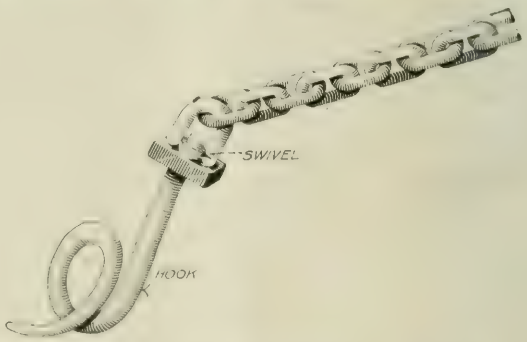
RE-FOOTING STATION POSTS WITH CONCRETE

The ground between the posts was first picked and cleaned down to solid rock and then braces were put in between the posts at the bases. Molds were then made and coarse concrete was poured in to form the main part of the foot block. After this application had set, the work of getting the concrete under the posts was begun, and this was done one post at a time. First, the timber was sawed half way through, well above the rot, so as to chip out half of the post in a vertical direction. As soon as the wood had been chipped out, and the half crater in the concrete foot block cleaned down to solid rock, a piece of old mill belting was nailed to the remaining half of the post to make the form while concreting in the portion of the post that had just been removed. A coarse-sand cement batter was rammed into the hole. When this half had set thoroughly, so that it could take the weight of the post, the other half of the timber was cut away, the belting laced together and shifted around to make the form for this half, and the remainder of the post was concreted in. In this manner, all of the posts of the station were sawed off and replaced at the bottom with a concrete foot that formed an integral part of the concrete foot block along each line of posts. No trouble with the timbering is expected for several years, as the stations are dry and well ventilated, and it was only at the bottom that the posts were decaying. But in timbering stations cut in rock, where decay rather than ground weight will probably determine the life of the timber, it is well to put in concrete foot blocks under the posts of the set when they are first placed.

Device for Stopping Runaway Mine Train

Many a mule has been killed in a mine by a runaway train on a steep grade. Grades should not be so steep as to cause trains to accelerate to a speed that cannot be controlled by the mule, aided by brakes; but often it becomes necessary to connect up with old drifts that cannot be graded to the best tramming advantage.

Brakes will sometimes fail to hold a train when applied by a new mule skinner, who will not always realize just where the train must be braked strongly to hold it under control. Sometimes a car will dump in transit, and if the train is coupled with side chains over car hooks, the cars that do not dump are likely to become unfastened and run away, creating a source of constant danger to mule, men and mine supports.



"PIG-TAIL" HOOK, SWIVEL AND CHAIN

This menace can be easily avoided by simply passing a chain over the top of the cars from the front of the rear car to the back of the front car of the train. As the cars making up a train often have to be gathered from separate chutes, the chain must be made so that it can be attached and detached easily and quickly. This is affected by the use of a Missouri "pig-tail" or worm hook, shown in the illustration, which is attached to each end of the chain. This hook is dropped over the door rod of an end-dump car, and is thus effectively fastened, yet in such a way as to be quickly detachable.

With a chain thus attached to a train, all that need be done when a runaway is threatened, is to unlatch the door of the rear car—the cars being coupled with the gate end foremost—and the brakeman, when jumping off, gives the rear car a slight push. This push dumps the car, and the train is snubbed up effectively without any other inconvenience than cleaning some ore off the track, for in all probability the rear car will only partly dump. Even if the trainman does not give the car enough of a push to dump it, the pull of the chain on the front gate rod will cause it to dump almost as soon as the door is unlatched.

The chain need not be especially heavy, and, as it is easily attached and detached from the cars, little inconvenience is experienced from its use.

This simple but effective method of stopping a runaway train is used in hauling the ore on the upper levels of the Hecla mine, at Burke, Idaho, where the mule skinner running over the bad grade was one of the most earnest in its praise. His rule, he said, was to take no chances, but to dump early if his brakes began to slip, for then he generally did not have much shoveling to do in cleaning up, as the rear car probably would not dump completely.

Better Dies Make Better Drill Bits*

The increased efficiency to be obtained by proper forming and treating of drill bits is so marked, and so little attention is paid to this end of the ordinary day's work by mine officials, that one is led to believe they do not realize what can be accomplished with little effort on their part. Some are beginning to give their drill-steel situation serious consideration and are paying dividends from this end of their work which they little believed possible.

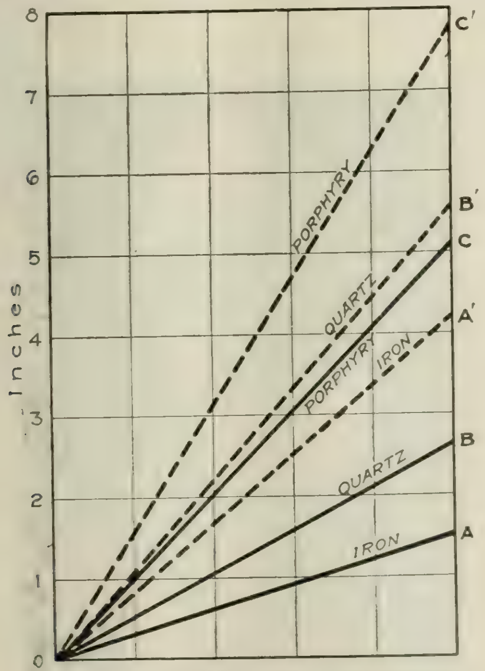


FIG. 1. RELATIVE DRILLING SPEEDS

The accompanying chart shows results that were accomplished by one of the largest copper mines in this country. Lines *OA*, *OB*, *OC* show drilling speed in inches per minute obtained with their standard machine-sharpened drill bits using ⅛-in. changes in gage. Lines *OA′*, *OB′*, *OC′* show results obtained by using bits with proper reaming edges and faces and a 1/16-in. change in gage. In addition to increased drilling speed, their steel breakage has decreased from 10.5% to 1.5% and the amount of footage obtained from each steel before resharpening was increased 50%.

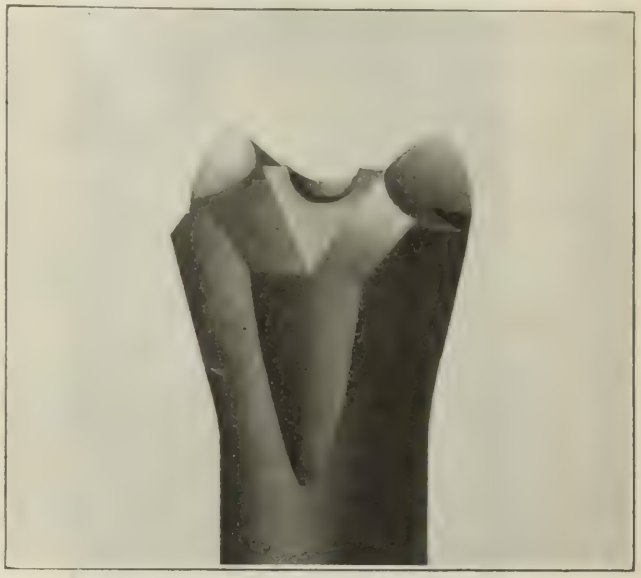


FIG. 2. "DOUBLE ARC" BIT

A number of vertical gaging dies, furnished with the Sullivan sharpeners, may be used in forming bits with correct reaming edges and faces. These dies are equipped with a positive gaging device arranged for 1/16-in. changes in gage. If any mine official will go into this situation carefully, he may expect approximately the following results: Increased drilling speed from 40 to 100%; decreased steel breakage; increased footage from each steel sharpened; lower sharpening costs; less time lost underground; and life of drilling machines increased.

An extra minute used in the drill shop is better than 15 minutes wasted underground. This waste can be largely avoided. One should not try to see how fast he can make drill bits, but how well he can make them. Much labor will be saved in the end.

In using the gaging dies, the bit is upset in the clamping die by the horizontal hammer and dolly in the usual manner. The vertical dies are adjusted to the proper gage by means of the key and thumbscrew. The proper gage, reaming edge and wing taper are applied by hammer action under the vertical swaging hammer. Changes in gage for the different steels in a set are made in a few seconds.

The popular "bull" bit, the familiar "cross" bit or the new "double arc" bit (Fig. 2) can be made in these dies rapidly and cheaply. The all-hammer process and the alternation between the dolly and vertical swages compact the metal and improve its wearing quality.

---

*Howard T. Walsh in "Mine and Quarry."

Four Officers of the 27th Engineers

LIEUT. COL. O. B. PERRY,
Commanding Officer

CAPT. E. S. BERRY,
Adjutant

CAPT. NORVAL J. WELCH,
Company A

CAPT. JOHN W. BALCH,
Adjutant

The Power of Money

"Might makes right," the Prussians said, speaking more truly than they thought, for back of the power that will ultimately crush the things that are wrong lies the financial might of this country and the Allies. The power of money for good was never better exemplified, and similarly, though in a smaller way, that fact is likewise true of the Comfort Fund.

The argument has been advanced that the mining regiment needs nothing, as the Government takes care of all. It is true that never were soldiers as well cared for as they are by Uncle Sam, but no one has yet heard of a soldier's family that stopped sending him things on that account. The sum thus far expended from the Comfort Fund (over $10,000) for the 27th has been spent in the various ways that the men's own folks would take. And those who have contributed have been moved by goodfellowship alone.

Mr. Manager, why not bring the Comfort Fund to your employees' attention, especially on pay day, when the money is moving fast? Show that your camp is alive and that the men know there is such a thing as a real mining regiment at the front. Put your company on record as back of the 27th.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$14,436.50
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	10.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	25.00
Richard McCarthy	100.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
A. F. Taggart	10.00
G. E. Farish	25.00
H. K. Sherry	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
P. M. Arnold	10.00
W. A. Wolf	5.00
Employees of Utah Leasing Co., Newhouse, Utah	20.50
Employees of Braden Copper Co.	112.50
Charles A. Mitke (second contribution)	10.00
G. M. Colvocoresses	25.00
Charles Le Vasseur (monthly)	5.00
A. H. Wethey	25.00
S. Ford Eaton	25.00
H. H. Hunner	5.00
N. G. Thomson	25.00
Members of the A.I.M.E. meeting in Colorado Springs, Sept. 4, 1918	215.00
Glen Miles	25.00
J. B. Wilmarth	25.00
Frederick MacCoy	5.00
Balance of a certain Joplin contribution received through Lieut.-Col. Gilmore	590.36
Total	$17,312.97

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

The Tin Control

Formation of the international monopoly to control the price and distribution of pig tin is told by Bernard M. Baruch, the chairman of the War Industries Board, in the following statement:

> Under an inter-allied pooling agreement reached by representatives of the United States, Great Britain, France and Italy at conferences held in London, which were attended by L. L. Summers, member and technical adviser of the War Industries Board, and George Armsby, chief of the tin section, each country participating in the conference will get its needed supply of pig tin. The action amounts to an international monopoly of a beneficent nature.
>
> The plan of distribution worked out allows the United States about 80,000 tons of pig tin, or two-thirds of the world's entire production, annually. With the War Industries Board supervising the allowance to this country, all imports of pig tin, tin ores and concentrates will be consigned to the American Iron and Steel Institute, which will receive, pay for and distribute the metal to the industry through the United States Steel Products Company.
>
> The price will be regulated by the War Industries Board and will be uniform to all consumers of 10 tons of pig tin or over. There will be another uniform price for users of less than 10 tons. These prices will be maintained at a level which will encourage production in the tin-mining countries—Great Britain and the Straits Settlements chiefly—and stop profiteering. Prices, rules and regulations will be announced later. It is probable that users and dealers may be licensed.
>
> The War Industries Board believes there will be insured by these arrangements a steady supply of material at a stable and reasonable price. Since the negotiations for the pooling arrangement began in London six weeks ago, the price of pig tin has fallen steadily. The quotation on Sept. 6 last showed a net decrease of 14c. per lb. as compared with the price on July 15, 1918.
>
> That there may be a sufficient supply of tin in the United States to meet the war needs and to supply essential civilian uses, vigorous plans for conservation of the metal are being made effective through coöperate efforts by the War Industries Board and by the Food and Fuel administrations in the enforced substitution of other than tin for containers, wherever that is possible. Tin-container manufacturers have agreed with the War Industries Board in plans that will curtail their use of tin plate 30%, which means a saving in the next three months of about 150,000 tons of tin plate.
>
> The Food Administration is working out a tin-conservation plan with various industries, including lard and lard-compound packers, wholesale grocers, cracker manufacturers, tea and coffee packers, cocoa and chocolate manufacturers and baking-powder manufacturers. All have been urged to substitute fiber, paper or other containers where possible.
>
> The Fuel Administration has taken up the subject with the oil dealers, and the War Industries Board is working along similar lines with the tobacco manufacturers and all industries in which tin is used in turning out the finished product.

Mr. Baruch said that the Summers commission is planning for the extension of the pooling arrangement to basic materials other than tin. He admitted that it is the desire of the board to extend the pooling arrangement to all minerals of which there is a shortage.

The above is communicated by a Washington correspondent. We may add that the new arrangement will abolish the unrestricted competition for tin among American, British and other Allied interests. Hereafter all purchases of tin in the Straits Settlements will be made by E. Boustead & Co. on their own behalf and on that of the other importing houses, which firm will act under the direction of the tin control in London. In Great Britain, licenses will continue to be issued by the rubber and tin committee to various shipping firms.

Imports and Exports of Metals and Ores

Imports of the more important metals and ores as reported by the Department of Commerce for July, 1918, and those for July, 1917, the latter as finally revised, were as follows:

IMPORTS, JULY, 1917, AND JULY, 1918
(In pounds, unless otherwise stated)

Metal and Ore:	July, 1917	July, 1918
Antimony ore, contents	1,442,929	1,119,077
Antimony matte, regulus or metal	2,856,333	1,400,030
Copper:		
Ore, contents	6,472,934	6,179,353
Concentrates, contents	2,213,200	5,185,245
Matte, regulus, etc., contents	797,982	1,533,838
Imported from (in part):		
Canada	2,951,522	2,104,426
Mexico	2,475,101	3,397,685
Cuba	3,080,526	2,121,720
Chile	751,181	3,417,904
Peru	67,368	350,175
Unrefined black, blister, etc	10,122,230	19,543,854
Refined, in bars, plates, etc	46,865	5,389,000
Old, etc., for remanufacture	2,951,355	111,891
Composition metal, copper chief value	29,187	14,145
Lead:		
Ore, contents	10,151,631	3,597,906
Bullion, contents	6,222,828	2,134,609
Imported from (in part):		
Canada	317,759	2,209,572
Mexico	7,306,624	3,495,546
Chile	....	26,307
Pigs, bars and old	32,012	24,927
Pyrites, long tons	76,826	46,908
Zinc:		
Ore, contents	10,232,491	1,193,916
Imported from (in part)		
Canada	878,962	829,327
Mexico	6,531,129	364,589
Blocks or pigs, and old	36,823	....
Manganese ore, long tons	53,438	29,886
Imported from (in part):		
Cuba	360	9,702
Brazil	43,437	15,925
British India	1,200	1,700

Exports of copper, lead and zinc for July, 1918, as reported to the Department of Commerce, with the figures for the corresponding month of 1917, the latter as finally revised, were as follows:

EXPORTS OF COPPER, LEAD AND ZINC
(In pounds)

	July, 1917	July, 1918
Copper:		
Ore, contents	293,200	326,352
Concentrates, contents	......	121,000
Unrefined, black, blister, etc	297,980	672,000
Refined in ingots, bars, etc	54,275,337	64,573,910
Exported to (in part):		
France	13,749,296	30,738,418
Italy	7,620,353	11,311,323
United Kingdom	28,778,133	19,595,996
Canada	3,389,136	2,826,126
Composition metal, copper chief value	7	7,690
Old and scrap	2,240	
Pipes and tubes	2,782,255	173,557
Plates and sheets	2,302,123	377.148
Wire, except insulated	1,792,223	1,905,418
Lead:		
Pigs, bars, etc., produced from domestic ore	6,270,671	13,711,872
Pigs, bars, etc., produced from foreign ore	179,369	3,046,069
Exported to (in part):		
Denmark	699,235	.....
Canada	1,317,443	5,880,469
United Kingdom	2,688,893	7,430,468
Argentina	740,350	
Japan	......	2,658,855
Zinc:		
Dross	858,221	2,023,402
Spelter:		
Produced from domestic ore	15,271,244	8,589,975
Produced from foreign ore	4,480,007	361,243
Exported to (in part):		
France	7,254,385	6,290,460
Italy	649,156	356,000
United Kingdom	9,489,089	2,186,547
Canada	1,723,643	373,891
Mexico		2,020
In sheets, strips, etc	2,454,625	1,461,441

Half Year's Production of Chromite

In the first six months of 1918, according to the U. S. Geological Survey, 26,000 long tons of all grades of chromite ore was mined in the United States, as compared with 42,700 in 1917. Mining was carried out under unfavorable conditions during the first four months of 1918, and many properties were not opened until April or May. The production of the first six months of 1918 may therefore be about one-third of the production for the year, which would amount to 65,000 to 75,000 long tons of all grades of ore, equivalent to 52,000 to 60,000 long tons of ore containing 50% chromic oxide.

The shipments from Jan. 1 to June 30 amounted to about 18,000 long tons of ore of all grades, equivalent to 14,400 tons containing 50% chromic oxide. Labor conditions in the chromite industry in California and Oregon have been as unfavorable as those in other industries. Transportation has been difficult, particularly haulage from the mines to points for shipment by railroad and water. The roads were put in better condition by the end of June, however, and they will probably be still further improved during the latter half of the year.

Huge Loan Best in the End

We must buy the war as common sense tells us to buy coal and other commodities—in as large quantities as we can. Expensive at best, war comes cheaper when bought in the sensible way. That is the reason the Government has arranged for the floating of the largest war loan the world has ever seen. Smaller loans, which would not meet in full the extraordinary needs of our victoriously fighting armies, would mean only prolongation of the war, at far greater cost to the people of America in the end.

The huge loan means economy in money, in resources, as well as economy in the lives of our soldiers "Over There." The faster the loan is taken, the more abundantly it is oversubscribed, the less the war will cost. By the same token, the greater the success of the huge loan, the more wealth in America will be saved from the maw of war.

The safest investment in the world is a Liberty Bond. For a patriotic American, Liberty Bonds are the best investment in the world. It is not only a wise thing to hold them—it is the patriotic thing to do. The soldier that takes a trench and then voluntarily gives it up is not to be compared with one who takes a trench and holds it against the enemy. An American who buys a Liberty Bond and then sells it is not so good an American as one who buys a bond and holds it. This does not apply, however, to one who sells his bond because of real necessity; there is legitimate trading in Liberty Bonds, which the Treasury recognizes.

Complete and overwhelming success of the great loan will mean the speeding of the day when war prices will end and the cost of living return to the scale of normal times of peace, and when our fighting men will return to productive labors, and the drain upon the property and life of the nation will at last be ended. The bonds must be bought, and by everybody, to achieve this end.

Events and Economics of the War

The most notable achievement of the American forces during the war was made last week when, on Sept. 12, the troops under General Pershing completely wiped out the St. Mihiel salient in 27 hours, taking 15,000 prisoners and 200 guns; continuing their advance on a 33-mile front, they have come within range of the fortress of Metz. Gains toward Laon and Cambrai were also made by the Allies. French and Serbian troops, taking the offensive on Sept. 16 against the Bulgarians between Dorian and the Vardar, pierced the enemy's lines and took 1500 prisoners. Discussion of peace terms proposed by Austria on Sept. 15 was flatly rejected by President Wilson. Not a life was lost when the liner "Persic," transporting 2800 American troops, was torpedoed off the English coast, the ship itself being saved by beaching. A U. S. Army contingent arrived at Archangel, Russia.

In the United States, the War-Minerals Bill, as redrawn by Senator Henderson, passed the Senate on Sept. 11 with minor amendments. Exemption from taxation for a limited amount of the interest on Liberty bonds was asked of both houses by Secretary McAdoo. Eugene V. Debs, former Socialist candidate for President, was sentenced to 10 years in prison for violating the Espionage Act. The Committee on Public Information gave to the press a series of documents revealing the Bolshevik leaders as paid agents of Germany.

Would Make Liberty Bonds Tax-Free

A bill has been reported to the House upon the request of the Secretary of the Treasury, calling for the exemption from taxation of a limited amount of the interest of Liberty Bonds. The measure provides that until two years after the end of the war, the interest on an amount of bonds not over $30,000 in principal, of the Fourth Liberty Loan, owned by an individual, partnership, association or corporation, shall be exempt from graduated additional income taxes, and excess- and war-profits taxes now or hereafter levied.

Former loans are included in the bill as worded at present. The interest received after Jan. 1, 1918, on the amount of bonds of the First Liberty Loan, converted, dated either Nov. 15, 1917, or May 9, 1918; the Second Liberty Loan, converted and unconverted, and the Third Liberty Loan, the principal of which does not exceed $45,000 in the aggregate, owned by any individual, partnership, association or corporation, is to be exempt from such taxes; provided, however, that no owner of such bonds is to be entitled to such exemption in respect to the interest on an aggregate principal amount of such bonds exceeding one and one-half times the principal amount of bonds of the Fourth Liberty Loan originally subscribed for and still owned by him at the date of his tax return. The exemptions sought are to be in addition to all other exemptions provided in the act authorizing the Second Liberty Loan.

Gold Placed Under Control

Complete control over the use of gold for export and domestic manufacture is secured to the Federal authorities through the new order of the Director of the Mint, forbidding the various coinage mints and the U. S. Assay Office at New York to sell gold bars except to those holding priority orders. The order was issued on Sept. 9. The New York Assay Office had announced on Aug. 30 that it had been instructed to stop the sale of gold bars entirely until further notice, but that instruction was revoked the following day. Its issuance, however, evidently caused certain interests to seek to stock up with gold bars, as in the succeeding five business days, it is said, $1,772,000 worth was bought, or twice the normal amount.

The authority as to the quantity of gold to be sold for commercial purposes is vested in the War Industries Board, the Federal Reserve Board, and the Secretary of the Treasury, as stated on the market page of the last issue of the *Journal*. By some the order is looked upon as an effort to stop hoarding; also to reduce the production of less essential articles.

War Board Takes Steel Inventory

A country-wide inventory of stocks of steel on hand is being made by the War Industries Board at the instance of its chairman, Bernard M. Baruch, in coöperation with the census bureau of the Department of Commerce. The ascertainment of the supply of steel is of first importance in view of the deficiency of production of steel for direct and indirect war needs.

The present estimated total production of steel in sight is 17,000,000 tons, and war demands total over 23,000,000 tons, with the demand constantly rising. In a recent interview with the Washington newspaper correspondents, Mr. Baruch announced he could not approve requests for an ounce of steel for domestic uses, because of the imperative need of meeting the war demands.

The census bureau, through its equipped census-taking organization, is sending questionnaires to more than 40,000 manufacturers in this country asking complete reports of stocks of steel on hand down to the smallest holdings. It is sought to reach every manufacturer who uses steel in any way and in any amount in his industry.

Koppel Plant Sold

At the public sale of the Orenstein, Arthur Koppel Co.'s plant at Koppel, Penn., by the Alien Property Custodian on Sept. 12, the Pressed Steel Car Co. was the successful bidder. The price paid was $1,312,000, but the sale remains to be confirmed by the advisory committee for which A. Mitchell Palmer, the custodian, is acting. The public auction of the enemy-owned plant was originally scheduled for Aug. 15, but was later postponed. There were seven bidders, each of whom deposited a check for $50,000 as a guarantee that he would abide by the terms of the sale. The auction was attended by several hundred representative steel men. The proceeds will be invested in Liberty Bonds.

The firm's history, it is said, furnished an example of the methods which Germany pursued before the war to acquire military information regarding American industry. As one of the many branches throughout the world of the parent concern in Germany, the Koppel company installed light railway equipment in the greater part of American plants making munitions, steel and similar products. It therefore had no difficulty in obtaining valuable data for Berlin.

Mint Receives Platinum

Platinum in the form of jewelry has been sent in such quantity to the office of Ray T. Baker, Director of the Mint, in response to the Government's call for the metal, that Mr. Baker was led to request on Sept. 10 that further shipments be sent thereafter to the U. S. Assay Office. Payment will be made for these consignments, it is said, but those wishing to donate platinum should send it to the Red Cross.

According to Washington dispatches, as announced in last week's issue, Mr. Baker will act as Platinum Administrator. His duty will be to collect the metal, refine it, and deliver it to the War and Navy departments as they require it.

Britain Considers Post-War Priority

The British Minister of Reconstruction appointed a committee last year, says *Iron and Coal Tr. Rev.*, to consider the principles upon which, in the event of a shortage of the necessary supplies for industry after the war, such things should be rationed, and to report upon the machinery requisite for the purpose. The committee has now presented its report, and though advising that control should be discontinued at as early a date as possible, and that in the meantime there should be the least possible interference with private enterprise, it has made recommendations as to the principles and machinery for allocation and priority after the war in cases where it is found to be imperative.

The committee has recommended that special consideration should be given to industries which provided a large measure of employment, and that importance should be attached primarily to industries connected with: (1) The production of food and raw materials; (2) the manufacture of machinery and equipment which are immediately necessary for the industrial and transport requirements of the country; (3) the manufacture of finished goods for export; (4) the production of goods for home requirements of a pressing nature. Detailed recommendations are also made by the committee as to the machinery to direct allocation and relative priority.

The government has decided to take immediate action on the lines of the committee's report and the recommendations of the Minister of Reconstruction. It is the intention of the government that post-war control and allocation of materials shall be applied only in cases where it is absolutely necessary. On the assumption, however, that of certain commodities there will be a shortage which will render some form of control imperative, arrangements must be made for dealing with the matter.

It is proposed that a small Cabinet Committee on Post-War Priority shall be set up, consisting of the President of the Board of Trade, the Minister of Labor, the Minister of Shipping, the Minister of Munitions, and the Minister of Reconstruction, with the same chairman as the War Priorities Committee. This committee will determine large questions of policy and will lay down the general principles upon which any allocation and priority should proceed where necessary. Secondly, this Cabinet committee will be assisted by the standing council composed of members of the departments chiefly concerned, together with persons representative of commerce, industry, and labor. These two bodies will form the central machinery, and will, of course, be in close touch with the existing War-Priorities Committee.

Gasoline Stocks Decreasing

A serious shortage of gasoline exists, according to data furnished the Senate on Sept. 11 by Fuel Administrator Garfield, who intimated that it was this situation that made the "gasless Sunday" necessary in the East. The figures indicate only a 30-day reserve supply. Though the California production of gasoline has decreased equally with that of the Eastern fields, it has been necessary to draw upon it to the extent of 250 cars to make up for the shortage in the East.

The data furnished the Senate as to stocks in the territory east of California show a decline of 3,200,000 bbl. between the high point on Apr. 1, 1918, and Aug. 1. The average total daily consumption in this territory is given as 194,000 bbl., which is 3000 bbl. more than the approximate daily production.

Stocks in California decreased from 1,787,000 bbl. on Mar. 1, 1918, to 848,000 bbl. on Aug. 1, a difference of 939,000 bbl. The average daily deficit for the first half of 1918 is 3000 bbl. The movement of crude petroleum and its products is eastward, both for export and for the war needs of this country. The situation would indicate the need for greater rather than lessened restrictions upon the use of gasoline.

Low Accident Record at Nitro, W. Va.

A remarkably low accident record through concerted effort in modern safety engineering is claimed by the U. S. Employees' Compensation Commission for the work of constructing the Federal explosives plant "C," at Nitro, W. Va., which was begun early in January, 1918. Hundreds of buildings have been erected on the 1600-acre plant site for making smokeless powder.

To date, it is claimed, there has been but two-tenths of 1% of the number of working hours lost by injuries resulting from accidents causing absence of employees. Only six fatalities have occurred during the last eight months. Upward of 19,000 employees have been working overtime and Sundays to complete this gigantic project. Only eight accidents per 10,000 employees per day have occurred entailing loss of one day or more. This accident-prevention work has been done under the direction of C. B. Hayward, safety engineer.

Industrial News from Washington

By Paul Wooton, Special Correspondent

War-Minerals Bill Passes Senate

The Senate passed the War-Minerals Bill on Sept. 11 without a rollcall. Despite the fact that the bill was rewritten by the Senate committee, it is understood that the House conferees will accept it as just passed. Senator Smoot's effort to eliminate chalk, fluorspar, fullers earth, kaolin and mica from the bill was unsuccessful. A number of amendments were proposed and accepted. Their importance, however, was limited to perfecting certain phases of the bill, to which the committee gave its consent.

Senator Henderson, in urging the adoption of the bill, said that it would put the United States in a position to control largely those rare metals and minerals which will be used after the war as well as during the war. Senator King, of Utah, made several long arguments against the measure. His principal fear is that private enterprise will be interfered with and that it will bring few benefits of a substantial character to the men who do the actual mining.

Senator Shafroth, of Colorado, in justifying the action of the committee in departing so widely from the House bill, said that conditions surrounding the mining industry are such as to make it impracticable to attempt to apply the exact provisions of the Lever Act to it. He also explained why the committee had seen fit to reject the maximum and minimum price proposals contained in the House bill.

Senator King declared that "private capital, private ingenuity and private industry will go out and develop the mining districts as they have in the past." Senator Jones, of New Mexico, countered with the statement that the price of some metals has increased up to 2000%, but that a mere increase of price, without a definite length of time for the price to prevail, would not induce the opening of properties requiring time and large expenditures. To this, Senator Smoot suggested that the tariff be tried. Senator Jones answered that any tariff that might be thought of would not serve to protect a miner from the low-cost producers within the United States.

During the course of the debate, Senator Jones revealed the fact that Mr. Baruch has been making contracts which were backed by his private fortune. It was necessary to take this step, he said, to secure certain metals, because there was no authority in law for the Government to undertake it.

Senator Fall was afraid that the bill as originally drawn gave the Government the power to fix the wages of every miner in the United States. He was allowed to attach an amendment to make certain that no such interpretation would be placed upon it. Though he objected to a number of points in the bill, he declared that the "committee worked faithfully and arrived at a compromise such as I can force myself to accept, when I never could have supported anything along the lines of the original House bill." Senator Fall feels that he has added an important safeguard to the bill in annexing a proviso "that no ores or metals the principal money value of which consists in metals and minerals other than those specifically enumerated shall be subject to requisition."

Senator Shafroth amended the bill so as to provide that the headquarters and offices required for the administrative force are to be situated at such a point west of the Missouri River as the President may deem proper. The conferees who will consider the bill are Senators Henderson, Walsh and Poindexter, and Representatives Foster, Taylor and Garland.

Should Claim Deferment for Men

The War Department has provided the necessary machinery for the protection of essential industries like mining from the indiscriminate operation of the draft, and is depending upon the companies and individuals to protect their industries by taking special care to see that skilled labor which cannot be replaced receives the proper industrial deferred classification. Mining organizations producing necessary war minerals should consider it a patriotic duty to attend actively to this matter at once, it is held, and to take up with their local boards the classification in the draft which their key men should receive.

The Army desires to have every man who can be replaced put into a classification where he will be ready to carry a gun as soon as called for, but does not wish to take men who would be more useful for war purposes where they are. Should those engaged in operating essential war mines not carry out this duty promptly, the War Department may naturally hesitate, it is said, to furlough men from the Army in cases where the companies have neglected to ask the proper deferred classification for the men, as provided for under the selective-draft regulations.

Machinery has also been created whereby, in some instances, the key men in essential industries, who have failed for any reason to receive industrial deferred classification, may still be returned to their work by the Adjutant General of the Army after their arrival at camp. Under this arrangement, the different departments and bureaus representing certain industries may designate a certifying officer, who may recommend to the Adjutant General that the soldier in question be granted an indefinite furlough without pay and ordered to report to the industry where his services are needed. For the protection of the metal-mining industry in this regard, the Secretary of the Interior has named Van. H. Manning, Director of the Bureau of Mines, as the certifying officer for the Department of the Interior.

This function has been assumed by the Fuel Administration for the coal mining and oil industry, so that the Bureau of Mines will receive only applications for the mining and metallurgical industries, excluding the steel industry.

Editorials

"Hello! This Is Liberty Speaking"

WITH this issue we publish an attractive insert with the slogan "Hello! This is Liberty speaking. —Billions of dollars are needed, and needed now." This direct message is to you and to every other American. The Fourth Liberty Loan is almost upon us. It is up to you to do your part. Put this insert above your desk as a reminder that when Liberty calls, you will be there.

The "Mines-Control" Bill

THE "mines-control" bill was so rewritten in the Senate's committee that it emerged quite shorn of its guise as a mines-control bill, becoming simply an authorization to the Government to engage in trading in minerals and metals, with the right to take over and operate any idle mines of the substances specified in the act. As drafted by Senator Henderson, this was a great improvement over the House bill, which contained provisions that the Senate would never have passed, as appeared from its debate. The worst feature of Senator Henderson's bill was the 75% clause.

Unfortunately, the Senate let that stand, no one apparently noticing it; anyway, there was no discussion of it. However, some other amendments were made. By one of these the administration is limited exclusively to the substances named, and by another there may be no requisitioning of ores or metals the principal money value of which consists in minerals or metals other than those named in the act.

A rather unfortunate amendment is that which prevents the President from selling anything for less than the purchase price or production cost. With such a stipulation, the Secrétan syndicate in copper of 30 years ago would have been a great many years in liquidation. We can imagine the plight of the Government if it be overbought in ferromanganese, tin, and some other things, being unable to get out, even at a small sacrifice, while the going is good.

Another amendment provides for headquarters and offices for the administrative forces west of the Missouri River. And, finally, one limits salaries to the rates paid for similar or like services rendered in executive departments of the Government.

With these amendments, the bill was passed by the Senate after a rather perfunctory debate, and it now goes into conference. Further comment may well be deferred until the bill takes its final form.

Copper and Cotton

THE promise of a large crop of cotton this year has been blasted by unfavorable weather, and we are now confronted by the certainty of a short crop. Normally this would be followed by a further advance in price, as it was, although the latter was already high. But now the War Industries Board proposes to step in and fix the price for cotton, the immunity of which has heretofore been the subject of pungent comment. Immediately the Southern senators and representatives rose in rage and rushed to the White House to see about this iconoclastic idea of interfering with what has previously been sacrosanct. It may be conceived that the White House was embarrassed by this situation, but the President seems to be meeting it manfully.

However, the immunity of cotton heretofore has been akin to a scandal in our affairs. We compare it with copper, for the latter has been the chief scapegoat. Both copper and cotton are essential elements in ammunition. Copper is used for making the cartridge cases, cotton for making the explosive that is put into them. Copper is produced in the North and West by companies that are largely owned in New York and New England. Cotton is produced in the South, chiefly by individual planters. In the economic policy of both the Administration and of Congress there has been a mighty difference according to geography and a mightier one according to whether a group of, say, 20,000 people combine to do business together, or whether the same number undertake business individually.

The people in the West and North, where copper is produced, cannot escape the feeling that their industry has been arbitrarily handicapped, while that of the South has been left free. Really there is far more reason for fixing the price for cotton now than there ever was for fixing the price for copper. Cotton is a commodity of seasonal production. The planting of this year's crop was determined by the price for last year's, but before the real commodity price of last year's crop could be determined there were many speculative adjustments and maneuvers. In a situation like the present there would naturally be unusual turmoil and great profits by some shrewd and lucky people at the expense of those less shrewd and lucky. Such situations seldom develop in commodities of regular production, like the metals—at least not to the same extent—for they are never stocked up in the same way.

The Federal Trade Commission

THE independent press, ourselves included, has been scathing in criticism of the Federal Trade Commission under the chairmanship of William B. Colver. Some people, not perceiving the national danger in the policy of that body, have been surprised and even have thought the criticism was too harsh. Yet the same has been voiced on the floor of Congress by members who have been alive to the fact that this commission was attacking some interests for political purposes, while it was exonerating or being silent about others. The meat packers have been lately the special target of the commission. They are limited by agreement with the Food Administration to a profit of 9%. "If the packers made such profits as Henry Ford's motor company" said Senator Sherman, "the Federal Trade Commission would have been speechless with indignation." It has been pointed out that the Federal Trade Commission not only plays favorites but also that it is ignorant and malicious in its representations respecting interests against which it seeks to inflame the people. It has the right to pry into the affairs of all business enterprises, but it is so ignorant that it cannot understand the information that it commands. Last year it studied, among other things, the cost of producing copper, and blundered with the data, which in this case did not do the harm that might have been done, for its recommendations were overruled by the War Industries Board. Not so with its "study" of the cost of producing coal, which led Messrs. Baker and Daniels to repudiate the Lane-Peabody agreement, that did more than anything else to produce the coal crisis of last winter, and for which it is blamed by the Fuel Administration itself.

The indictment of this commission has ceased to be that of the press alone, or the unofficial charges of other bureaus of the Government, but has become that of the recognized and unprejudiced organ of the business of the country. The Chamber of Commerce of the United States sent to President Wilson, under date of Aug. 17, 1918, a communication in which it asserts that the Federal Trade Commission has ceased to perform the duties for which it was created and implies that it has, by reason of the attitude toward business that it has adopted and the activities of some of its members, become a menace to the welfare of the nation.

Lowering Haulage Costs

THE small capacity of cars used in many mines greatly increases the cost of train haulage, including that of loading and dumping. In this issue is described a mine car that has a capacity of 82 cu.ft., and yet can be lowered through a 4 x 5-ft. shaft compartment without difficulty. The Hecla car will doubtless require some modification to adapt it to local conditions. For some drifts it will be too wide, in view of its length, to make sharp turns, although it will go around a 28-ft. curve. But we are certain that, by using this type of design, many companies which at present are shuttling long trains of 1½-ton cars back and forth between the chutes and the skip pockets, in the mad attempt to keep up with the skips, will find that they can develop a car which will cut down their haulage costs considerably.

To use this type of car to best advantage, it is necessary to arrange the haulage track so that the trains run directly over the skip pocket, as the cars can then be dumped easily and rapidly. At many mines this can be accomplished only by rearranging the haulage drifts so that the ore trains will run across the skip pockets at the rear of the shaft stations. When new levels are opened, however, the pockets may be cut as inclined raises starting at a distance below the level sufficient to bring them out on the level far enough from the shaft so that their tops may be flared without weakening the latter. It is folly to blast out a skip pocket directly under the floor of a station, as is typical of present-day practice. The amount of ground thus taken out next to the shaft is greatly increased, and the pockets must be made much smaller than efficient operation demands.

At this time, when there is such a shortage of labor throughout our mining regions, we believe that the Hecla type of underground car is well worthy of serious consideration at most shaft mines in the West. Increasing the capacity of the car used in the trains will not only lower the haulage costs, but will greatly decrease the number of men usd on the haulage levels.

Sir William Ramsay

IN DR. RICHARD B. MOORE'S appreciation of Sir William Ramsay, which appears in the July issue of the *Journal of the Franklin Institute*, we find the following paragraph, which deserves a wider circulation and which we commend to the attention of those of our readers who have not already seen it:

> Ramsay's courage was another great asset. He was never afraid to say or write what he believed to be true, no matter what criticism might be aroused. On one or two occasions he made premature announcements that had to be taken back, but these were few and far between, and need not be remembered in connection with the magnificent series of actual discoveries that he gave to the world. It was this quality of courage more than anything else that made him the great man that he was. He had confidence in his own work; and when his results were contrary to those of others, he was not afraid to stand by them. On the other hand, he was equally willing to acknowledge a mistake when it was made.

Such a pen portrait will be valued even by technologists and engineers whose interest in Ramsay's achievements may be purely academic; the writer of the memoir sensed the principal reason for his success—the unwavering faith in his own work, the courage of his conviction. His persistent belief arose not from any superficial bias, but from an ingrained conviction that comes to all real students and investigators who remain true to their self-imposed task of leaving no stone unturned to add to knowledge, and to whom no fact is too insignificant to escape notice and painstaking classification.

As the exception is said to prove the rule, so the occasional acknowledgment of fallibility throws into bolder relief Ramsay's great contributions to physical and chemical science. Such initiative as his invites criticism, whereas commendation is usually held in reserve as a post-mortem tribute. There is only one way of avoiding adverse criticism, and that is to avoid making mistakes; and we learned recently that individuals in the latter category would be confined to those who are dead and those who attempt nothing.

Ramsay would have done little if he had remained content to echo the opinions of others—if he had tried to evade the responsibility attached to proclaiming his opinions before the proof was overwhelming. We are grateful to Dr. Moore for an appreciation of so eminent a colleague in the brotherhood of scientific endeavor—an appreciation that contains many lessons.

The record of the hearings before the Senate Committee on Mines and Mining on the War-Minerals Bill will be an addition to any mining library. It will be sent to any reader of the *Journal*, without charge, on application to our Washington correspondent—Paul Wooton, 307 Union Trust Building, Washington, D. C.

The article on "Ore Treatment in Colorado" that appeared in our issue of Aug. 31 was prepared by a member of our editorial staff. Inadvertently, acknowledgment was not made at the time of the source from which the various tables in the article were derived. These tables, as well as the table in the article on "Mine Adits in Colorado," were compiled from *The Mineral Industry* and *The American Mining Manual*, and acknowledgment of the use of these two references is made herewith.

BY THE WAY

The following extract from a recent communication is printed as received. We refrain from laying ourselves open to the accusation of having attempted "to gild refined gold." We therefore give it as it came:

> My dear sir
>
> I noticed your Add inreguard you were interested in securing corspondences from one in mining centers, who might keep you in tutch with the mining activity of The districts of importance, and it is with pleasher to the best of my ability from long years of experience in the mining fields and not haphazared guessing I will hope to give you such information in-which you are interested reguarding mining properties of merit and magnatude disclosing the earmarks of probable developing into dividen paying properties, that could be secured and equipted and, purchessed on right terms,
>
> Mind you I wish to impress you with the fact I cannot make a producing mine out of gaunge material five hundered miles away from any mineral zone, and above all I would be the last man to lead you to error or take up your valuable time in being devoted to a wildcat proposetion, or bring you on any expenctive rain-bow chases,
>
> I have studed this formation from early life in my teens. and their is no reason why I should make any Error's having carefull watched all the great mines of this state develope into the greatest dividen payers in the U S,
>
> In brief, their are a lot of oppertunities here to be taken up and if you are interested. I should indeed be pleased to go into further details with you. I will ashure you that I will not lead you to any expenctive errors, But I would suggest the best plan would be to send your engineer here and go over the different properties with me and select what would suite you.

What Your Liberty Bond Will Do

If you buy a $100 bond of the Fourth Liberty Loan you are lending the United States Government enough money to feed a soldier in France a little more than seven months. Or you have furnished enough money to give him a complete outfit of winter and summer clothing, including shoes and stockings, and slicker and overcoat and blankets, with enough left over to arm him with a good revolver. You have done that much to beat back the Hun.

It takes $35 more to arm him with a rifle with a bayonet on it, and if you buy a second $100 bond you furnish him this rifle and 1000 cartridges for it; and there will still be enough of your money left to purchase a good-sized bomb to throw in a dug-out, or demolish a machine gun, together with the Huns operating it.

The effort to separate Liberty Bond holders who are not familiar with stock and bond values from their Liberty Bonds has taken a new turn. The manipulators, instead of offering to buy the bonds at inadequate prices, offer in exchange for them stocks and bonds of various wildcat corporations, the face value of which is large but whose actual value is little or nothing.

Monthly Copper Production for 1918

This table is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo, Backus & Johnston and Kantanga companies, whose copper does not come to the United States.

MONTHLY CRUDE COPPER PRODUCTION, 1918

	May	June	July	August
Alaska shipments........	6,069,642	3,980,197	3,994,204	4,245,557
Arizona:				
Arizona Copper.........	4,130,000	3,700,000	4,000,000	4,300,000
Cons. Ariz. Smelting.....	2,000,000	1,750,000	1,430,000	1,250,000
Inspiration...........	10,250,000	10,300,000	9,000,000	9,000,000
Magma..............	1,169,083	947,128	800,000	900,000
Miami.............	5,100,408	4,692,554	4,793,082	5,374,198
New Cornelia (*a*)........	2,880,000	2,822,000	2,300,000	2,838,000
Old Dominion...........	3,239,000	3,368,000	2,533,000	2,064,500
Ray.............	8,120,000	7,736,559	7,300,000	6,625,000
Shannon..............	802,000	672,000	794,225	708,000
Shattuck Arizona........	840,999	805,310	672,024	682,861
Other Arizona...........	27,491,118	25,823,920	24,727,751	26,363,078
California:				
Mammoth..............	1,328,000	1,196,000	1,330,000	1,320,000
Michigan:				
Calumet & Hecla........	12,944,732	11,699,212	11,118,426	10,718,520
Other Lake Superior (*b*)..	7,000,000	7,000,000	7,000,000	7,000,000
Montana:				
Anaconda..............	28,400,000	25,800,000	25,400,000	24,900,000
East Butte	2,208,300	1,999,760	2,076,460	1,714,358
Nevada:				
Mason Valley...........	1,759,728	1,224,485	1,190,177	1,032,702
Nevada Cons...........	7,000,000	7,250,000	6,400,000	6,500,000
New Mexico:				
Chino.................	5,987,340	6,706,474	6,310,396	5,065,818
Utah:				
Utah Copper..........	18,200,000	18,500,000	16,021,766	19,920,947
Eastern smelters (*b*).....	1,750,000	1,750,000	1,750,000	1,750,000
Total reported.......	158,670,350	149,723,599	140,941,511	....
Others, estimated........	22,400,000	17,000,000	17,350,000	....
Total United States....	181,070,350	166,723,599	158,291,511	....
Imports, ore and concentrates, etc............	10,886,293	11,624,275	12,898,436	....
Imports in blister, etc....	27,892,478	13,801,332	19,543,854	....
Grand total..........	219,849,121	192,149,206	190,733,801	....
British Columbia:				
Granby Cons...........	3,808,125	3,438,521	2,167,077	2,820,207
Mexico:				
Boleo.................	1,873,760	1,322,720	1,697,360	....
Cananea..............	4,100,000	4,100,000	5,000,000	5,000,000
Other Foreign:				
Braden................	6,758,000	8,292,000	7,036,000	6,690,000
Cerro de Pasco.......	6,166,000	5,874,000	5,238,000	5,786,000
Chile...............	7,506,000	9,280,000	7,556,000	....
Katanga	5,180,810	3,505,315	4,894,200	4,894,200
Backus & Johnston......	2,053,818	2,096,727	1,324,823	....

(*a*) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery, which is included under "Other Arizona." (*b*) Estimated.

The item "Alaska shipments" gives the official figure of the U. S. Department of Commerce. Kennecott production for May, June, July and August was 3,404,000, 4,044,000, 5,090,000 and 5,280,000 lb., respectively.

The production of the United States by months since the beginning of the year was as follows:

	1918
January......	165,431,568
February	160,011,364
March	185,525,168
April	163,207,096
May	181,070,350
June	166,723,599
July	158,291,511

Bonuses Paid to Its Employees engaged in military service by the De Beers Consolidated Mines aggregated $869,226 on June 30, 1917, according to its annual report. The number of its employees in active service as of that date was 354, and the casualty list totaled 182, of which 62 were known to be fatal.

NEW PUBLICATIONS

The Use of Permissible Explosives in the Coal Mines of Illinois. By James R. Fleming and John W. Koster. Pp. 110; illus. Bull. 137, U. S. Bureau of Mines, Washington, D. C.

Abstracts of Current Decisions on Mines and Mining from September to December, 1917. By J. W. Thompson. Pp. 147. Bull. 164, U. S. Bureau of Mines, Washington, D. C.

Siliceous Dust in Relation to Pulmonary Disease Among Miners in the Joplin District, Missouri. By Edwin Higgins, A. J. Lanza, F. B. Laney and George S. Rice. Pp. 116; illus. Bull. 132. U. S. Bureau of Mines, Washington, D. C.

Bibliography of Petroleum and Allied Substances, 1915. By E. H. Burroughs. Pp. 147, U. S. Bureau of Mines, Washington, D. C.

Recovery of Gasoline from Natural Gas by Compression and Refrigeration. By W. P. Dykema. Pp. 123; illus. Bull. 151, U. S. Bureau of Mines, Washington, D. C.

Bibliography of Petroleum and Allied Substances, 1915. By E. H. Burroughs. Pp. 147. Bull. 149, U. S. Bureau of Mines, Washington, D. C.

The Lake Clark-Central Kuskokwim Region, Alaska. By Philip S. Smith. Pp. 162; illus. Bull. 655, U. S. Geological Survey, Washington, D. C.

The Structural and Ornamental Stones of Minnesota. By Oliver Bowles. Pp. 225; illus. Bull. 663, U. S. Geological Survey, Washington, D. C.

Clay-Working Industries and Building Operations in the Larger Cities in 1916. By Jefferson Middleton. Mineral Resources of the United States, 1916. Part II. Pp. 73. U. S. Geological Survey, Washington, D. C.

Southern California Floods of January, 1916. By H. D. McGlashan and F. C. Ebert. Water-Supply Paper 426, U. S. Geological Survey, Washington, D. C.

The Cosna-Nowitna Region, Alaska. By Henry M. Eakin. Pp. 54; illus. Bull. 667, U. S. Geological Survey, Washington, D. C.

The Geology of the Tuapeka District, Central Otaga Division. By P. Marshall. Pp. 72; illus. Bull. 19, New Zealand Department of Mines, Geological Survey Branch, Wellington, New Zealand.

The Quaternary Geology of Southeastern Wisconsin, with a Chapter on the Older Rock Formations. By William C. Alden. Pp. 356; illus. Prof. Paper 106, U. S. Geological Survey, Washington, D. C.

Annual Report of the Mines, 1917. Pp. 79; illus. Department of Public Works and Mines, Halifax, N. S.

The Evolution of National Systems of Vocational Re-education for Disabled Soldiers and Sailors. By Douglas C. McMurtrie. Pp. 319, illus. Bull. 15, Federal Board of Vocational Education, Washington, D. C.

Petroleum, Asphalt and Natural Gas. Pp. 248; 5 x 7½; illus. Bull. 14. Leather. $2. Kansas City Testing Laboratory, Kansas City, Mo.

The American Fertilizer Hand Book; the Standard Reference Book and Directory of the Commercial Fertilizer Industry and Allied Trades. Pp. 456; 7½ x 10½; illus.; $1.50. Ware Bros. Co., Philadelphia, Penn.

Measuring the Temperature of Gases in Boiler Settings. By Henry Kreisinger and J. F. Barkley. Pp. 72, illus. Bull. 145, U. S. Bureau of Mines, Washington, D. C.

A pamphlet written for the purpose of assisting in the efficient use of various fuels. Errors in the ordinary methods of measurement of boiler-gas temperature are pointed out. The necessary instruments are described, including the thermocouple, for which construction and calibration notes are given. The results of a number of tests with various types of boilers are tabulated.

La Pratica del Forno Elettrico. Alfred Tiburzi. 4 x 6, pp. 259, illus. Ulrico Hoepli, Milano, Italy.

A short review of electric furnace practice. Arc and resistance furnaces are described, as well as their operation and control. The book is in Italian, and will therefore be of little practical use to American metallurgists. Those interested in the development of electric furnaces in foreign countries, however, should find the treatise of interest and value.

The Salt Creek Oil Field, Wyoming. By Carroll H. Wegeman. Pp. 52, illus. Bull. 670, U. S. Geological Survey, Washington, D. C.

Descriptive of an oil field producing 10,000 bbl. daily—the largest in Wyoming. The history of the development of the district, drainage, water supply and geology are among the subjects dealt with. The source, distribution and yield of oil, and flow and operation of wells are described. Future production is estimated.

Analysis of Mine and Car Samples of Coal Collected in the Years 1913 to 1916. By Arno C. Fieldner, Howard I. Smith, J. W. Paul and Samuel Sanford. Pp. 478, illus. Bull. 123, U. S. Bureau of Mines, Washington, D. C.

Samples of coal are analyzed by the Bureau of Mines from time to time, and the results applied in connection with investigations into the causes of accidents in mines, geological features, value of the product, and other matters. The bulletin under review gives analyses and descriptions of samples collected from 1913 to 1916 inclusive. Analytical methods employed are described.

Geology and Paleontology of the Raton Mesa and Other Regions in Colorado and New Mexico. Papers by Willis T. Lee and F. H. Knowlton. Pp. 450, illus. Prof. Paper No. 101. U. S. Geological Survey, Washington, D. C.

Any one interested in the coal measures of Colorado and New Mexico will find in this professional paper important reference to this subject.

Mineral Springs of Canada, Part II. The Chemical Character of Some Canadian Mineral Springs. By R. T. Elworthy. Pp. 173, illus. Bull. 20, Canada Department of Mines, Ottawa, Canada.

Details of the composition of a number of samples of Canadian mineral waters, prefaced by much general information on the subject, including definitions, methods of recording analyses, classification system of collection of samples, and analytical systems. A bibliography is appended.

Report of the Clay Resources of Southern Saskatchewan. By N. B. Davis. Pp. 93, illus. Canada Department of Mines, Mines Branch, Ottawa, Canada.

An account of field investigations and laboratory tests on a large number of clays collected in southern Saskatchewan. The geology of the district is described and general data of interest are included. The information on the characteristics of various classes of clay, their preparation and manufacture, will be of value to technologists and merchants An excellent map of the district is appended.

Annual Report of the Mineral Production of Canada During the Year 1916. By John McLeish. Pp. 343. Canada Department of Mines, Mines Branch, Ottawa, Canada.

A detailed collection of statistics of the production, exports and imports of minerals during 1916, the fiscal year terminating on Mar. 31. Comparative tables are given and also production by province. The various metals are considered under separate sections, and complete data of non-metallic and clay products and structural materials are included.

Report on Mining Operations in the Province of Quebec During the Year 1917. Pp. 147, illus. Department of Colonization, Mines and Fisheries, Quebec, Canada.

Quebec's mineral production for 1917 shows a 22% increase in value over the previous year's output. Even gold and silver production was raised, but this is accounted for by the fact that both metals come from zinc-lead and copper ores, and are recovered as byproducts. Asbestos and graphite output has increased considerably. Details of the individual operations of the various mines during the year are given, together with notes on economic geology and other pertinent information. A list of the principal operators and owners of the mines and quarries in the province will be found useful for reference purposes.

Mineral Resources of Alaska. Report on Progress of Investigations in 1916. By Alfred H. Brooks and others. Pp. 469, illus. Bull. 662, U. S. Geological Survey, Washington, D. C.

This publication deals at considerable length with the progress made in Alaska during 1916, and contains complete statistics. An informative article on the mining industry follows a preface and administrative report, all three being contributed by Alfred H. Brooks, who has handled the subject in an able manner, basing his information largely on an intimate personal knowledge of the country. Special articles on placer deposits on the Porcupine, Tolovana, Anvik-Andreafski and other districts, and on the Seward Peninsula are presented. Other monographs deal with lode deposits containing either gold or copper. A detailed account of water-power investigations in southeastern Alaska is also given.

The Arbouin Copper Mines at Cardross, on the Chillagoe Mineral Field, North Queensland. By Lionel C. Ball. Pp. 70, illus. Publication No. 261, Department of Mines, Queensland Geological Survey, Brisbane, Australia.

This bulletin deals with a copper district situated about 150 miles from Cairns, North Queensland, which was discovered in 1872, but was neglected until 1897. A company was organized in 1909 to work the principal deposits, and a blast furnace blown in, early in 1912, which operated intermittently until the outbreak of the war. Statistics show that it has cost more than twice the value of the product to obtain an output. Freight from the coast absorbed $50 per ton of material hauled. Sinking a three-compartment shaft probably cost $125 per foot; driving, about $50. Concentration of ore is advisable, but smelting operations have shown that success is attainable. A carefully arranged synopsis of the geology of the ore deposits and the mineralogy of the district gives complete information in this connection, from which a reliable estimate of the future worth of this isolated mineral field may be made.

Concrete Engineer's Handbook: Data for the design and construction of plain and reinforced concrete structures. By George A. Hool, Nathan C. Johnson and others. 6 x 9, pp. 885, illus. $5. McGraw-Hill Book Co., New York.

A distinctive feature of the book is that the authors have supplemented their own work on the subject by chapters and contributions by other specialists dealing with less known phases of concrete and reinforced-concrete construction. The section on material is informative, well arranged and comprehensive. General methods of construction, plant requirements, and properties of mortars and concrete are clearly described and illustrated. Details of buildings, bridges, arches, walls and chimneys form an important proportion of the book, and are considered both with reference to theory and design, and to construction. A special section on dams merits attention; and the information on siphonic spillways is new and from an authoritative source. The general arrangement of the book —the division into sections and subsequent paragraphing— is excellent. Although primarily intended for concrete engineers, the volume will prove of considerable value as a reference book when concrete or reinforced-concrete work is under consideration.

A Handbook of Briquetting, Vol. II. Briquetting of Ores, Metallurgical Products, Metal Swarf and Similar Materials, Including Agglomeration. By G. Franke. Translated by Fred. C. A. H. Lantsberry. 6 x 9, pp. 214, illus. J. B. Lippincott Co., Philadelphia, Penn.

A companion volume to a previous publication (Vol. I) that dealt mainly with the briquetting of mineral fuels. The book, however, is complete in itself and covers in detail the characteristics of crude ores and prepared materials suitable or unsuitable for briquetting; the object of the process, and the particular requirements to be observed to insure successful results. Byproducts from metallurgical reduction works, and swarf (filings and like materials) from workshops are classified. Complete data of briquetting practice, with or without the use of binding materials, for a large number of products, are given in tabulated form and approved practice is subsequently elaborated in greater detail. Binding materials are discussed; and drying and moistening machines described.

The mechanical aspect of the question is covered by descriptions of various briquetting machines. The book concludes with accounts of typical plants, which mostly reflect German and Norwegian practice, together with details of calcining in channel ovens. Tubular sintering furnaces are also considered.

The volume will be of value as a reference book to those who are concerned with briquetting operations, or who are interested in the possible application of the practice to their products, as exemplified by European methods.

The Twenty-eighth Annual Report of the Transvaal Chamber of Mines for the Year 1917. 7 x 9½, pp. 506. Transvaal Chamber of Mines, Johannesburg, South Africa.

The report contains data of monthly and annual (1917) output from the mines of the Rand and other parts of the Transvaal, with complete information as to the mill equipment in operation at each property. Sources of the gold are shown, according to the treatment method employed, and this is followed by a systematized statement of working costs and profits. A complete list of liquidations and companies registered in the country is given. Tables of labor distribution, salary and wages earned, casualties, and death rate, with average and proportionate (white and native) number of workmen employed, are presented in convenient form. Complete statements are appended of dividends paid, and past and present production of the mines.

The activities of the Chamber in dealing with economic problems are shown in accounts of progress made in the treatment and prevention of miners' silicosis, and in connection with experimental work in dust allaying. Social welfare work has been carried out in unusual directions, and ordinances have been passed improving the former regulations with regard to holiday leave on pay for all employees.

The book contains a mass of statistical information published in a manner that might well be adopted in many other mining districts. It will be acceptable to those who seek information on mining operations in the Transvaal.

Mortality from Respiratory Diseases in Dusty Trades (Inorganic Dusts). By Frederick L. Hoffman. Pp. 458. Bull. 231, Industrial Accidents and Hygiene, Series No. 17, Bureau of Labor Statistics, U. S. Department of Labor, Washington, D. C.

Chapter IV of this complete authoritative review deals with the mineral industries (mines, quarries, ore reduction and smelting). Frederick L. Hoffman, in discussing the limitations of occupational statistics, says:

> Much has been written in general terms on the health of miners and other mine employees, which, for reasons stated requires to be accepted with extreme caution. No very satisfactory progress has been made in the perfection of vital statistics to the extent that the relative health and mortality of specfic employments under and above ground can be ascertained, especially with regard to the relative incidence of pulmonary tuberculosis and non-tuberculous respiratory diseases. As previously pointed out, the health-injurious conditions are frequently limited to a comparatively small group of underground employees, as best emphasized in the case of the rock drillers of the gold mines of the Transvaal. All general conclusions concerning the relation of the industry in its entirety or its principal branches must be considered inadequate for medical and public health purposes, or as a basic consideration for protective legislation.

A complete review of such statistical matter and reports as have been collected, together with a discussion of preventative measures, is given. The dust hazards of different kinds of mining are separately considered. To mine managers and employers of underground labor there is much of value in this part of the bulletin.

Personal

Have You Contributed to the Association of the 27th Engineers?

H. A. Wheeler is investigating the manganese resources of Missouri.

George A. Packard has left Boston for Ontario for a few weeks' examination work.

Arthur Thacher, of St. Louis, Mo., attended the Institute meeting in Colorado.

Philip N. Moore has returned to St. Louis, Mo., from a two months' trip to Alaska.

F. G. Stevens, of Toronto, Ont., has been examining coal properties in Kentucky and West Virginia.

Karl Eilers, of the American Smelting and Refining Co., has been in Salt Lake City, in connection with business for his company.

G. C. Bateman, general manager of the La Rose Mines, Ltd., Cobalt, Ont., has been examining properties in Alberta and British Columbia.

D. C. Jackling and **C. M. MacNeill,** of the Utah Copper Co., were in Salt Lake City recently for the purpose of inspecting the company's property.

C. Carleton Semple was in New York recently, having arrived in Seattle, Wash., last month after a trip through southwestern and southeastern Alaska.

J. C. Houston, formerly assistant manager of the Dome Mines, Ltd., at Porcupine, Ont., has been appointed manager of the Kirkland-Porphyry gold mine.

R. H. Seip, safety engineer for the New Jersey Zinc Co. at Franklin Furnace, N. J., attended the meeting of the National Safety Council at St. Louis last week.

Frank W. Sansom, mining engineer, of Joplin, Mo., has been made lieutenant colonel of the Second Regiment, Missouri State Guard. He served in the Spanish-American War.

Clemence W. Hippard and **Han Ho Huang** have been appointed research graduate assistants in mining engineering at the engineering experiment station of the University of Illinois.

Frederick E. Burbidge, manager of the Federal Mining and Smelting Co., of Wallace, Idaho, has returned from Quantico, Va., where he visited his son, who is a lieutenant of marines.

R. M. Jones, mining engineer of Goldfield, Nev., has been commissioned a captain of engineers and at present is with Company 3, Engineer Officers' Training School, Camp Humphreys, Virginia.

Earnest Bamberger has returned to Salt Lake City from Washington, where he has been engaged in war work, to take charge of his interests in this section, including the Ontario mine, at Park City.

O. F. Brinton, of Baxter Springs, Kan., has resigned as manager of the Admiralty Zinc Co., with properties in the Oklahoma section of the Joplin district, and will, it is understood, join the U. S. Army.

N. H. Getchell has returned to his mines in the Senator district, Arizona, after a long stay in a Chicago hospital, that kept him from his seat in the Arizona Senate during the recent extra legislative session.

Roy H. Allen, mining engineer and manager for the Tennessee Mining Co., at Joplin, Mo., has been notified of his acceptance in the Quartermaster Department of the Aviation Service, to hold the rank of captain.

George W. Moore, for the last seven years connected with the American Metal Co. as buyer in the Joplin district, has resigned to become head of the buying department of the Eagle-Picher Lead Co., with offices in Joplin.

Harrison E. Clement has recently been appointed general manager of the American Mining and Exploration Co., operating the Imlay and Rye Patch mines, in the Humboldt district, with headquarters at Imlay, Nevada.

William H. Kemp, of South Boston, Mass., and **William C. Lapham,** of Quincy, Mass., have returned East from a visit to Los Angeles, Calif., and Jerome, Ariz., made in connection with the recently compromised Hull Copper Co. litigation.

Sidney L. Shonts, mining engineer, of Wallace, Idaho, has been commissioned by the Government to investigate chromite deposits in Idaho and eastern Oregon. He is now in Oregon in response to requests to examine several discoveries of promise.

A. D. Hughes, manager of the dredging operations of the Yukon Gold Co. on Prichard Creek, Idaho, has enlisted in the Engineer Corps of the Army and will report for duty at Camp Humphreys, Va. His successor is **D. H. Perry** of San Francisco.

W. M. Tappan, formerly superintendent of the Hull-Rust mine at Hibbing, Minn., and for several years assistant superintendent of the Hibbing district, has been promoted to be general superintendent of the district for the Oliver Iron Mining Co.

Oscar Lachmund has resigned as general manager of the Canada Copper Corporation and will be succeeded by **Hugh R. Van Wagenen,** of Denver, Colo. Mr. Van Wagenen, has been in British Columbia looking over the situation and is to return to take up his new duties in a few weeks.

Harold C. E. Spence recently returned to his headquarters at the Ritz Carlton Hotel, Montreal, after spending several months in Labrador, Newfoundland, and Nova Scotia on work in connection with the oil-shale deposits in those places. He is now at the Mount Royal mines, at Duncan, Arizona.

Carlos W. Van Law has resigned as a vice president of the United States Smelting, Refining and Mining Co., and announces that he will engage in a general consulting practice, with especial attention to organization and management of mining and metallurgical enterprises. Mr. Van Law has been spending most of his time for the last two years in reviving the Crimora manganese mines in Virginia, which used to be famous as the largest domestic producer of this ore. Mr. Van Law has also been doing some work for Governmental departments in Washington.

Obituary

R. A. Kelso, a pioneer of Ontario and discoverer of the Alexo nickel mine, died in Vancouver, B. C., early in the summer. The townsite of Kelso, Porcupine, was named after him.

E. A. Ubrey, formerly active in mining affairs in Utah, died suddenly in Salt Lake City, on Sept. 1, at the age of 71. He was one of the organizers of the Alta Tunnel and Construction Co., of Utah.

Societies

American Association of Engineers has issued a directory of engineers, giving a brief synopsis of the experience and training of all members of the association, for the good of the members and as an aid to the employer of engineers. Cloth; 6 x 9 in.; pp. 192; $2.

Institute of Metals (British) held its autumn meeting on Sept. 10-11 in London. The following papers were presented: "The Effect of Progressive Cold-work upon the Tensile Properties of Pure Copper," by W. E. Alkins; "The Resistance of Metals to Penetration Under Impact," including a note on "The Hardness of Solid Elements as a Periodic Function of Their Atomic Weights," by Prof. C. A. Edwards; "Grain Growth in Metals," by Z. Jeffries; "Rapid Recrystallization in Deformed Non-Ferrous Metals," by D. Hanson; "The Influence of Impurities on the Mechanical Properties of Admiralty Gun Metal," by F. Johnson; "Rapid Method of Estimating Phosphorus in Bronzes," by T. E. Rooney; "A Peculiar Case of Disintegration of a Copper-Aluminum Alloy," by R. Seligman and P. Williams; "Annealing Cold Rolled Aluminum Sheet by Abbreviated Exposures at Various Temperatures," by R. J. Anderson; "Alloys of Copper and Zinc: an Investigation of Some of Their Mechanical Properties," by F. Johnson; and "Use of Liquid Fuel in the Foundry," by Capt. A. E. Plant.

Technical Schools

New York University is about to embark on a movement for enlarging its engineering school to coöperate more fully with the Government in war service and in reconstruction service after the war. Chancellor Elmer E. Brown states that plans for the extension of the school of applied science of the university include the erection of a new engineering building on the campus at 181st St., New York, on a tract recently given to the university by Mrs. Russell Sage. The movement is regarded as a war emergency measure. The council of the university and the faculty of the engineering school agree as to the need of keeping engineering students in training during the war, and of introducing added facilities for technical instruction. Dean Charles H. Snow of the school of applied science states that the attendance in engineering schools has fallen off about 35%. During the last summer New York University has trained 1800 National Army men, 600 at a time, as gas-engine workers, automobile repairers, truck chauffeurs, blacksmiths, carpenters, machinists concrete workers, radio operators, and in other crafts. These men, on completion of their training, were assigned to different army units.

Industrial News

Metals Disintegrating Co., Inc., has removed from 3 South William St. to 62 Broadway, New York.

Vulcan Steel Products Co., 120 Broadway, New York, will discontinue the publication of "Vulcan" with the August issue for the period of the war. Governmental restrictions concerning house organs and the need for conserving labor and material render this step advisable.

Manufacturers' Catalogs and supplementary literature are needed at U. S. A. General Hospital No. 9 at Lakewood, N. J., for re-educational work among disabled soldiers. The courses studied are those given in any polytechnic school and cover 40 or more subjects. The catalogs should be addressed to the Chief of Educational Service at the hospital.

Industrial Electric Furnace Co., Chicago, makers of the Snyder electric furnace, are installing a five-ton furnace in the plant of the Zimmerman Steel Co., Bettendorf, Iowa. It is a three-phase furnace designed for acid operation and will be used for general work. C. H. Atherton, manager of the latter company, ordered the installation to replace the converter which they had been using.

Jeffrey Manufacturing Co., Columbus, Ohio, has reopened its branch office in Cleveland, Ohio, at 437 Leader-News Bldg., which will be in charge of P. C. Dierdorff and C. B. Reed. Messrs. Reed and Dierdorff have both had years of successful sales and engineering experience in the manufacture and application of Jeffrey products and are especially qualified to render advisory service to customers in solving elevating, conveying, crushing and mining-machinery problems.

New Patents

United States patent specifications listed below may be obtained from "The "Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum, Process of Making Nitride of. Mark Shoeld, Chicago, Ill., assignor to Armour Fertilizer Works, Chicago, Ill. (U. S. 1,274,797; Aug. 6, 1918.)

Ball Mill. Donald H. Fairchild, Denver, Colo. (U. S. No. 1,275,184; Aug. 6, 1918.)

Concentration—Jig. Henry W. Faust, Seattle, Wash., assignor to Sybil B. Faust. (U. S. No. 1,275,235; Aug. 13, 1918.)

Copper, Method of Producing Commercially Pure. Charles S. Bradley, New York, N. Y. (U. S. No. 1,275,374; Aug. 13, 1918.)

Furnace, Electrical Induction. Oluf Christian Böckman, Notodden, Norway. (U. S. No. 1,275,206; Aug. 3, 1918.)

Metals, Production of Finely Divided. Thomas A. Edison, Llewellyn Park, West Orange, N. J., assignor to Edison Storage Battery Co., West Orange, N. J. (U. S. No. 1,275,232; Aug. 13, 1918.)

Mine Ventilation, Means of. Stanley Nettleton, Johannesburg, Transvaal, South Africa. (U. S. No. 1,274,438; Aug. 6, 1918.)

Phosphorus, Manufacture of. Harry Orlando Hickman Wenman, Bishop's Castle, England. (U. S. No. 1,274,479; Aug. 6, 1918.)

Platinumizing Metal Surfaces, Process of. Benjamin B. Crombie, Port Chester, N. Y. (U. S. No. 1,274,995; Aug. 6, 1918.)

Zinc. Process for Utilizing the Residues Obtained in the Distillation of. Rudolf Köhler and Otto Baltin, Lipine, Germany. (U. S. No. 1,275,045; Aug. 6, 1918.)

Editorial Correspondence

SAN FRANCISCO—Sept. 10

Petroleum Production in California in June totaled 8,486,932 bbl. During the month, 42 new wells were completed, having a total initial daily production of 5492 bbl. The total number of wells producing in the month was 8292, having a total daily production of 282,896 bbl., an increase over May of 7763 bbl. There was a total of 56 new rigs installed and 382 wells were being drilled. Six wells were abandoned. Field and pipe-line stocks, including crude and residium, at July 1, totaled 24,233,520 bbl., an increase from June 1 of 256,602 bbl. of crude and a decrease of 22,790 bbl. of residium, or a total increase of 233,812. These figures are taken from the summary issued by the Pacific Coast Petroleum War Service. The report of the state oil and gas supervisor, R. P. McLaughlin, issued Aug. 31, shows 17 new wells ready to drill during August, making a total of 514 since Jan. 1, compared to 724 for the same period in 1917, a decrease of 29%. At the end of 1917 every oil-producing county in the state registered an increase in average daily production for the year. But the figures for June, 1918, although showing an increase over May in average daily production, show an appreciable decrease in some of the important fields as compared to June, 1917. The increase in June, 1918, over May, is due to large increase in other fields and development in the new coast fields.

Temporary Labor Shortage in the mines of Nevada County has been overcome by the return of a large number of mine laborers from the shipbuilding plants, whither they had gone beguiled by higher wages. Many of them soon learned that the cost of living and the various attractions for the entertainment of workingmen drew so heavily upon their earnings that they were unable to save as much per month as they had at the mines. No doubt hundreds of the men were enticed from the mining camps by the fear of curtailment in gold mining on account of the high cost of operation. Recently this fear has given way to the hope that the Government will do something to relieve the gold-mine operator, and many of the miners have come to realize that they themselves have been largely responsible for the reduction in gold production, for shortage of labor has been one of the effective factors in reducing output of the mines. In addition to these causes for the return of the miners to the mining camps, the fact that their jobs in the mines are of a permanent character, and the more profitable in the long run, has created an influence difficult to escape by workmen who have the future welfare of their families at heart. The manufacturing center have their attractions, which are costly; the mining camps their home influences and interests, which are economic. But the men had become restless and impatient, and not a few of them persuaded themselves that shipbuilding was a more patriotic employment than mining.

DENVER—Sept. 11

Tungsten Mining in Colorado appears to be on a stable basis, although it is not as active as during the boom days of 1917. At the present time the demand is strong, and the price ranges from $18 to $22 a unit. All of the developed properties are running at full capacity, and the mills of the Wolf Tongue, at Nederland, the Long Chance, on the Beaver; the Primos, at Lakewood; the Rare Metals, at Rollinsville; the Vasco, at Tungsten, the Red Sign, at Ferberite, and the Lucky Two, at Boulder, are running steadily. At Boulder the Tungsten Production Co. is working to capacity, manufacturing ferrotungsten for which there is a good market, and the Black Metals Co. is turning out large quantities of tungstic acid.

Fluorspar Mining in Colorado is greatly stimulated by the demand for this mineral on account of its use in making war munitions. The mineral is mined near Jamestown, in Boulder County, at the Barstow mine, in San Juan County, and elsewhere in the state. The Wano mill at Jamestown has been overhauled and changed so as to concentrate fluorspar and its output of this ore will be increased to 125 tons daily as soon as the plant is operating at full capacity. The present output is from 50 to 60 tons daily. Lack of transportation facilities has prevented greater production of this ore, which must be hauled to Boulder in auto trucks over a poor wagon road. At present a movement is on foot to build a new and better road. The concentrate is shipped to Chicago, Pittsburgh, and other Eastern points.

The New Draft Bill is of vital interest to Colorado mine operators, especially as it refers to classification of labor. Representative mining men have interviewed General Crowder and Chairman Neave of the man power committee of the U. S. Employment Service, in whose hands is placed jurisdiction over problems involved in the new draft. The Provost Marshall is determined to place all physically able men from 18 to 36 into military service at once except those shown to be absolutely necessary to production in the industries. Mine operators are asked to make suggestions promptly to assist in placing valuable men in deferred classes. The United States Employment Service plans a campaign backed by a declaration of President Wilson, to urge all men engaged in necessary work in mines, oil fields and industries producing raw or manufactured materials, to ask for deferred classification. All decisions as to classification will be made by district boards and not by local boards. The State Advisory Board of the U. S. Employment Service in Colorado will nominate three advisors to sit with the District Board, one to pass on agricultural questions, one on industries, and one on commercial and professional pursuits. The advice of these men will probably count heavily in decisions of district boards; hence the selection of the industrial advisor is important. As these appointments will be made at an early date, operators should take prompt measures to see that suitable appointments are made. It is desired that representative men be appointed to fill these positions. Mine operators and metal producers are urged to at once check up on all employees in order to place in the hands of the district board individual personal information regarding each man essential to each mine or oil field.

SALT LAKE CITY—Sept. 13

Mining, Development and Operating Costs to Utah metal producers have risen considerably during the last six months, and show an increase of at least 33 to 50 and in some cases up to 65% between Jan. 1 and July of the present year. During that period the rise in the price of some of the principal supplies has been approximately as follows: Powder, from $20.88 to $24.75; fuse, $28.50 to $53.75 per 1000 ft.; caps, $18 to $24 per 1000; steel, 11c. to 23c. per lb.; timber, $28.50 to $34.75 per 1000 ft. Also, wages have increased 75c. a shift within this time, the present scale being: Machine men, $5.25; machine helper, $5; hand miner, $5; mucker, $4.75; timberman, $5.25; trammer, $4.75; laborer, $4. In addition, there has been an increase of 25% in freight rates, and an increase of 55% in the freight rate on bullion to Eastern refineries, all of which must be paid by the producer. The result has been a decrease in production, especially of low-grade ores, and some companies have discontinued the mining of copper. The Utah Chapter of the American Mining Congress, acting for Utah metal producers, has requested that the Railroad Administration restore the old rates on ores of an actual value of $20 or less. The matter is now under consideration, and favorable action is hoped for. If the rates on low-grade ores are restored, the resultant increased production of ores of this character will add to the output of higher-grade ores also, as more high-grade ores developed in connection with low-grade bodies will be shipped.

RENO, NEV.—Sept. 7

Secondary Mining Education for men employed in metal mines and mills was first introduced by Nevada and is now conducted as an extension department of the University of Nevada. The system consists of five district schools. Four of these are permanently situated at Virginia City, Tonopah, Goldfield and Ely, and the fifth is a moving school which is at present in session at Yerington, but is free to go to any camp in Nevada where the demand is sufficient. The object of Nevada's secondary mining schools is to enable working miners and millmen to fit themselves for higher positions without stopping work. The only requirement for entrance into these schools is the ability to talk and read English, and the instruction is elementary and practical in character. Thirty-seven courses are offered, and suggestions are made for the grouping of these courses to train for different positions. Courses and groupings may be obtained by writing to the Director of the Mackay School of Mines at Reno, Nevada.

PHOENIX, ARIZ.—Sept. 10

Handbills Calling for a General Strike in the Globe-Miami and the Jerome districts have been circulated. They announced the purpose of the proposed strike to be the forcing of the release of Thomas J. Mooney, William D. Haywood and others now in custody, including members of the I. W. W. recently convicted in Chicago for violation of the Espionage Act.

The State Corporation Commission has been petitioned by 3000 men working in the copper mines and smelteries of the Miami district to investigate water and electric-light service rates. Complaint is made against five water companies and also against the city of Miami. The commission has asked the water companies to supply data as to costs and earnings and will soon arrange for a hearing.

WALLACE, IDAHO—Sept. 7

Scientific Ventilation of deep workings is receiving the attention of Coeur d'Alene operators. The Federal Mining and Smelting Co. has taken the lead in this matter at the Morning mine, and is now delivering fresh air at the rate of 200 cu. ft. per min. per man employed. Robert N. Bell, state mine inspector, recently made an exhaustive investigation of the system adopted by the Anaconda company at Butte, and finds the system well adapted to meet conditions in this district. Its essential features, as described by Mr. Bell, are smooth-lined main conduits, plenty of blower capacity, and a sufficient number of air doors to direct its equal distribution underground and exhaustion back to the surface. According to Mr. Bell, there are no natural rock temperatures in Coeur d'Alene mines above 80 degrees.

Official Authority has been given the Oregon-Washington R. R. & Navigation Co. to construct a nine-mile branch up Pine Creek. The construction of this line was started last autumn, but during the winter high water carried out the completed track. By the time conditions were favorable to resume construction, the Government had taken over all railroads and suspended extension of new lines. Three months ago, through representations made by mining companies on Pine Creek, Director-General McAdoo authorized the expenditure of the original estimate, $300,000, for the completion of the branch. Following his action, the railroad company made a new survey, changing the grade to avoid damage by high water, which, with the increased cost of labor and material, brought the estimated cost up to about double the original figure. Confronted with this additional expense, the railroad company was unwilling to proceed without further authorization. This was recently received from Judge R. S. Lovett, Administrator of Railroads for the Government, and the enterprise will be taken up without further delay. Among the shipping mines that will be served are the Douglas, Constitution, Nabob and Highland-Surprise.

BUTTE, MONT.—Sept. 13

Efforts to Increase Copper Production are handicapped on account of the lack of skilled miners. There is not a property in the district that could not give employment to more men. With the new registration, several thousand miners will be subject to draft, and unless some concentrated effort is made to have them exempted, the production before the close of the year will be considerably lower than at present. Many of the miners are married men with families, and they will not be called upon for the present, but the majority of the men employed in all the mines are single, and they are surely to be placed in Class 1. Both the Anaconda and the Butte & Superior companies fell behind in tons of ore hoisted during August, and there will probably be a further decline during the present month. Next month there may be some additions to the mine force, owing to men returning from prospecting in the hills during the summer and from ranch work, but the number will not even up the loss by the draft.

ST. LOUIS, MO.—Sept. 10

Lead Mining in Franklin County is receiving considerable attention at present. The Tamm interests have opened up a lead-and-zinc property near Anaconda that is producing considerable zinc carbonate. The Franklin Mines Co. is reopening tin-lead properties on Hoosier Creek near St. Clair. The old Northumberland mine, at St. Clair, is being reopened and a shaft has been sunk to 118 ft. on a fissure vein. St. Louis interests are opening up a fissure-vein deposit south of the Meremac River, near the old Cyclone mine.

JOPLIN, MO.—Sept. 9

The First of a Number of contemplated warehouses for ore storage in this district is under construction at Picher, Okla., and the promoters of the Oklahoma Ore Storage Association, which is associated with the Oklahoma Mining Exchange, expect to build several others immediately. Though the plan appears to be gaining headway, older producers are still credulous in respect to the enterprise. During the last week George E. Nicholson, head of the Kusa Spelter Co., Kusa, Okla., wrote to the promoters of the project and gave it his unqualified endorsement, stating that he would dispense with his ore buyers in this field as soon as the warehouse association begins business. Promoters of the idea have announced in Miami papers that they expect to build one or more warehouses at Joplin or Webb City, but the matter has not as yet been brought to the attention of the producers or business men in these cities. It is hoped, it is said, to have the first warehouse at Picher, Okla., completed by October 1.

CLEVELAND, OHIO—Sept. 10

The Labor Shortage in the Lake Superior iron districts is becoming more evident, according to "Iron Age." This is particularly true on the Gogebic and Cuyuna ranges, and on the latter has necessitated some curtailment in the production of manganiferous ores, which have been so much in demand this year. Stock piles at the underground mines on the various ranges have been well cut down, and it is expected that these piles will be about cleaned up when navigation closes. More ore carriers are being diverted to the Lake Michigan grain trade, and as soon as the grain movement has started from ports at the head of Lake Superior, considerable additional vessel tonnage must be withdrawn from the ore trade.

GRAND RAPIDS, MINN.—Sept. 8

Itasca County Shipments amounted to 6,716,000 tons of iron ore for the year ended June 30, 1918, according to the report of W. J. Trescott, mine inspector for the county. The Canisteo mine, at Coleraine, shipped 1,621,387 tons of ore and removed 1,707,732 yd. of overburden during the period mentioned. From the standpoint of shipments, the Bennet mine, in the Keewatin district, ranks second, with a shipment of 920,495 tons, and the Holman mine third, with 841,537 tons. At the Hill Annex mine, at Calumet, 1,218,131 yd. of dirt was removed, and at the Arcturus mine, at Marble, 1,136,708 yd. During the year there were within the county 11 fatal accidents. Considerable exploration was done, a total of 300 men being employed in this work. The average wage for all mining labor was $4.31 per day, and varied from $3.88 for common labor to as high as $9.30 for steam shovel engineers. During the period, 9,149,000 yd. of overburden was stripped at different mining properties and three washing plants were started, which makes a total of nine now in operation. Shipping and development operations employed 4273 men, which is the largest number in the history of the county, as 3300 were employed in the previous year and only 2200 in 1900, when great development and construction work was under way.

TORONTO—Sept. 13

Development of Oil Resources of western Canada has recently been strongly urged upon the government as a war measure by the Saskatoon Board of Trade and other representative bodies. The government has referred the question to the Reconstruction Committee of the Cabinet, of which the Hon. A. K. MacLean is chairman. There is little data available as to the commercial possibilities of the western oil deposits, as the reports deal almost entirely with the geological and scientific conditions. D. B. Dowling, of the Geological Survey, is now engaged in an investigation of these oil fields and the action of the committee will probably be influenced by the result of his researches.

Acquittal of the Defendant was the decision given by Police Magistrate Armstrong, of Cobalt, in the case M. P. MacDonald, mining engineer, charged with violating the Ontario Land Surveyors' Act by doing underground surveying. The case is regarded as one of importance to the profession as establishing the right of mining engineers to do underground surveying, within properly recorded boundaries, as has hitherto been the general practice in Cobalt. An adverse decision might have entailed the re-survey of most of the underground workings of the camp. The exclusive right of the surveyors to make surveys for recording purposes is not disputed.

VICTORIA, B. C.—Sept. 12

Value of Gold Bullion deposited at the Dominion of Canada assay office, Vancouver, B. C., during the month of August, 1918, was $608,838.43, which is an increase of $253,845.43, over the same month of 1917. Most of this gold came from the Yukon.

Consolidated Mining and Smelting Co. of Canada has announced a scholarship of $500 per annum which it will give to the man standing first, among the families of its employees, in his matriculation examination for an applied science course in the British Columbia University or any Canadian university.

The Installation of a Reduction Plant for the purpose of developing the production of mercury required in Canada for munition purposes has been recommended by Charles Camsell, in charge of the work of the Geological Survey in British Columbia, following his examinations of mercury deposits at the western end of Kamloops Lake. The deposits occur in irregular veins, consisting chiefly of calcite and quartz, with some dolomite, containing pockets of cinnabar in a zone of decomposed tertiary volcanic rocks. A small quantity of mercury was produced from these deposits in the period extending from 1895 to 1897, in all 138 flasks of 76½ lb each, valued at $4607. There has not been any production of mercury in Canada since. Its occurrence has been reported in ores of the Cobalt district, Ontario; in the neighborhood of Field, B. C., and near Sechart, west coast of Vancouver Island.

The Establishment of a Steel Industry on the Pacific Coast which would lead to the utilization of the magnetic iron ores of British Columbia, as well as to the material advancement of its commercial interests, is earnestly desired by the provincial government. William Sloan, Minister of Mines, declares that he has decided to diamond drill a number of the most promising properties to gain a definite idea of the tonnage available and also to give those interested a practical demonstration of the possibilities of the iron and steel industry. His engineers have been carrying out investigations with this work in mind, and properties have been selected. He therefore has announced that tenders would be called for at an early date for the diamond drilling of iron properties and that the work thereon would be proceeded with as expeditiously as possible, in order that the desired information might without loss of time be put before those who might be interested in the iron-ore deposits of the province.

The Boundary District of British Columbia has suffered a blow in the recent closing down of the Phoenix mines of the Granby Consolidated Mining and Smelting Co., with the consequent discontinuance of operation of the Grand Forks, B. C., smeltery. The absence of this industry, apart from the general indirect effect, means a serious loss to the West Kootenay Power and Light Co., which for years has supplied power for this plant, and to the small mine operators accustomed to make shipments of ore to the smeltery for treatment, besides throwing many employees out of work. The explanation given by the company is that it is no longer profitable to handle the low-grade ore of the Phoenix mines, because of increased costs, among those things instanced being the increase in the cost of hydro-electric power, increased price of coke and increased railway freight rates. The mines have been operated for some time on a narrow margin, it taking 22½c. per lb. to produce a pound of copper from their ores, because of high costs. With the government price of 23½c. per lb., there was a margin of profit of 1c. The subsequent increase to 26c. per lb. did not make the difference that might have been looked for, owing to the simultaneous rise in freight and other charges.

The Mining News

ARIZONA

Cochise County

SHATTUCK ARIZONA (Bisbee)—August production was: Copper, 682,861 lb.; lead, 199,528 lb.; silver 14,189 oz., and gold, 112.91 oz. Production for eight months of 1918 was: Copper, 6,561,059 lb.; lead, 644,465 lb.; silver, 100,460 oz., and gold, 819.51 ounces.

CALUMET & ARIZONA (Warren)—Smeltery production during August amounted to 5,568,000 lb. of copper, of which 4,376,000 lb. was available for Calumet & Arizona.

Greenlee County

ASH PEAK EXTENSION (Duncan)—Sinking from 200 to 300 level and will crosscut vein. John Horrigan is superintendent.

ASH PEAK (Duncan)—Development by Goldfields-Consolidated progressing with satisfactory results. Charles Starr is superintendent.

PHILLIPS & YOUNG (Duncan)—To start development on manganese property next week.

RIVAL (Twin Peaks)—Drifting on 200 level.

Mohave County

HAMME CLAIMS (Cedar Valley)—Deep tunnel to be driven to cut several veins 1000 ft. below outcroppings. Mill to be moved to a point below mouth of tunnel, which is expected to develop an ample water supply.

CHLORIDE QUEEN (Chloride)—New machinery has been installed. Shaft is down 230 feet.

EMERSON (Chloride)—Has erected mill.

GOLDEN CROSS (Chloride)—Developing Jack Pot claim and has installed complete plant.

TENNESSEE (Chloride) — Operations temporarily suspended.

RICO (Kingman)—Shaft nearing 200 level.

UNITED EASTERN (Oatman) — Mill making 97% extraction of quartz ore carrying gold.

SILVER LEGION (Stockton Hills)—Leased by A. J. and W. O. Davidson and G. W. Brady, who will ship. Ore carries gold, silver, copper and zinc.

Pima County

NEW CORNELIA (Ajo)—August production was 3,928,000 lb. of copper.

GUNSIGHT (Gunsight)—To use trucks to transport ore to the railroad.

MONTEZUMA (Gunsight)—Five-stamp mill started on property seven miles east of old Gunsight and 24 miles east of Ajo.

COBRIZA (Tucson)—Being developed under lease by Wiley B. Akers. First car of copper and silver ore shipped. Mine situated 65 miles west of Tucson, in Como Babi Mountains.

Pinal County

RAY HERCULES (Ray)—Two sections of mill in full operation and the third to begin soon.

Santa Cruz County

CONSOLIDATED ARIZONA COPPER (Mowry)—Has received hoist and engine. Other machinery ordered. Shaft has been sunk 100 feet.

MORNING GLORY (Patagonia) — Increasing working force. Leased by E. R. Shaw and associates.

MOWRY (Patagonia)—Plant to be installed to concentrate manganese ores.

THREE R (Patagonia)—Operating 100-ton concentrating mill.

Yavapai County

GADSDEN (Jerome)—Sump below 1200 level has been sunk and station is being cut.

GRAND ISLAND (Jerome) — Sinking three-compartment shaft at rate of 100 ft. a month, and now down about 270 feet.

GREEN MONSTER (Jerome)—Dorothy May shaft down 849 ft. and bottom is diorite.

SQUAW PEAK (Jerome)—Tunnel in over 200 ft. and has cut ore.

VERDE COMBINATION (Jerome)—Four headings being worked on the 1080 level. Three show mineralization in quartz and schist.

VERDE SQUAW (Jerome)—Plant has been installed and will operate soon.

ARKANSAS

Marion County

DIXIE GIRL (Buffalo)—Late rains have furnished supply of water for milling purposes. Hauling ore for shipment. Building new tram from deposit of carbonate to the mill.

HAWKEYE (Rush)—Mill completed and in operation. Ore being hauled to Yellville for shipment.

MATTIE MAY (Rush)—Opening up second body of carbonate ore, 75 ft. below upper body productive for some time. Mill to be built on property soon.

MORNING STAR (Rush)—Opened 20-ft. face of manganese-bearing clay above zinc-bearing strata. Ore is disseminated through the clay in varying sizes.

WILD BILL (Yellville)—Under operation by H. M. Berdeen, who has opened up good lead prospect.

CALIFORNIA

Shasta County

MAMMOTH (Kennett)—Smeltery production during August is estimated at 1,320,000 lb. of copper.

COLORADO.

Boulder County

MALMO (Brainerd Camp)—Tunnel operations resumed Sept. 1. A shoot of gray copper ore has been opened. C. E. Bredenberg is manager.

CARIBOU (Caribou)—Leadville lessees producing considerable ore. Transportation of ore delayed by car shortage of Denver, Boulder & Western R.R. About ten carloads of high-grade silver ore awaiting shipment.

San Miguel County

MORNING STAR (Mount Wilson)—Being developed under lease by Nick Zurich, of Telluride. Compressor and air drills have been installed. Small vein of silver-lead ore has been opened.

CARBONERO (Ophir)—Active development to be continued. Three carloads of crude ore shipped last month.

SHIPMENTS OF ORE AND CONCENTRATE from Telluride during August were: Smuggler and Black Bear [illegible] cars of concentrate to Pueblo and 18 cars to Durango; Tomboy, 2 cars concentrate to Pueblo and 34 cars to Durango; Cimarron, 2 cars concentrates to Pueblo; Lewis, 3 cars concentrate; Boomerang mine, one car crude ore; total 102 cars. During same month last year 123 carloads were shipped.

TOMBOY (Telluride)—Wage scale paid by company since May 15, 1918, has been raised 50c. per day.

IDAHO

Shoshone County

SHERMAN (Burke)—Raise being driven from No. 5 tunnel to connect with level 500 ft. above.

COPPER KING (Mullan)—Mine has closed down pending arrangements to build 100-ton mill.

NATIONAL (Mullan)—Installation of new hoist and electric pump almost completed. Mill running one shift only while changes are being made. Winze to be sunk 200 ft. from 1500 level.

TUSCUMBIA (Wallace)—Lessees operating mine and Idora mill have started shipping concentrates. Idora mill is on Beaver Creek, one mile from railroad.

NEVADA

Eureka County

OIL SHALE has been discovered 13 miles north of Eureka, and locations are being made.

Humboldt County

O'LEARY AND CLOUGH (Golconda)—Have sold manganese mine, 16 miles south, to National Resources Corporation, of Indianapolis. Development work to start soon. Buildings under construction. Plan to use caterpillar tractor for ore haulage to railroad.

Lander County

COPPER CANYON (Battle Mountain)—Shipping 30 tons of copper ore per day. High freight rates, smelting charges and wages have seriously cut down profits on this ore, as is true of all small copper producers in Nevada, higher price of copper notwithstanding.

Nye County

THANKSGIVING (Manhattan)—To resume operations under direction of C. T. Stanley. To sink shaft 100 ft. deeper and crosscut to ore.

WHITE CAPS (Manhattan)—Shaft sinking has started.

TONOPAH DISTRICT ore production for the week ended Sept. 7 totalled 9335 tons, of an estimated gross milling value of \$158,695. Producers were: Tonopah Belmont, 1895 tons; Tonopah Mining, 3900; Tonopah Extension, 2184; Jim Butler, 217; West End, 777; Rescue, 66; MacNamara, 315; Montant, 162; Halifax, 112 and miscellaneous 22 tons.

NORTH STAR (Tonopah) — Drifting north on 980 level has cut smelting-grade ore for full width of drift and for length of 25 ft. Drifting still in progress.

WEST END CONSOLIDATED (Tonopah)—New office building being built.

Storey County

UNION (Virginia City) — Two men seriously injured on 2600 level by accidental explosion of charge in drill hole while it was being loaded.

White Pine County

CONSOLIDATED COPPER MINES (Kimberly)—July production of copper was 1,059,389 lb. Transmission line and transformer station were completed early in July. Kimberly concentrator, Morris-Brooks compressor plant, mine pumps and haulage, pumping plant for concentrator and all shops and small equipment are to be placed on electric drive.

NEW MEXICO

Grant County

BOSTON-HECLA (Lordsburg)—Surveying site for new shaft and buildings and constructing wagon road. R. E. Vandruff is general manager.

EL DORADO (Lordsburg)—Option has been taken by G. Neil, of Wilcox, Ariz., who will start work soon.

GREEN KING (Lordsburg)—New shaft down 35 ft. and showing copper sulphides. Daniel Brial is owner.

UTAH

Beaver County

MILFORD COPPER (Milford)—Making shipments of iron ore and small amount of copper. Alfred Frank is manager.

Juab County

TINTIC SHIPMENTS for the week ended Sept. 7 amounted to 155 cars.

APEX STANDARD (Eureka)—Sinking shaft. Mine has extensive holdings in western end of district.

EUREKA MINES (Eureka)—Two machine drills started on 700 level. Considerable low-grade ore available, as well as ore of better grade.

IMPERIAL LEAD (Tintic Junction)—Has contracted for hauling of ore to railroad. W. Mont Ferry is president.

LIBERTY MANGANESE (Tintic Junction)—Owns 11 claims in west Tintic section. Promising showing of manganese ore developed by 100-ft. tunnel and crosscut. T. L. McCarthy, of Salt Lake, is president.

Salt Lake County

MONTANA-BINGHAM (Bingham)—Two cars of copper ore shipped recently.

Summit County

PARK CITY SHIPMENTS for the week ended Sept. 6 amounted to 3,578,394 lb. ore and concentrates.

SILVER KING CONSOLIDATED (Park City)Drain and operating tunnel in 7700 feet. Mill machinery being installed at No. 2 shaft, where 250-level workings are being cleaned out and retimbered to produce mill ore for mill. Old workings recently cleaned out and closed down.

Tooele County

SEMINOLE COPPER (Gold Hill)—Ore being stocked on dump. Mill to be built.

WESTERN UTAH COPPER (Gold Hill)—Gold Hill shaft down 325 ft. Level to be cut at 400 ft., and development undertaken. Copper ore cut in Yellowhammer shaft, down over 90 ft. Property producing about 100 tons of ore daily.

Utah County

ACTIVE PROPERTIES in American Fork Canyon are the Globe Consolidated, Bog Iron, Mineral Flat, Earl Eagle, Bay State, Healey, Etta May and Smuggler.

BELEROPHON (American Fork)—Shipped first car of concentrates from new mill. Under lease to C. B. Ferlin.

WASHINGTON

Ferry County

LONE PINE-SURPRISE (Republic) — Shipped 1500 tons during August. Ore has been followed 342 ft. on 500 level. Little development work in progress.

Stevens County

UNITED COPPER (Chewelah)—Property has been leased to A. W. Kemp, who is making small shipments.

CANADA

British Columbia

LANARK (Illecillewaet)—Rich vein uncovered for 350 ft. shows lead, copper and silver ore. New machinery is being installed.

LADYSMITH SMELTING (Ladysmith)—Has ceased operations again, the smeltery having been run for a short time, during which period an accumulation of ore was disposed of.

EUREKA (Nelson)—Mine has been sold to Inland Mining Co., of Walla Walla, Wash. J. J. Malone is manager.

TIDEWATER COPPER (Sidney Inlet)—Opening up old workings. Driving tunnel through mountain and constructing small railroad to connect with wharf to facilitate shipments.

CONSOLIDATED MINING AND SMELTING (Trail)—Rock Candy group of fluorspar claims, situated on north fork of the Kettle River, being rapidly developed and will make regular shipments soon.

MEXICO

Sonora

GREENE CANANEA (Cananea)—Production in August was: Copper 5,000,000 lb.; silver 155,940 oz. and gold, 1250 ounces.

PERU

Junin

CERRO DE PASCO (Cerro de Pasco)—Planning new smeltery, to be built at the junction of company's main railroad and the Central Ry. of Peru. Project is expected to cost about \$5,000,000 and will have a capacity of 10,000,000 lb. of blister copper per month.

AFRICA

Belgian Congo

UNION MINIERE DU HAUT KATANGA (Elizabethville)—Produced in August 4,894,210 lb. copper.

The Market Report

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
12	4.7550	101⅛	49½	16	4.7550	101⅛	49½
13	4.7550	101⅛	49½	17	4.7550	101⅛	49½
14	4.7550	101⅛	49½	18	4.7550	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Sept.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
12	*26	†	8.05	7.75	9¼@9⅜
13	*26	†	8.05	7.75	9¼@9⅜
14	*26	†	8.05	7.75	9¼@9⅜
16	*26	†	8.05	7.75	9¼@9⅜
17	*26	†	8.05	7.75	9.25@9.35
18	*26	†	8.05	7.75	9.10@9.20

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
Sept.	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
12	122	122	137	343½	343½	29½	28½	54
13	122	122	137	343½	343½	29½	28½	54
14	.	...	.	.	...	..	.	.
16	122	122	137	343½	343½	29½	28½	54
17	122	122	137	343½	343½	29½	28½	54
18	122	122	137	343½	343½	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Sept. 18, 1918

There is scarcely anything to be said of the markets except to report events, zinc and antimony being the only important metals in which free markets remain.

Copper—There were no special features. Mine production shows a rather distinct tendency to diminish. Refiners have pretty much adjusted their contracts with mining companies on the new terms which the advance in price to 26c. permitted.

Copper Sheets—The base price of copper sheets is 35¼c. per lb. Copper wire is quoted at 29 and 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper. Unchanged.

Tin—The great event of the week was the announcement of the international tin control, whereby all purchases in the Straits are to be made through E. Boustead & Co., and allocations for consumption are to be made through the tin control, sitting in London, the distribution in the United States to be through the American Iron and Steel Institute. Moreover, it is generally understood that the financial obligations will be assumed by the U. S. Steel Corporation. This arrangement will put tin merchants completely out of business. Nobody yet knows just how the tin business is going to be done or when the new plans will be inaugurated. Nobody knows just how the buying of tin in Hong Kong and Batavia is to be managed, how the Bolivian and miscellaneous business will be conducted, what will be the position of merchants who have supplies afloat, or what will be the position of producers who have contracted their production for some time ahead.

Singapore quoted £337½, c.i.f., London, on the 12th and the 13th. Since the 13th no quotations have been communicated, and it is assumed that the new order of things has gone into effect, with a consequence of no further trading in that market. In this market Banka tin and metal of 99% grade is quoted at 78@80c., and there is a good demand for it. Straits tin for shipment is quoted at 72c. The London quotation for Straits is £343½, which would be equivalent to 73c. here. It is expected that a price of something like the current quotation will be fixed in London, and something in the neighborhood of 73 or 75c. here. The question will then be whether the Chinese, Dutch, Bolivians and others will be willing to produce and sell for what the international control is willing to give.

Lead—The business is entirely in the hands of the Lead Committee. This is endeavoring to make seven or eight tons suffice where ten tons are needed. Orders for consumption are being carefully scrutinized, and all uses that are deemed nonessential are being excluded.

An error was made in our London prices last week. The price of London lead, 3 months, should have been 28½ on each of the respective dates, Aug. 29, Aug. 30, Sept. 2, Sept. 3 and Sept. 4.

Zinc—A rather large business was done in both common spelter and brass special. Europe wants to buy a lot of manufactured brass, but we seem to be unable to furnish all that is wanted, owing to insufficient brass-mill capacity, or, rather, not insufficient mill capacity, but insufficient labor.

The spelter market did not respond to some large purchases in the manner expected, and as the week wore on it became easier. Spot and prompt metal fetched distinctly higher prices than what producers were willing to accept for fourth-quarter contracts. High-grade spelter is easy, and a fairly large sale of intermediate was made at a surprisingly low figure.

Average monthly price of New York spelter—Our July and August monthly New York spelter prices are in error, and we make correction as follows: July, 8.688; August, 8.985.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—The market was firm at 14@14¼c. for spot. There were some large inquiries in the market, and it is doubtful if much metal can be obtained at the price quoted this week. There is still some unsold stock, but the quantity is steadily diminishing, and there is understood to be some large prospective business. Futures are held at prices relatively higher than spot. We quote 14¼@14½c., duty paid. The Chinese and Japanese houses are not at all keen about selling.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50@1.75 per pound.

Nickel—Market quotation: ingot and shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Unchanged at $125@130. Demand is fair and stocks are light. San Francisco reports by telegraph $118 firm.

Gold, Silver and Platinum

The general stock of money in the United States on Sept. 1 totaled $7,092,955,371; of this, $3,079,300,229 was in gold coin and bullion, $460,253,959 in standard silver dollars and $231,874,845 in subsidiary silver. The money in circulation on Sept. 1 was $5,621,311,201, or $52.95 per capita. On Sept. 1, 1917, the per-capita circulation was $45.96.

Silver—Shipments to London for the week ended Sept. 14 were 700,000 ozs. Business with the Far East is being done on a large scale from San Francisco. China exchanges are now ruling very high, owing to the lack of bullion importation.

Mexican dollars at New York: Sept. 12, 78; Sept. 13, 78; Sept. 14, 78; Sept. 16, 78; Sept. 17, 78; Sept. 18, 78.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 14—Blende, per ton, high, $77.70; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $52.50@50; calamine, basis 40% zinc, $38@33. Average selling prices: blende, $52.79; calamine, $38.03; all zinc ores, $52.23.

Lead ore, high, $106; basis 80% lead, $104@100; average selling price, all grades of lead, $103.21 per ton.

Shipments the week: Blende, 14,593; calamine, 457; lead, 1519 tons. Value, all ores the week, $788,670.

The development of a stronger demand advanced the market $2.50 per ton, and it is reported one buyer was short of filling orders and could not get the ore without further advances. Sellers early learned of the larger demand and withheld their ore.

Platteville, Wis., Sept. 14—Blende, basis, 60% zinc, highest price reported, $70.60 per ton. Base price for premium grade, $75; base price for high-lead blende, $49 to $50 per ton. Lead ore, basis 80% lead, $97 per ton. Shipments reported for the week were 2578 tons blende, 353 tons galena, and 715 tons sulphur ore. For the year to date the totals are 92,089 tons blende, 5381 tons galena, and 34,561 tons sulphur ore. During the week there was shipped to separating plants 2485 tons blende.

Other Ores

Chrome Ore—There is reported to be more ore offered than the market is able to absorb, and quotations are easier.

Manganese Ore—Unchanged.

Molybdenum Ore—In better demand. We quote $1.10.

Tungsten—The demand for high-grade ores still continues strong, although high-grade scheelite is practically off the market. High-grade wolframite ranged in price from $24.50 to $25 per unit. Low-grade ores have shown no real improvement in price; sold without guarantee they range from $18 to $19 per unit. Charles Hardy makes the following interesting comment: "Unfortunately, the supply of high-grade ore, low in manganese and practically free from tin and copper, is becoming scarcer almost every day. On the other hand, the specifications for the manufactured product are so strict that most buyers insist upon the most rigid adherence to their specification for the ore. Nevertheless, such works as can use off-grade ores have also entered the market on a large scale, and, besides spot lots, two contracts were closed to absorb future shipments, especially of eastern ore. These contracts should eliminate from the market a considerable quantity of the now so freely offered Chinese wolframite. Besides, Italy is in the market for a large tonnage of tungsten ore. The War Board, however, has ruled that no shipment can be allowed from this country at present, and thus negotiations for the Italian requirements will be carried on direct with the country of origin, and, if the contract is completed, this large tonnage will also eliminate from the open market material which would otherwise be freely offered for sale."

Other Minerals

Pyrites—Spanish lump is quotable to those who possess a license from the Government at 17c. per unit on the basis of 9s. ocean freight, buyer to pay war risk, less 2% and excess freight; but no sulphur imports are being received. Domestic pyrites is selling at a price of 25c. per unit, f.o.b. mine, according to delivery basis. Some mines in the South are reporting prices as 34c. per unit for lump and 32c. per unit for fines f.o.b. mines. Unchanged.

Iron Trade Review

PITTSBURGH—Sept. 17

The quarterly meeting between the price-fixing committee of the War Industries Board and the special committee of the American Iron and Steel Institute will be held in Washington tomorrow, to discuss the matter of prices to rule for the fourth quarter of the year.

Production of steel ingots in August was less than expected, being at the rate of only 40,300,000 gross tons a year, against rates of 42,250,000 tons in July and 43,500,000 tons in June. Thus far this month there have been heavy gains, by reason of the weather being more favorable. Based on the ingot reports, an estimate may be made that about 6,000,000 net tons of finished rolled steel was produced in July and August, and with the increase over this rate that may be expected, the half year's output may be 19,000,000 tons, which compares with the War Industries Board's recent statement that 23,000,000 tons is needed for the period, whereas the prospective output was only 17,000,000 tons. The result of the discrepancy is a further tightening of supplies of raw steel for certain finishing departments. Thus recently the current allotment of sheet bars for the tin-plate mills, equal to approximately 100%, is cut by 30% for the fourth quarter. Merchant mills and wire mills are likely to be restricted further, and a meeting is to be held next week to consider whether standard steel pipe can stand a further restriction.

Pig Iron—There is no open pig-iron market, supplies being obtainable only on allocations, and then with difficulty. The market remains quotable at the set limits, covering deliveries through Sept. 30: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b furnace, freight from the Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less.

Steel—There is no regular soft steel in billet or other unfinished form available, and only occasional odd lots of shell-discard steel. Surplus production at various plants was allocated long ago, and from time to time these allocations are modified or extended for additional periods of time. We quote: Billets, $47.50; sheet bars and small billets, $51, slabs, $50; rods, $57.

Ferroalloys

Ferroalloys—Consumers are showing no particular confidence in the future of the market, there being cases of consumers covering for first quarter but not for second quarter, although the recommendation some time ago was that consumers cover for the half year. There is practically no demand for prompt lots. We quote ferromanganese at $250, delivered, for 70%, with $4 a unit extra for higher manganese content, and 16% spiegeleisen at $75, furnace.

Coke

Coke—Production of byproduct coke continues to make a new high record nearly every week, the last report showing 557,000 tons, which, with 616,000 tons of beehive coke, made a total of 1,173,000 tons, the largest weekly total this year with two exceptions. Connellsville beehive production is holding its own, and Connellsville coal shipments to byproduct plants have shown a slight tendency to increase. The Fuel Administration has ordered the cessation of screening old dumps at beehive plants, on the ground that the work absorbs labor needed at ovens. The screenings were being sold for household use at as high as $6.75 per net ton at plant, so that the contractors were in position to pay fancy prices for labor.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740	......	32.584	50.920	......
Oct.	67.855	87.332	......	32.361	44.324	......
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	......	117.500	......	135.250	......
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	......	244.038	......
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	......	8.611	......	30.500	......
October	6.710	......	6.650	......	30.500	......
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	......	7.966	......	54.000	......
October	7.983	......	7.813	......	54.000	......
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.19	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.81	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40		42.24		48.58	
October	37.25	......	33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Sept. 17
Alaska Gold M.	2⅝
Alaska Juneau	1⅝
Am.Sm.& Ref.,com.	76¼
Am. Sm. & Ref., pf.	103⅛
Am. Sm. Sec., pf., A	90
Am. Zinc	15
Am. Zinc, pf.	46½
Anaconda	67¼
Batopilas Min	1
Bethlehem Steel	80¼
Butte & Superior	25½
Butte Cop. & Zinc	10½
Cerro de Pasco	33
Chile Cop.	15¾
Chino	39¾
Colo.Fuel & Iron	45½
Crucible Steel	64⅛
Crucible Steel, pf.	88¼
Dome Mines	9⅛
Federal M. & S.	11¾
Federal M. & S., pf.	39¼
Great Nor., ore ctf.	30⅝
Greene Cananea	44¾
Gulf States Steel	78
Homestake	74
Inspiration Con.	53⅜
InternationalNickel	29¾
Kennecott	32⅞
Lackawanna Steel	81
Mexican Petrol	104
Miami Copper	27⅞
Nat'l Lead, com.	57½
National Lead, pf.	101¼
Nev. Consol.	20⅞
Ontario Min	8¼
Ray Con.	24
RepublicI.&S.,com.	90
Republic I. & S., pf.	102½
Sloss-Sheffield	60
Tennessee C. & C.	18
U. S. Steel, com.	109⅜
U. S. Steel, pf.	110⅝
Utah Copper	83½
Va. Iron C. & C.	71

BOSTON CURB*	Sept. 17
Alaska Mines Corp.	‡.12
Boston Ely	.60
Boston & Mont.	.43
Butte & Lon'n Dev.	.15
Calaveras	1
Chief Con.	3½
Contact	‡.15
Corbin	‡10
Cortez	.14
Crown Reserve	.15
Crystal Cop.	‡.41
Eagle & Blue Bell	‡2½
First Nat. Cop.	‡1⅛
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	19
Mexican Metals	.35
Mines of America	‡1
Mojave Tungsten	.11
Nat. Zinc & Lead	.15
Nevada-Douglas	.45
New Baltic	.40
New Cornelia	17
Oneco	.20
Pacific Mines	‡.35
Rex Cons	‡.06
Yukon Gold	.85

SAN FRAN.*	Sept. 17
Alta	.02
Andes	.02
Best & Belcher	.02
Caledonia	.03
Challenge Con.	.03
Confidence	.04
Con. Virginia	.18
Gould & Curry	‡.01
Hale & Norcross	.04
Jacket-Cr. Pt.	.06
Mexican	.17
Occidental	.40
Ophir	.02
Overman	.01
Savage	.02
Sierra Nevada	.11
Union Con.	.26
Utah Con.	.01
Belmont	2.00
Jim Butler	.47
MacNamara	.31
Midway	.06
Mont.-Tonopah	.10
North Star	.04
Rescue Eula	.08
West End Con.	.96
Atlanta	.02
Booth	.03
Comb. Frac	‡.02
Florence	.10
Jumbo Extension	.09
Kewanas	.01
Nevada Hills	.01
Nevada Packard	.25
Round Mountain	.17
Silver Pick	.03
White Caps	.13
Big Jim	‡.75
United Eastern	3.60

COLO. SPRINGS*	Sept. 17
Cresson Con.	4.81
Doctor Jack Pot	.03
Elkton Con.	.04
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.66
Granite	.17
Isabella	.03
Mary McKinney	.07
Portland	.82
United Gold M.	.12
Vindicator	.30

BOSTON EXCH.*	Sept. 17
Adventure	.80
Ahmeek	75½
Algomah	‡.15
Allouez	49½
Ariz. Com., ctfs.	15½
Arnold	‡.20
Bingham Mines	9¾
Bonanza	‡.16
Butte-Balaklava	‡.25
Calumet & Ariz.	67½
Calumet & Hecla	460
Centennial	12
Copper Range	46¼
Daly West	2½
Davis-Daly	5¼
East Butte	10⅛
Franklin	‡4⅛
Granby	83¼
Hancock	‡6
Hedley	‡12
Helvetia	‡.15
Indiana	‡.60
Isle Royale	‡25½
Keweenaw	1 1/16
Lake	5
La Salle	2
Mason Valley	‡3½
Mass	3¾
Mayflower	‡2⅝
Michigan	2⅝
Mohawk	55
New Arcadian	1⅛
New Idria	14½
North Butte	13⅞
North Lake	.60
Ojibway	‡.65
Old Dominion	39
Osceola	51½
Quincy	66
St. Mary's M. L.	‡49
Santa Fe	‡.60
Seneca	11¼
Shannon	3⅜
Shattuck-Ariz.	‡15½
So. Lake	1
So. Utah	‡.16
Superior	4½
Superior & Bost.	3⅝
Trinity	3
Tuolumne	‡1
U. S. Smelting	43
U. S. Smelt'g, pf.	43
Utah Apex	1⅞
Utah Con.	9¾
Utah Metal	2
Victoria	‡2
Winona	1
Wolverine	23
Wyandot	‡.50

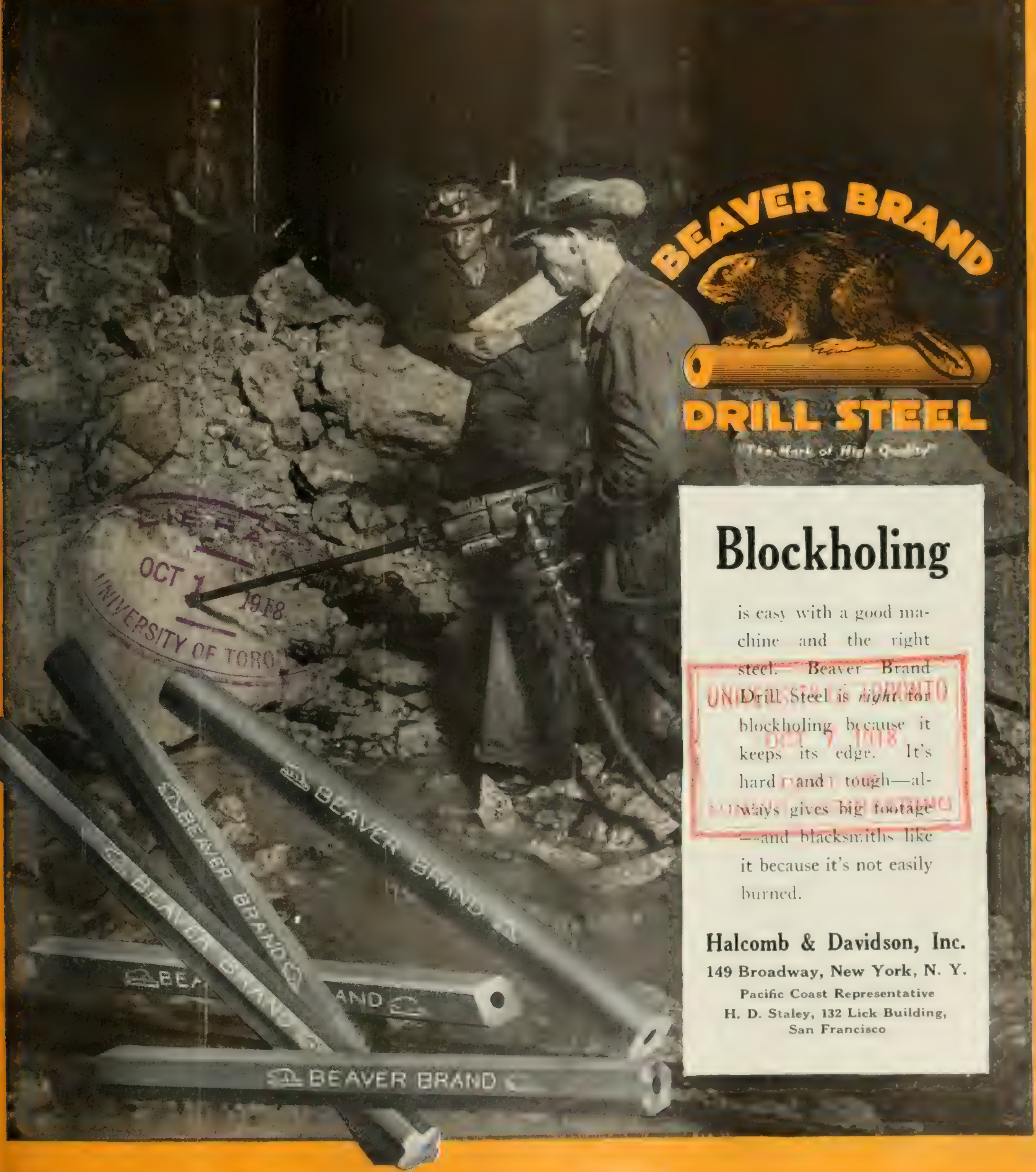
N. Y. CURB†	Sept. 17
Big Ledge	.75
Butte & N. Y.	‡.75
Butte Detroit	‡.05
Caledonia	.45
Calumet & Jerome	1⅛
Can. Cop. Corpn.	1⅝
Carlisle	‡2
Cashboy	.04
Con. Ariz. Sm.	1½
Con. Coppermines	5
Emma Con.	‡.10
Goldfield Con.	‡.20
Goldfield Merger	.02½
Greenmonster	‡⅛
Hecla Min.	4¼
Howe Sound	4
Jerome Verde	‡.50
Louisiana	‡⅛
Magma	‡28
Majestic	‡.15
Marsh	.03
McKinley-Dar-Sa.	‡.44
Milford	‡.75
Mother Lode	.34
Nixon Nevada	‡.36
Ohio Cop.	
Rawley	‡2½
Ray Hercules	4¼
Richmond	‡.56
Rochester Mines	.32
St. Joseph Lead	14
Standard S. L.	⅛
Stewart	.14
Success	.12½
Tonopah	2⅜
Tonopah Ex.	1⅛
Tribullion	.12½
Troy Arizona	.10
United Cop.	‡⅛
United Verde Ext.	‡37
United Zinc	1⅛
Utica Mines	‡.08

TORONTO*	Sept. 17
Adanac	.06
Bailey	.02
Beaver Con.	.27
Chambers Ferland	‡.10
Coniagas	2.00
Hargraves	.02
Kerr Lake	5.75
La Rose	.37
Min. Corp. of Can.	‡2.00
Nipissing	8.75
Peterson Lake	.08
Temiskaming	.28
Wettlaufer-Lor.	.01
Davidson	‡.30
Dome Exten.	.14
Dome Lake	.10
Hollinger	4.50
McIntyre	1.37
Newray	.15
Porcu. Crown	.10
Teck-Hughes	.20
Vipond	.10
West Dome	.06

* Bid prices. † Closing prices. ‡ Last Quotations.

Engineering and Mining Journal

McGraw-Hill Co., Inc. Price, 20c. New York, September 28, 1918



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is easy with a good machine and the right steel. Beaver Brand Drill Steel is *right* for blockholing because it keeps its edge. It's hard and tough—always gives big footage—and blacksmiths like it because it's not easily burned.

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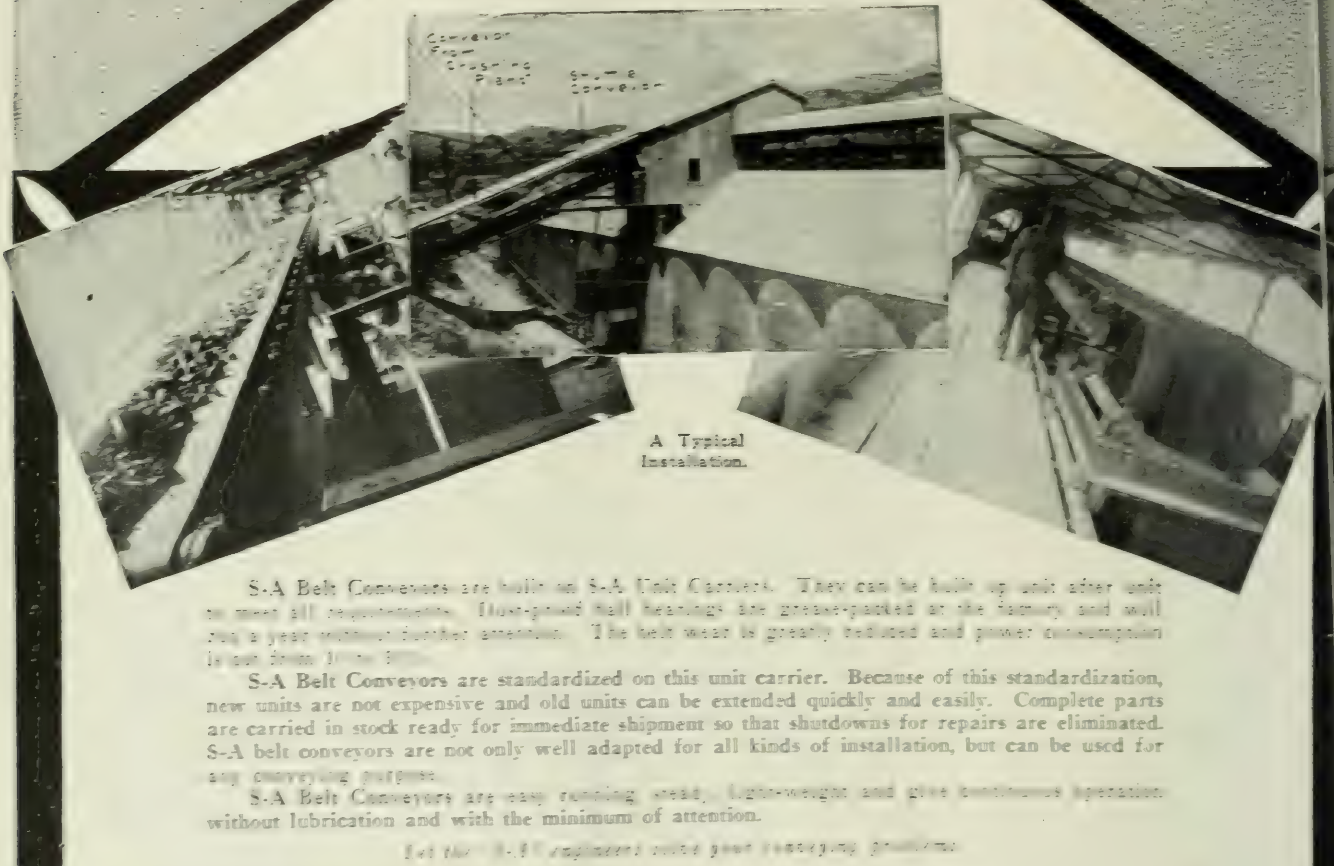
S-A BELT CONVEYORS



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S-A Belt Conveyors are built on S-A Unit Carriers. They can be built up unit after unit to meet all requirements. Dust-proof ball bearings are grease-packed at the factory and will run a year without further attention. The belt wear is greatly reduced and power consumption is cut from [illegible].

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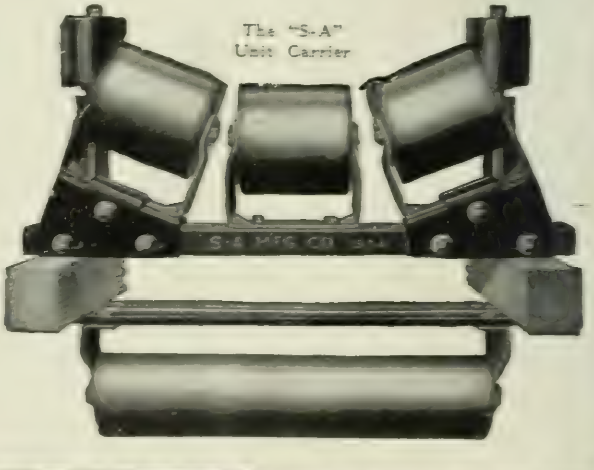

The "S-A" Unit Carrier

Engineering and Mining Journal

September 28, 1918

Volume 106 Number 13

UNITED VERDE EXTENSION MINE. ON THE RIGHT IS THE HOME OF JAMES S. DOUGLAS

The Jerome District of Arizona—Part I

By J. R. FINLAY*

The geology of the district as disclosed by facts at present ascertainable, and conjectures that may be proposed to account for the formation and position of the ore deposits. Parallel instances in other districts are cited to add weight to the theories advanced. The history of two important Jerome mines—the United Verde and the United Verde Extension—is recorded, and interesting prophecies are made as to the probable results of future operations. The paper concludes with some pertinent remarks on the requisites for successful metal-mine development.

JEROME is one of the most spectacular places in the United States. When an automobile road has been built direct from Prescott, it will be only 21 miles from that town. On that highway the tourist will come upon the Verde Valley first over the flank of Mount Mingus, and will find himself looking down over an escarpment 4500 ft. high. The picture will give him a thrill. Even after months of looking at it, much is found that has previously escaped notice. It is more than a scene of relief and color; it is a vast exposure of present-day geological processes, volcanoes and erosion, and of important geological facts reaching back to the earliest recorded ages. By relating all these features, one finds that the panorama builds up an interest even exceeding that of the Grand Canyon. Fifteen or twenty miles away, straight in front across the valley, is the same great mass of colored strata that appears in the Canyon, but here forming only the front of the great plateau. On the summit, 60 miles away, are the San Francisco peaks, looking like Mount Shasta. In the bottom of the valley are glimpses of the river amidst clouds of smoke from two great smeltery stacks which, at this distance, look like pipestems.

In the discussion of this district I am venturing to explore some of the fine realms of geological speculation which mining engineers usually avoid. I would have no desire to do this if there were not reason, more or less vague and hardly capable of clear expression, for thinking that these speculations follow a line which may lead to practical results.

No more can there be any doubt that the study of ore deposits, from the point of view of pure science, has become part of the essential equipment of a mining man. Secondary enrichment, the magmatic origin of ore deposits, the effects of contact and regional metamorphism, the indications of such action in rock alteration, and many similar things are absorbed by hosts of men who have never consciously studied geology. It is far from impossible that a study of the history of earlier continental geography may lead to further knowledge of the areas of mineralization.

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FAMILIARITY OFTEN BREEDS MISUNDERSTANDING

Nothing is more common than for people to assume that they understand things because they see them often. A view of the moon through a good telescope is, to the average man, an astounding revelation—all the more so, the greater the man's intelligence—although nearly everybody sees the moon every month, and the average man has read of it and has a fair idea of what it is. There is nothing difficult about it. He may see the moon as plainly as he can see the house across the street: mountains and plains, bright sunlight and impenetrable shadow; lofty mountain pinnacles whose summits are aglow with the rising sun; a clear view of a sphere, not a flat disk—a huge object with an area greater than the United States and all its outliers. But did he realize it? He will probably have to confess that he did not. But, once he does, he will have no doubt that it is worth while, although the knowledge will never bring him a cent. Similarly, how many stop to realize that the unconformable parting of two rock formations is a record of great events and changes? That dividing plane is, at once, the surface of an ancient continent and the floor of an ancient sea. The fact is perfectly intelligible; it requires no extraordinary effort of the imagination. The only obstacle to overcome is the habit of not observing and thinking about such things.

GEOLOGIC UNCONFORMITIES AT JEROME

One of these unconformities is so conspicuous at Jerome that it serves as a starting point for the mining operations. The miners in half the district are exploring, not the present land surface, but the surface of a continent that was buried many millions of years ago. In a way, it is part of another world; not wholly inaccessible, like the moon, but probably less understood. Fragments of the pre-Cambrian surface are exposed at different places, but rarely more than its edges are brought to light. It is just as important to realize that this old surface may be destroyed by deep erosion, so that its most valuable and interesting features are lost, as it is to realize that the larger part of it is inaccessible because it is buried; more so, in fact, because there is a chance that part of the buried portion may be exhumed. In these tattered edges of the old continent are many valuable ore deposits—the iron mines of Michigan and Minnesota, the zinc mines of New Jersey, the old iron mines of Southeast Missouri, the gold mines of the Black Hills, and, no doubt, many others. Exploration, groping along this old surface, prompted by geological speculation, led to the discovery of the wonderful copper bonanza of the United Verde Extension. This single incident justifies a lot of speculation.

Of course, there is no profit in letting one's imagination run riot, creating pictures that are nothing but dreams. It is, however, possible to use the imagination as a searchlight to explore the dark world of possibility. In that way it may lead to many a solid fact.

Study of the mines of Jerome reveals a setting of impressive facts which point the way to some equally impressive conjectures. The facts are as follows:

1. The ore deposits were developed (geologically) into their present condition during the erosion of a continental area. This period of erosion continued for an exceptionally long period, speaking even of geologic time, for it resulted in wearing the continent down to a nearly level plain (peneplain), which was finally submerged slowly and quietly by an invasion of the sea. This submergence persisted during long ages of Palæozoic time with no greater disturbance than occasional gentle oscillations of level. The period of erosion had followed a period of mountain building which was, in all probability, exceptionally severe and widespread and was accompanied by volcanic or batholithic action on a grand scale. It appears, then, that the period of erosion, as well as the succeeding era of deposition during Palæozoic time, represents a long epoch of quiescence and extremely slow differential subsidence, following a period of disturbance during which the mountain-building forces in this part of the world had exhausted themselves.

2. The ore deposits are a part, or result, of almost the latest pre-Cambrian igneous action to be seen. The rock masses most intimately associated with them are not highly metamorphosed or disturbed; they are markedly less so than any of the older pre-Cambrian rocks which occur in the neighborhood.

3. Neither the ore deposits nor the rocks in which they occur differ in any essential respect (unless age is an essential) from deposits in nearby districts which were formed during the later mountain-building periods that brought to an end the long-continued submergence, sea invasion and marine deposition of Palæozoic, and again of Mesozoic, time.

4. The period of deposition which immediately preceded the pre-Cambrian continental uplift was an active and extensive one. It is represented by the Belt series of rocks, which are thick masses of sandstones or quartzites or conglomerates, shales and limestones—all prevailingly ripple-marked or sun-cracked, and containing some sparse remains of animal life thought to be chiefly fresh-water forms. At any rate, the evidence is positive that most of the Belt rocks were formed either on land surfaces or in shallow water, and were probably piled up in river deltas, playas, lakes, estuaries, and perhaps shallow arms of the sea or tide flats.

CHARACTERISTICS OF BELT ROCKS

These Belt rocks were tilted, faulted, folded and metamorphosed during the latest great pre-Cambrian continental uplift, but they were not generally distorted or metamorphosed to anything like the extent to which still earlier rocks had been. In fact, they are found to lie upon them in positions of unconformity as abrupt as that which separates them from the succeeding Palæozoic rocks. Some of these still older rocks are also, without doubt, sedimentary; that is to say, they were once sands or muds. The separation between the Belt rocks and the still earlier ones therefore took place during a prior period of continental uplift, mountain building, and erosion which had followed upon an even more primitive age of quiescence, subsidence and deposition.

The Belt rocks are thus so characteristic that they may be recognized with fair certainty wherever they are well exposed. They are found in large patches, some of them areas of thousands of square miles, extending from not far north of Roosevelt Dam, in Arizona, to central British Columbia, northwest of Banff—a distance of 1300 miles north and south, and within a strip about 300 miles wide east and west. Jerome is just west of the area in which these rocks are positively identified, lying about 100 miles northwest of large exposures described by Ransome in the Tonto Basin and about 75 miles slightly east of south of other large ones in the bottom of the Grand Canyon. About 200 miles northeast of the latter are large exposures in the Needle Mountains, in southwestern Colorado; 200 miles northwest of the Needle Mountains, across vast masses of later sediments, are found similar great exposures in the Wasatch Mountains of Utah; 75 miles further northwest, they occur along the Bear River, in Utah; and 225 miles further north begin the great areas of Belt rocks in western Montana, which extend thence far northwesterly through the Cœur d'Alene region of Idaho into British Columbia.

DEDUCTIONS FROM ACKNOWLEDGED FACTS

I have recited these facts in order to show the broad basis for the following conjectures, which appear to me to be reasonable:

1. The Belt formation is the filling of a great epicontinental depression or trough which was either filled as fast as it sank or sank because it was filled, so that during the whole process its surface was fairly level and low. One cannot be sure, of course, that there were not two or several basins with interruptions between; but even if so, the conditions in all were substantially the same. This parallelism of conditions over so wide an area could have been induced only by a dominant influence sufficiently potent to dwarf local influences. It is noticeable that the Belt rocks contain stupendous quantities of fine sands, grading in fineness down to true silts, and alternating. Coarse pebbly sands, to say nothing of heavy conglomerates, are rare. It is, therefore, plain that these materials must have been transported far enough to break up effectually all the coarser products of erosion; but at the same time the detritus was delivered into the settling area constantly and in great volume.

It seems to me that such conditions of combined uniformity and volume over such extended areas must indicate the neighborhood of a great mountain chain, or at least an extensive belt of highlands on one side or both sides of the trough. It is not necessary to call upon a direct effort of imagination to find an explanation; the geography of the present day offers a number of examples from which to choose.

The great uplift of the Himalayas is bordered on both sides by similar areas of deposition. On the south side is the Ganges flood plain, covering 300,000 square miles, in which recent sediments borne by the Ganges and Brahmaputra are known to be over 2000 ft. deep and may continue to accumulate in the future almost without limit and without pronounced change in their character. The vast plains bordering the Sea of Aral are a similar field, being filled with detritus brought down by the Oxus and the Jaxartes, and with dust and sand swept in by desert winds.

PARALLEL INSTANCES IN NORTH AMERICA

Or one may turn to North America to find several other examples; namely, the Gulf of California, the upper end of which has already been filled across by the detritus of the Colorado River, so that its northern extension has been cut off and the water there has evaporated, leaving a large area below sea level. This trough is 800 miles long, 100 to 150 miles wide and is receiving sands and silts of both rivers and winds from a vast area of erosion. The valley of California, 400 miles long and 75 miles wide, between the Sierra Nevada and the Coast Range, is being filled with detritus of the same nature, already known to be over 2000 ft. deep, and is sinking as it fills.

Still another example, on a scale and of a nature sufficient to make a parallel with the Belt rocks, is the great coastal plain of North America beginning at Long Island and extending along the coast through Georgia, Florida, Louisiana, and Texas into eastern Mexico—a distance along a gently curved line of fully 2000 miles, with a width up to 500 miles, and receiving the detritus of all the rivers on both sides of the Appalachian Mountains, and from the Rocky Mountain uplift for 2000 miles, from Tampico to Alberta. It receives the sands migrating down the Missouri and the Arkansas, the Rio Grande, the Nueces, the Guadalupe, the Brazos, the Red River, the Mississippi, the Ohio, the Alabama, the Flint, the Savannah, the Potomac, the Susquehanna, and the Hudson—513,000,000 tons a year of sand and mud, besides 270,000,000 tons of chemicals in solution. This whole coast is an interminable stretch of fine sands, assorted by waves and shore currents, piled up on the shore in dunes. This mass has been accumulating and slowly shifting without striking interruption since the beginning of Upper Cretaceous times, and no one knows how deep it is.

At any rate, the Belt rocks represent some such scale of grand continental features, great mountains and great rivers, debouching upon a huge subsiding basin or slope for ages under conditions generally as quiet and stable as those on our Gulf Coast today. In this great basin there was little volcanic activity. It is probable that there was some, but it certainly was hardly more prominent than it has been along the coastal plain—no greater than that in the valley of California in recent times.

VOLCANIC ACTIVITY FOLLOWS PERIOD OF SLIGHT ACTION

When this cycle of deposition came to an end, however, there was an outburst of mountain-building energy on a great scale, accompanied by volcanic activity and batholithic action. Before this ended, the Belt rocks were hardened, tilted and folded, and finally subjected to erosion so widespread and long continued that the enormous accumulations of rock were wholly swept away over large areas, until they remained only in depressed tracts or synclines; such, for instance, as one found in the bottom of the Grand Canyon, where sediments not less than 12,000 ft. thick are found as a mere remnant protected from the general destruction through having been squeezed into a trough that extended below the level of effective attack. At the tops of these troughs the tilted beds of quartzite often project some distance into the overlying rocks, showing that before the erosion had been completed they had become harder and more resistant than the neighboring granites and schists, and had formed low hills and ridges in the rolling plain which was the expression at once of a worn-down continent and of a cycle of recurrent geological agencies.

THEORIES OF FORMATION OF JEROME DEPOSITS

From this assemblage of fact and inference, I believe it is possible to make an intelligent conjecture that the ore deposits of Jerome were formed from igneous action which accompanied the uplift and mountain building that occurred at the end of the Belt period of deposition. The diorites of Jerome in which, or along which, the orebodies occur are comparatively fresh and massive. This fact is marked enough to make it seem certain that they had not participated in the metamorphism, deformation and erosion of the continent that preceded the Belt rocks. The fact that the Belt formations contain practically no interbedded volcanic material, both in general and in the areas nearest Jerome in particular, is good and almost positive evidence that this extensive igneous activity did not take place during the period of Belt deposition. It is possible, therefore, to come naturally to the conclusion that the Jerome rocks appeared during the uplift which brought the Belt period to an end. Under this assumption, I can see no difficulty whatever in picturing the succession of events. As was the condition with the Belt rocks, the Jerome intrusives suffered the long-continued erosion and oxidation which continued in the mountains of the post-Beltian and pre-Cambrian continent. Like the Belt quartzites, they finally projected as low hills, covered with reddish soil—hills so low that they would have attracted little attention in the slightly rolling landscape.

COPPER DEPOSITS LIKELY AT BOTTOM OF GRAND CANYON

There are no Belt rocks at Jerome and none are known nearer to it than the Grand Canyon. These supposed relations between the Jerome ore deposits and the disturbances which ensued upon the termination of the Belt period of deposition are not based, therefore, upon direct evidence, but rest upon conjecture, or, to call it by a more dignified name, upon a process of reasoning. But it diminishes the scope for guesswork, and adds something to the probability of my conjecture, to find that in the bottom of the Grand Canyon there are copper deposits which have precisely the broad geological relations which I have pictured for those of Jerome. L. F. Noble[1] describes these deposits as fissure veins which cut across both the Unkar Group (Algonkian or Belt) and the underlying Vishnu schists (Archæan). To be specific, the facts are as follows:

1. The Unkar group contains great intrusions of diabase, similar, no doubt, to some of the rocks at Jerome. The copper-bearing veins are fault fissures cutting the Unkar rocks but terminating at the overlying basal sandstone of the Cambrian. Speaking of these deposits, and of the conditions of formation, Noble says:

> All the other deposits in the Archæan and Algonkian rock occur either in similar fissure veins, which represent the mineralized fault planes of normal Algonkian faults, or in the zone of shattering along the line of the Algonkian displacement of the West Kaibab fault. All the faults belong to the same period of displacement, the one in which the great mountain-making movement came at the end of Algonkian time.

2. I have not yet recited the facts upon which may be based another interesting conjecture. Jerome is situated at the edge of a broad area of Archæan rocks which has a width toward the southwest of 250 miles. Upon this surface there are a few scattered patches of Palæozoic sediments, and many recent accumulations of volcanic rocks as well as of desert detritus, but this covering is only partial and shallow. The area looks as if it might be a zone extending, with some modifications, such as the relative amounts of Palæozoic strata occurring upon it, for a long distance northwest into Nevada and southeast into Mexico. Throughout its length, no characteristic Belt rocks are known upon it, or, at least, they do not appear in Bayley Willis' map of 1911.

SOUTHWEST AND NORTHEAST OF JEROME DIFFER

At any rate, the area southwest of Jerome is an almost continuous exposure of crystalline rocks, bearing plain evidence of erosion that has worn far down into the earth's crust. If the Belt rocks ever covered it, they have been swept away; if Palæozoic rocks covered it once (they certainly did in part), they have been practically swept away. Neither Mesozoic nor Tertiary rocks occur on it except as volcanics, and perhaps patches of talus that are not the sediments which go into depressed areas, but are the immediate products of faulting and uplift.

The zone northeast of Jerome, the plateau region, is of opposite character and geological experience. Since Archæan times, with some interruptions, such as the present and the period of post-Beltian and pre-Cambrian erosion previously considered, it has been prevailingly a dumping ground for the products of erosion. It contains the Algonkian Belt series, 12,000 ft. thick at the Grand Canyon and 25,000 ft. thick in Idaho; it contains, also, a large amount of Palæozoic, Mesozoic and Tertiary sediments, all of which have been deposited either in the sea or in low-lying depressed areas. It has finally been elevated into a plateau, but its solid mass has not been shattered. It has recently been penetrated by igneous activity, no doubt as a part of the process of uplift, but this event is practically a new experience for the region, such as had not occurred before in the long ages from the pre-Cambrian to the Tertiary.

It is clear that the belt southwest of Jerome, as compared with that northeast of it, has been prevailingly a belt of erosion. To explain this one has the choice of two suppositions, either of which points to about the same conclusion: the belt may have been the seat of active sedimentation interrupted by periods of intensive erosion, which means that it must have been elevated into high mountains, or it may never have been depressed enough to receive much sediment, which would indicate that it has been continuously a mountain area, but not necessarily in high ranges. There is no escape from the deduction that it has been a belt of elevation. Nor does it lack what I am convinced is a general concomitant of mountain building, for it contains at least along its eastern border, abundance of batholithic igneous intrusions.

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[1] [illegible] Quadrangle [illegible] Bull. 549

My conjecture from these broad facts is that Jerome lies on the line which separates a zone of prevalent upthrust from a zone of prevalent subsidence. Such a line is naturally one of flexure and rupture, or, in other words, a line of weakness. It may be assumed that such a line has frequently divided a sea from the land, or a mountain front from a plain. It is, in fact, not a line but a zone of varying width. I think it reasonable to suppose that the mountain zone of Arizona as defined by Ransome has this general significance; that it is a zone of permanent or recurrent weakness between two comparatively solid blocks of the earth's crust, along which several strain adjustments on a continental scale have taken place; that these adjustments have found relief in many fusions of deep-seated rocks; that these fused masses have penetrated upward to or near the surface in the form of stocks or batholiths; that these batholiths gave off into the enclosing rocks the streams of mineralized gases or solutions which produced the ore deposits; and that, consequently, the ore deposits lie generally in the zone of weakness which finds some expression in the elevation or depression of bordering areas, therefore in the processes of erosion and deposition, and finally in the geography and topography of the continent. Thus one may perhaps hope to establish a more or less clear relationship between the processes of erosion, sedimentation, mountain building, batholithic action and magmatic ore deposits, and even with the expression of the processes in the major topographic features.

FORMATION OF JEROME DEPOSITS CONTEMPORARY TO THOSE OF LAKE SUPERIOR AND CANADA

3. If it be logical to regard these conjectures as measurably correct, there is reason to argue that the ore deposits of Jerome may belong to the same cycle of continental history as the copper mines of Lake Superior, the copper-nickel deposits of Sudbury, the silver deposits of Cobalt, and perhaps the gold mines of Porcupine, Ontario. These deposits are all connected with batholithic, or at least volcanic, masses along a tolerably well-defined axis. They may all belong, as has been suggested to me by Prof. C. K. Leith, to the same period of mountain building. The broad facts, on which conjecture may be based, are as follows:

The Upper Huronian, or Animikie, series of Lake Superior, as well as certain earlier rocks separated from the Animikie by an erosion interval or moderate unconformity, is an example of normal sedimentation on an extensive scale. Following a long period of continental quiescence, during which erosion forms had reached mature stages, there ensued a slow subsidence and sea invasion. The first deposits were sandstones or conglomerates, merely the washed débris of land weathering; following these were chemical deposits or precipitations such as usually take place in deepening waters, limestones and the peculiar iron formations; finally, deposits made after the subsidence had come to an end, and erosion products from the land rapidly filled the shallowing basin—shales and sandstones.

Then followed an outburst of mountain building or continental readjustment, during which certain areas of the rocks described were dislocated and contorted, just as rocks have been dislocated and contorted along many mountain-building axes in other places in later times. This disturbance was accompanied by igneous activity on a tremendous scale, producing innumerable batholiths or intrusions, as well as great piles of surface volcanics or extrusions. The Keweenawan series, the copper-bearing rocks of Lake Superior, was such a pile. It consists of a succession of thick lava flows separated by beds of coarse erosion products or talus, such as invariably accumulate on mountain slopes. As the process went on, the volcanic activity lost its vigor, the intervals between eruptions became longer, the accumulations of débris greater, until finally the eruptions ceased altogether and the lowlands around or the depressions between the volcanic piles were swamped in a huge mass of talus which differs in no essential respect from the wash that fills the depressions between the fault blocks of Arizona.

It seems to me that this Keweenawan series, then, is distinctly a record of continental disturbance, the reverse of the period of quiescence and marginal deposition of which the Huronian is the record. With the closing of the Keweenawan disturbance, the Lake Superior region settled into a state of crustal quiescence which has lasted to the present day. During Palæozoic and again in Cretaceous times it was quietly depressed, so that it received a partial invasion by the sea, the record of which is sediment still undisturbed and almost unconsolidated. In all its major aspects, this succession of events is on all fours with that recorded for the Belt series, the mountain-building interval, and the Palæozoic of central Arizona; and it is a fair inference that the copper deposits of Jerome belong to the same line in the geological column and to the same set of general causes as those of Michigan.

STRUCTURAL FEATURES OF JEROME ORE DEPOSITS

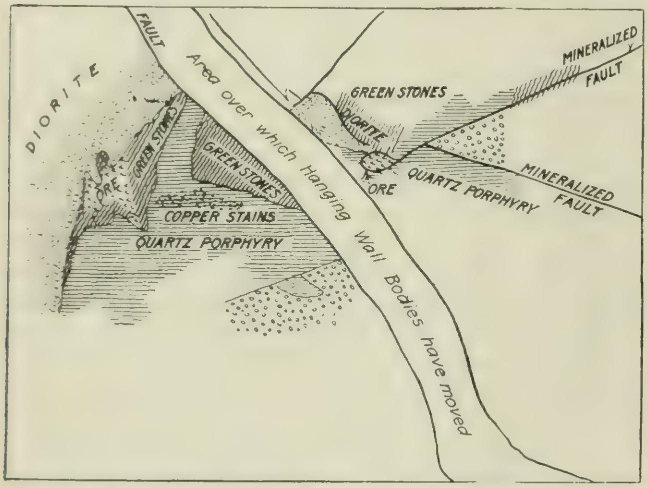
A great deal remains to be learned about the structural features that govern the occurrence of the deposits in the Jerome district, but one salient fact appears to be established—the ores are distributed along the contacts of intrusive masses of an augite diorite. All the masses of this diorite now known may easily have been originally one, which has been divided by faulting, but this is not yet a definitely proved fact. This diorite is next to the youngest of the pre-Cambrian rocks of the district, but it is cut by a set of dikes which are also a kind of diorite, but are narrow. The orebodies are younger than the great diorite intrusions but older than the narrow dikes. The massive diorite, which may be designated the United Verde diorite; the orebodies and the narrow dikes, which are known by the rather extraordinary name of "water courses," are all undisturbed except by recent faulting, and plainly did not participate in the mountain-building stresses which affected the other pre-Cambrian rocks. They are, however, definitely pre-Cambrian in age. The whole process of formation was completed, the ores were exposed by erosion, oxidized to a depth of 500 ft., the copper had migrated to the zone of secondary enrichment, and the orebodies brought completely into their present condition before the invasion of the Palæozoic sea.

The rocks cut by the United Verde diorite are all ancient volcanics, either intrusive or extrusive. Some of them may be of pre-Algonkian age, on the theory that the United Verde diorite is post-Algonkian, because they have been subjected to stresses vigorous enough to give them a widespread schistosity; and I suppose this must indicate that these rocks participated in mountain-building movements that occurred before the Belt rocks were deposited.

Relation of Greenstones and Quartz Porphyries

The oldest rocks seem to be prevailingly greenstones, many of which are undoubtedly extrusives, often in the form of bedded tuffs, although a good many of these are of medium acidity and have a gray or dark color. These greenstones are often considerably folded, in axes running, generally, north and south. Into these greenstones a mass of quartz porphyry has been intruded, and forms the high ridge called Cleopatra Hill, just south of the United Verde mine. It is with this north border of the quartz porphyry mass that the present article is chiefly concerned, for the zone of mineralization follows it fairly closely.

As a whole, the quartz porphyry is a large irregular mass, the outlines of which are vaguely known at its west end, but not at all toward the east, where, beyond a great fault, it is generally covered with Palæozoic limestones and recent lavas. It is certainly intrusive into the greenstones and irregular in outline, probably sending off several spurs from the main mass, and extends along an approximately east-and-west course from southwest of the United Verde to and beyond the Texas shaft, a distance of two and one-half miles. The north boundary of this mass cuts across the bedding or schistosity of the greenstones nearly at right angles and forms a rude plane, which dips generally northward at an angle of perhaps 60°. It is a notable fact that this porphyry, which in its center approaches a granite in texture, has been strongly sheared, and a pronounced schistosity has been developed in a large part of it. Some portions, however, especially the southwestern part, have been much less affected by the shearing and are still massive. The pronounced schistosity begins at the United Verde mine and continues eastward as far as the rock is exposed on the surface. This schistosity has a strike of about N 20° W and occurs in bands of greater and lesser intensity.



GEOLOGICAL SKETCH MAP, JEROME DISTRICT

So far as known at present, the intrusions of United Verde diorite do not penetrate into the mass of the quartz porphyry, but seem to follow along its contact. Sometimes the diorite cuts across branching arms of the quartz porphyry and in places comes in contact with the main mass; but large wedges of the schist are included between the irregular boundaries of the two intrustions. It would appear that the greenstones near the contact formed a weak zone, which was followed, at least in a general way, by the diorite intrusions. As intimated previously, the diorite is strikingly fresher than the older rocks, and the contrast between its massive structure and the extremely schistose part of the quartz porphyry attracts immediate attention. As the diorite is patently a younger rock, one is inclined to wonder why it did not force itself in along the planes of schistosity, instead of going across them; but that it did not do so warrants the conclusion that the greenstones border must have been, on the whole, less resistant than even the most schistose bands of the porphyry. All the known valuable orebodies of the Jerome district occur in these greenstone schists, which form the border of the quartz porphyry, or are within the latter rock near its periphery.

(To be continued)

Soldier and Sailor Insurance

The business of insuring the soldiers and sailors in the service of the United States is scarcely a year old, and yet the Government has written more than $30,000,000,000 of insurance, insuring approximately three and a half million soldiers and sailors. This gigantic business, employing 10,000 individuals and doing a greater business than the largest insurance company of the world, has all been organized in less than 12 months. The bureau recently has been doing a business of more than a billion dollars a week; the total for the month of August will approximate $5,000,000,000 in new insurance. On one day 92,253 pieces of mail were received.

It is a great work, an intricate work, a work of which every American approves. More than 90% of the members of the country's military and naval forces are insured, and this insurance has strengthened the morale of our fighting men and brought comfort and courage to their dependents at home. In addition to the insurance there are added soldier and sailor family allotments and Government allowances to dependents, the disbursement of allotments and allowances already totaling more than $140,000,000.

Alaska Road Taps Matanuska Field

The Government railroad in Alaska between Anchorage and Seward has been completed, the Department of the Interior has announced. This makes possible the shipment of coal from the Matanuska mines directly to Seward, a distance of 190 miles. It will also furnish transportation facilities to the coast for the agricutural products and minerals which that vast territory will produce in the future. Sixty per cent. of the railroad is now ready for operation, and it is expected that before the end of the present season rail will also be laid from Nenana, which is about 400 miles inland, southward 50 miles to Lignite Creek, which will make the lignite coal in the Nenana fields available.

Shaft Sinking at the Seneca Mine

By W. V. Featherly*

The excellent progress made in sinking the Seneca shaft is the result of a well-planned organization, and each process and all branches of the work have been carefully considered. A bonus system has been instituted; a method of blasting whereby good breakage of the ground is obtained is used; certain men are entrusted with specified duties, and matters pertaining to the safety and comfort of the men are given special attention.

The Seneca Mining Co., at Mohawk, Mich., is sinking a compound shaft, which is to be vertical to a point 1450 ft. from the surface and will then follow a 400-ft. radius curve to meet the Kearsarge lode, which dips at an angle of 34° from the horizontal. The equipment and methods adopted in sinking are in accordance with modern practice, and the progress made has established a record for shaft sinking in the Lake Superior district.

SHAFT CREW WITH HAND HAMMER-TYPE DRILLS USED IN SINKING SENECA SHAFT

The shaft is to be of four compartments, having two skipways, one ladderway and one pipe compartment. Over-all dimensions of the excavation are 11 ft. 4 in. x 21 ft. 4 in. and steel sets of 5-in. H-beam construction are placed at from 6 to 8-ft. centers, depending upon the nature of the ground. These sets are put in so that they are placed 4 ft. from the bottom when the ground is soft, up to 30 ft. from the bottom when the ground is hard. The lagging is of 2-in. hard wood.

A double-drum steam hoist operates two 36-cu.ft. buckets. Air is furnished by one Sullivan tandem-compound, Corliss steam-driven compressor, and one class WB-2 Sullivan straight line, simple steam, two-stage air compressor is installed as a reserve. At the beginning of operations eight Sullivan DP-33 air tube rotators and eight hand hammer-drills of another make were in use. It was soon obvious that the Sullivan rotators were securing better results. Four more Sullivan rotators were purchased in April, and since that time 11 have been in constant operation, and two kept as spares. The header, shown in an accompanying cut, is connected to the main air line by a 3-in. hose and is supported in the center of the shaft while drilling by means of a cable leading from the steel framework. There are 11 hose lines, each 14 ft. long and leading from the bottom of the header to the drills; also one connection for a blowpipe.

Early Progress Made Under Handicaps

Excavation was begun on Feb. 13 during severe weather conditions as well as other handicaps. Water froze in the buckets, there were no steam lines installed in the shafthouse, and the rock had to be trammed by hand. Three shifts were worked, with only four or five men on a shift, and under these conditions progress was slow. During February, 51 ft. was sunk, and in March 113 ft., with conditions about the same. Early in April the rock-disposal haulage outfit was completed, the headframe inclosed, and steam heating coils were installed, so that 154 ft. of shaft was sunk during that month. By increasing wages 50c. per day the management was able to secure sufficient men by May 1, and since that time the work has been carried on at full capacity, the crew averaging ten men and one shift-boss per shift, and working three shifts.

During May 208 ft. was sunk in 27 working days, and this rate was maintained in June, when 195 ft. was sunk in 25 working days. This figure would have been exceeded had not the men encountered loose, soft ground, which caused considerable delay, as it was necessary to keep the steel work close to the bottom of the shaft to guard against loose rock falling on the men.

The bonus system which has been adopted consists of the following: The men receive a flat rate per day up to the first 100 ft. per month; 2c. per foot per day for all over 100 ft. up to 150 ft. per month; 3c. per foot per day for all over 150 ft. up to 200 ft. per month, and 4c. per foot per day for all over 200 ft. per month. This provides an incentive for the men to work hard, and each shift tries to send up more rock than the previous one. The shifts are well organized, and the same men have their regular work to do each time they blast. Two men attend to the raising and lowering of the header, which is hooked on the bottom of one bucket. The drills are taken up in the other bucket. One man looks after the main wires while the others are charging the holes and getting the tools up. The last two men connect the main wires. One of them inspects everything at the last minute and carries the key to the blasting switch.

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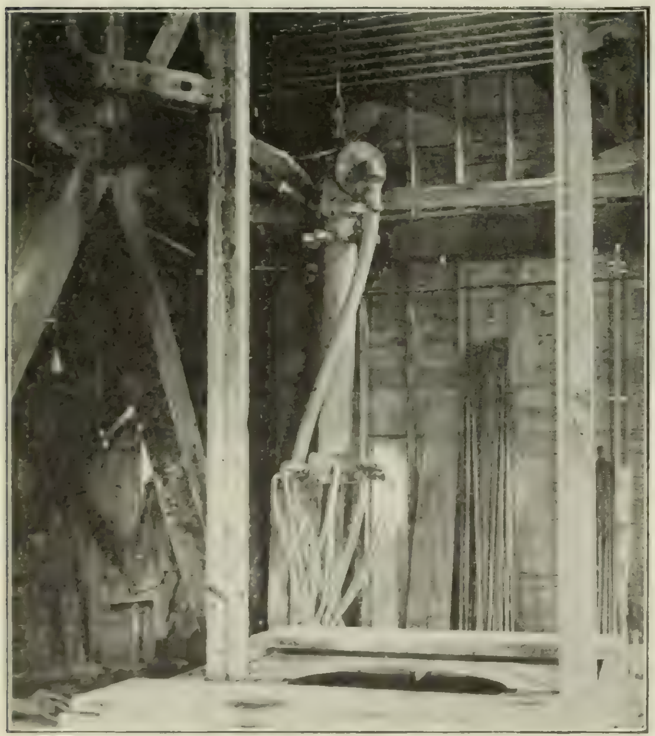
*Walker Bank Bldg., Salt Lake City, Utah.

METHOD OF CHARGING AND BLASTING

In blasting, electric igniters and blasting caps are used. The bottom of the deeper holes is charged with 60% powder, 45% being used in the remainder. The average depth of hole is 8 ft., and the round of 45 holes is drilled in from two and a half to three hours. The "sink" is made with a double V-cut, and is shot in two separate blasts, the cut holes being fired first. In the diagram, cut holes numbered 1, 2, 3, and 4, are shot in that respective order with instantaneous and delay caps. If all of these holes break satisfactorily, the squaring holes numbered 5, 6, and 7 are set off. This plan insures the breaking of the sink holes before the ends of the shaft are squared. Thus far, two pounds of explosive per cubic yard of rock has been the average.



AIR HEADER USED IN SINKING SENECA SHAFT, MOHAWK, MICHIGAN

Eight construction men are employed in placing sets while the men are drilling and not using the buckets. In drilling, ⅞-in. hollow drill steel is used, and this is sharpened and shanked by machi

Ventilation is secured by means of a 7½ hp. blower, which forces fresh air through a 16-in. Flexoid tube. With this equipment it is possible to return to the bottom of the shaft in less than ten minutes after blasting. Light is furnished at the bottom of the shaft by two factory domes, with four 100-watt lamps in each dome. The men are required to wear special hard hats, made of felt, treated with resin and shellac, which will resist a severe blow. Movable sollars, made of steel plates and operated by levers, are placed over the two compartments used for loading supplies in buckets. When the bucket hangs at the brace, the lever is thrown and the plates close in around the bucket, making practically a complete cover over the compartment. Electric signals are employed throughout.

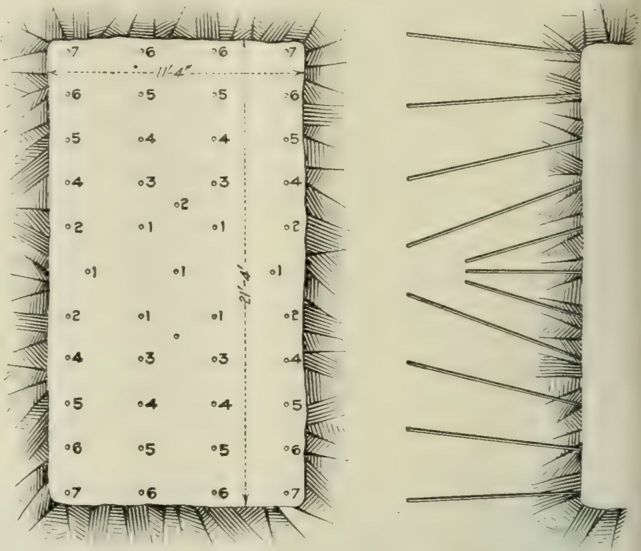


DIAGRAM SHOWING ORDER OF BLASTING AT SENECA SHAFT

Magnesite in First Half of 1918

According to R. W. Stone, of the U. S. Geological Survey, the production of magnesite in the six months ended June 30, 1918, was about 93,700 short tons, of which California produced more than half. The best figures available credit California with an output of about 47,600 tons of crude magnesite and Washington with 46,100 tons. Only two companies were producing in Washington, and one of these stopped quarrying from February to May in order to enlarge its calcining plant and develop the deposit. The rate of production in California is about 50% less than in 1917, and the rate in Washington is about 88% of that of last year. The output of California in the second half of 1918 will probably be no larger than in the first half, but that of Washington may be much larger, for development has now reached a stage where rock can be quarried, calcined, and shipped at an increased rate. The production for the entire year may be about 225,000 tons, as against 316,000 tons in 1917.

The increased freight rate and the importation of magnesite from Canada have greatly reduced the demand for California magnesite for use as a refractory material, so that all the small and some of the large producers have stopped work.

Important Physical Properties of Acid Refractory Materials and Methods of Estimation*

BY G. E. FOXWELL

The more important physical attributes of firebricks are considered, together with data showing on what each property depends. Various methods employed for measurement of the important characteristics are described. The peculiar composition of a firebrick necessitates the consideration of many details, such as softening prior to liquefaction, permanent contraction, thermal expansion, and slag permeation, all of which subjects are here discussed in detail.

WHEN a chemically pure substance such as naphthalene or picric acid is heated slowly, it melts at a definite temperature; there is no 'softening range," but a sharp melting within one-tenth f a degree. If, however, impurities are present, the nelting does not occur sharply, but extends over a wide ange, which is greater as the substance contains greater uantities of impurity; there is no definite melting point. This is the condition met in bricks. Bricks are agglomrates of many different substances. Thus a common irebrick containing, say, 65% of silica will consist of uartz, cristobalite, tridymite, sillimanite, and a variety f other bodies containing lime, soda, potash, magnesia, ron oxide, and titania in their composition. Sillimanite nelts at 1816° C., quartz at 1770° C., cristobalite at bout the same, and tridymite (of which such a brick vill contain little) probably melts at about 1500° C., ccording to Endell and Rieke. It will be noted that t least 80% of the brick melts above 1750° C., and et the softening temperature is probably under 1650°. A brick may show signs of softening at 1600° and et not be liquid until 1800°. The matter is further omplicated by the fact that one constituent may fail n such a way as to make the brick change its shape nder a slight pressure, and yet the surface of the rick will show no sign of fusion. Under these circumtances it is obviously difficult to determine the melting oint in a satisfactory manner.

USE OF SEGER CONES

Until recently the only test attempted was to denine the melting point, or rather softening point, under tmospheric conditions. By common consent, this is efined as the temperature at which the exterior surface f the brick exhibits signs of fusion. The temperature is usually measured by means of Seger cones. The yrometer is undoubtedly a more scientific instrument, nd for measuring the temperature of fusion of a pure ubstance of high melting point it is far superior to the Seger cone. For determining the melting point of such a complex agglomerate as a firebrick, however, the Seger cones possess advantages.

If a thin section of firebrick could be observed under the microscope while being slowly heated from atmospheric temperature up to its temperature of complete liquefaction, it would be seen that certain constituents (fluxes) would melt at a relatively low temperature. Thus, ferrous silicate melts at just above 1000° C. As the temperature rose, other fluxes would be seen to melt. The quantity of flux melted up to, say, 1300° C. would be small, but if the temperature were maintained at this point the molten flux would either dissolve or interact with the adjacent parts of the brick, and so the molten areas would increase. This action would be slight at 1300° C., but at 1400° to 1500° it would become serious. A brick which when heated at the rate of 10° C. a minute melted at 1600° C., when heated at 2° C. a minute might fuse at 1500°. Hence speed of heating is important.

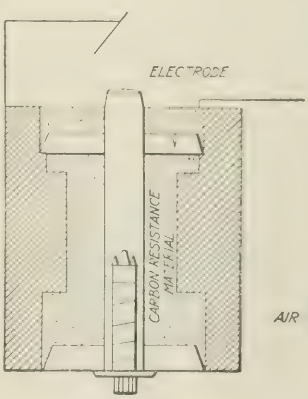


FIG. 1

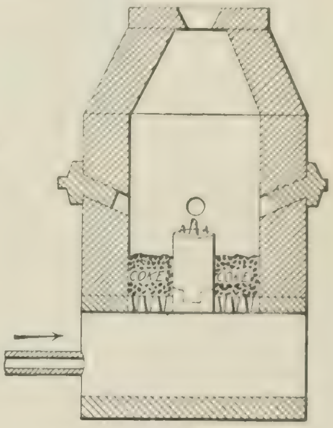


FIG. 2

Seger cones are so made that they collapse at specified temperatures when heated at a specified rate—namely, 10° C. per minute. This same rate of heating is specified for the determination of the softening point of bricks. It is clear, therefore, that if the rate of rise of temperature in any test is not exactly the same as that specified, the Seger cone method will tend to neutralize the error. The refractory test is, after all, only empirical. It merely permits of comparing one refractory with another.

METHOD OF OPERATION

The test is carried out by placing a piece of brick, chipped roughly into the form of a cone about 1½ in. in height, on a small disk and placing round it three or four Seger cones which have softening points at about the temperature at which it is expected the brick will soften. The brick and cones are then cemented to the disk by a suitable cementing material, and the whole is placed in a furnace. Usually Hirsch's electric furnace is used, though some prefer Deville's gas-fired furnace. Heat is then applied, the temperature being raised at the rate of 10° C. per minute. When the temperature gets within 100° of the expected softening point, it is necessary to watch the sample carefully. A skilled observer can tell exactly when the surface of the brick fuses, but if there is any doubt it is well to withdraw the sample from the furnace for a few seconds, when it is easy to tell if the fusing temperature has been reached or not. Fig. 1 gives a sketch section of the Hirsch furnace, and Fig. 2 one of a coke-fired furnace for the same purpose. An apparatus of a different type has recently been brought out in the United States. In this a minute fragment of the material under investigation is placed in such a position as to be surrounded by radiant heat. Observed under a magnifying glass, it is possible to tell the exact instant at which fusion of the surface occurs.

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*Abstracted from "The Iron and Coal Trades Review."

As mentioned, parts of brick will fuse long before the fusing proper, as shown in the described test. When this happens, the brick will be partly liquid, and hence its compressive strength will be greatly reduced. Consequently, when a brick is under pressure in a structure it will not stand as high a temperature as that given by the above test. Recently a good deal of attention has been paid to the determination of what is termed the "melting point under pressure." The melting point of any substance is only slightly depressed by increase of pressure; thus, the melting point of ice is lowered by 0.007° C. for each atmosphere of pressure. Hence, what is really measured in this test is the temperature at which a brick becomes sufficiently viscous to flow under a given pressure, and it is of much more use industrially than the previous one, and, in my opinion, will entirely supersede it in the near future.

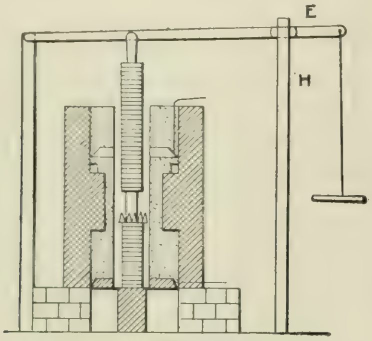


FIG. 3

MODIFIED HIRSCH FURNACE

For measuring the resistance to pressure at high temperature Dr. Mellor has devised a modification of the Hirsch furnace which has the advantage that it permits the furnace to be entirely used for either form of melting-point test. His apparatus is shown in Fig. 3. He employs specimens of cylindrical shape 6 cm. (2.3 in.) in height and 2 cm. (0.8 in.) diameter. This test piece is placed on a refractory block, which stands on a solid foundation, and is surrounded by Seger cones, as shown in the sketch. A thick graphite rod is used for transmitting the pressure to the specimen. Reference to the sketch will show the manner in which the load is applied. In order to determine the exact point at which distortion of the test piece begins, a mechanical device is employed. A binding screw is fixed to the arm of the lever *E* carrying the weights. A similar screw is fixed to the support *H*. These two pins are insulated from the rest of the apparatus, but are in circuit with an electric bell. When the test piece is distorted, the lever arm *E* falls and the two screws make contact and ring the bell.

Fig. 4 shows a more elaborate apparatus designed for the same purpose by Ezer and Griffiths, and described by them in a paper read before the Faraday Society. The furnace is of the carbon-tube resistance type. The specimen employed is cylindrical, ⅝ in. diameter and 1 in. in length. It is supported on a carbon rod, and a similar rod on top is used for transmitting the pressure. The pressure is created by a spring instead of a weight and lever arm, as in Mellor's apparatus. The carbon tube is 2 in. external diameter, 1½ in. internal diameter and 11 in. long. A slot ¼ in. wide extends the entire length of the furnace in order to allow the specimen to be seen. In this case no mechanical device is employed to let the observer know when the fusing temperature has been reached, but the test piece is observed throughout the whole period of testing.

The testing of refractory materials under load requires great care. In the first place, it is necessary to grind the opposite ends of the specimen exactly flat and as nearly parallel as possible. If not ground absolutely parallel, it is necessary to allow the carbon rod used for transmitting the pressure to take up its own position before putting any weight on it, so that it rests evenly on the whole face of the specimen. The temperature rise must be kept carefully to the standard—10° C. per minute. The area of the upper end of the test piece must be accurately known, for the pressure is measured in lb. per sq.in., and if the tests are to be comparable among themselves the same pressure must be used in each experiment. The greatest need in this connection is a handy apparatus whereby the pieces of brick may be accurately ground to a specific size.

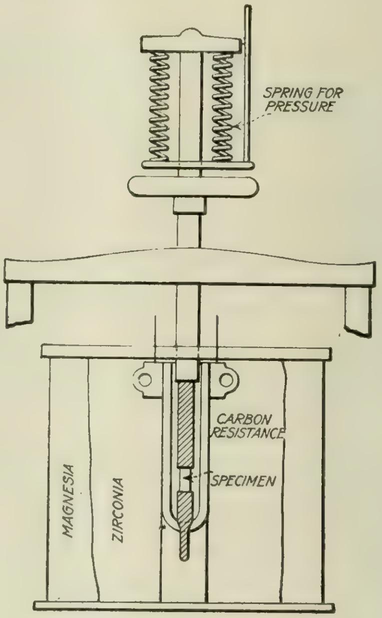


FIG. 4

Most materials expand on being heated, and on cooling contract again to their original size. Refractory materials are no exception to the first part of this generalization, but they do not return to their original size on cooling. Firebricks undergo a permanent contraction on heating. This is due to fusion of small quantities of fluxes, as already mentioned, which allows surface tension to come into play, resulting in the drawing together of the grains. Silica bricks, on the other hand, undergo a permanent expansion in use. This is due to the inversion of quartz to cristobalite, which is never completed in the brick kiln. This "permanent" expansion or contraction is comparatively easy to measure. A test piece about 4½ in. long and 2½ in. thick is measured carefully, marks being placed in order that the calipers may be put in the same position after the test. The calipers should read to within 0.01 mm. The test piece is then placed in a furnace and maintained at a specified temperature for two hours. This temperature is Cone 12 for material containing more than 80% of silica and Cone 14 for firebricks, according to the Gas Engineers' specification. At the expiration of two hours, the furnace is cooled, and when cool the test piece is again measured. The expansion or contraction observed gives the figure required when expressed as a percentage.

MEASUREMENT OF THERMAL EXPANSION

The true thermal expansion is difficult to measure and requires a special and expensive apparatus devised by Baron Coppée. Two saw cuts are made in a whole brick near the ends and platinum wires fastened into each cut. The distance apart of these wires is taken while the brick is cold. It is then placed in the furnace and the distance measured through suitable apertures by means of a cathetometer. The expansion thus found is not the true thermal expansion but the resultant of the thermal expansion and the "permanent" expansion or contraction. In order to obtain the true expansion, it is necessary to take the brick up to the required temperature, measure the expansion, then let the brick cool again and measure any "permanent" expansion or contraction which may have occurred. This point has been often overlooked.

PERMEABILITY OR SLAG PENETRATION

This test is of great importance in certain industries, and is one of those for which no standard method has been evolved. The American Society for Testing Materials recommends the following method, which is given as representative of the kind of method employed: A hole 2½ in. in diameter is cut with a drill pointed at an angle of 150° to a depth of ½ in. at the side. The hole is cleaned out and the brick heated to 1350° C. A known quantity of powdered slag is placed in the hole, and the temperature maintained at 1350° for two hours. The brick is then allowed to cool and is sawn in two pieces so as to bisect the original hole. The total area of slag penetrable is measured by means of a planimeter. Nesbitt and Bell, the originators of this method, find that the quantity of slag taken and the time of heating, provided this extends over two hours, do not materially affect the result.

I hold that since only comparative tests are required, the following modification of the porosity test would give as valuable results as this somewhat elaborate method: A piece of brick is dried at a red heat and weighed. It is then immersed in boiling water for an hour and the water allowed to cool with the brick in it. The increase in weight gives the total space of those pores which are penetrated by slag, as distinct from those which are totally closed.

In most cases a highly important property of firebricks is that of resistance to sudden changes in temperature. In the coke oven, just before discharging the coke the temperature of the wall will be 1000° C. or over; when the door of the oven is open for the discharging process the temperature of the inner face will drop to perhaps 950° C., though the side of the wall next the flue will retain its pristine temperature. On putting a charge of coal into the oven, the temperature will further drop rapidly to about 600° C., or possibly even lower than that on the inside, whereas the side next to the flue cools down more gradually and does not reach the same low level. It will be clear, therefore, that severe strains are likely to be set up in the coke-oven wall. Other instances of equally severe treatment might be cited from the iron and steel industry, but this will be enough to show the importance of this property.

There seems to be no definite test for resistance to temperature changes, and it is carried out only occasionally. The method usually employed is to take a whole brick very hot from a furnace, drop it into a bucket of water and endeavor to ascertain with the unaided eye if any signs of disintegration are visible. Professor Cronshaw has suggested that the test required is to raise the test piece to a certain temperature, allow it to cool rapidly to a lower temperature during a definite period of time by a definite means, and then carry out a determination of crushing strength.

CRUSHING STRENGTH DETERMINATION

The crushing strength is a somewhat difficult property to measure and requires expensive apparatus. I have suggested a much simpler method whereby a measure of the altered condition of the brick may be ascertained without any special apparatus. The non-resistance of a brick to sudden changes of temperature is caused by the occurrence of numerous minute cracks, formed by the strains set up in the brick. The method suggested is to heat up and cool down exactly as indicated by Professor Cronshaw, and to ascertain the total amount of cracks produced. The test piece, whose volume is known, should be boiled in water for an hour before testing, allowed to cool in the water, and then weighed. After the test, this process is repeated, and the increase in weight will give a measure of the cracks which have been produced. The brick is first raised to a temperature of 1000° C. in a muffle furnace and then plunged suddenly into cold water. This test is devised for coke-oven purposes. For other industries other initial temperatures will be required. Results obtained on two different bricks by this method are as follows:

	First Brick Tested	Second Brick Tested
Volume of brick, cc.	105	75
Initial weight of brick and water, gm.	218.502	155.222
Weight of brick and water after test, gm.	218.740	155.974
Volume of cracks produced, per 100 cc. of brick, cc.	0.230	1.003

THERMAL CONDUCTIVITY

This property is at present entirely a matter of experiment, and does not form the subject of any recognized test. Its measurement is perhaps the most elusive of all properties. It has been done by a few experimenters from time to time, but each finds it necessary to employ different apparatus from that employed by other workers. For a rough practical test, a bunsen burner may be allowed to play on one side of a brick, and the opposite face may be held in the hand. The time in which the brick becomes too hot to hold gives a rough indication of the relative heat-conducting powers of different bricks. This test, of course, is purely a practical one, and is of no value for definite measurement of the property.

I will endeavor to give an account of some of the methods which have been employed for measuring conductivity. From every point of view this is a most important property, and merits greater attention than has been given to it. The conductivity of bricks depends on two factors— (1) the amount of pore space in the brick, and (2) the material of which the brick is made. Air is one of the best non-conductors known, especially in small pores where not much circulation is possible. Consequently, the larger the pore space the slower the heat transmission through the brick, because the heat can pass only by radiation and not by conduction. The heat passes by conduction through the grain of the material of which the brick is made. The rate of transmission of heat by radiation—i.e., across the pores—is proportional to the difference in the fourth power of the temperatures of the surface radiating the heat and the surface receiving the heat. The conductivity across the solid part of the brick depends on simple temperature differences.

The first serious attempt at estimating the conductivity of brick was made by Wologdine, and his apparatus is shown in Fig. 5. As will be seen, it was necessary to make the brick of a special shape, which had a thickness of 5 cm. (1.9 in.) and formed a part of the walls of a furnace heated by gas. Thermocouples were embedded in the brick at a depth of 5 mm. from each face, and the furnace temperature was also taken by a thermocouple near the lower surface of the brick. The temperature of the water entering and leaving the calorimeter was measured, and the heat transmitted in the unit of time per degree difference of temperature between the faces was calculated. This method is not applicable to ordinary practice, as it requires a brick of a special size and shape.

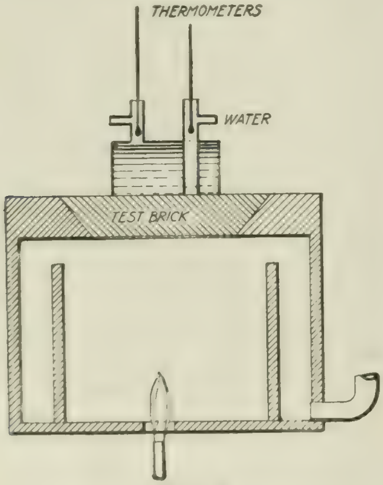


FIG. 5

Boyd Dudley has carried out experiments in America on a large scale. He built a whole wall of a furnace of the bricks under test and measured the heat transmitted through a definite area by means of a flow calorimeter. The bricks composing the wall were 9 in. by 4½ in. by 3 in. in size and the wall was heated by incandescent coke.

Dougill, Hodsman, and Professor Cobb have also carried out experiments on this subject. Their apparatus is shown in Fig. 6. It consists of a gas-heated furnace as shown, heated by a Méker burner using compressed air. The brick formed the roof of the furnace, and whole bricks were used. The temperature of each face of the brick was taken by thermocouples, as usual, and the amount of heat allowed to pass through the brick in a given time was obtained from the amount of water evaporated. The calorimeter used consisted of a rectangular copper vessel, which had a smaller rectangular copper flask fixed on to its base. As will be seen from the sketch, the water evaporated in this was measured, the water in the outer jacket of the calorimeter serving to prevent any loss by radiation. The apparatus seems to satisfy industrial requirements better than any other so far devised. The difficulty in apparatus of this type is to maintain a constant temperature and to maintain the temperature constant over the whole face of the brick.

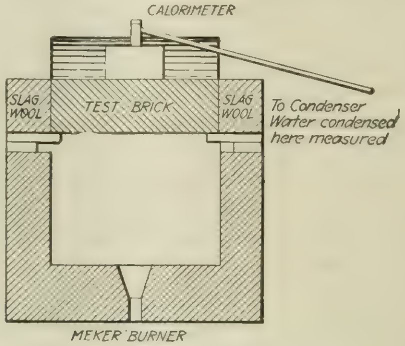


FIG. 6

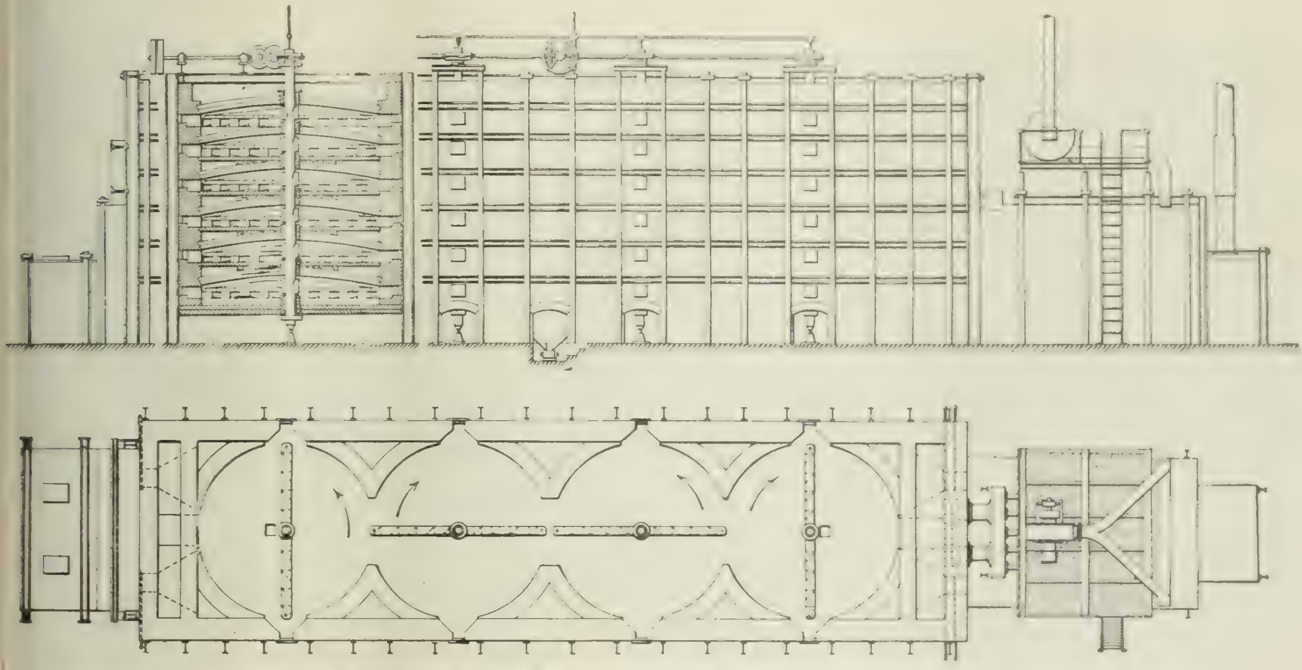
MOLTEN METAL BATH METHOD

Ezer Griffiths, of the National Physical Laboratory, has devised an apparatus whereby the lower face of the brick is heated by a bath of molten metal, thus ensuring an even temperature throughout. The temperature of this molten metal can be readily taken by a thermocouple. He uses a flow calorimeter to measure the amount of heat transmitted. The one employed is on the same principle as that of Wologdine, but it is surrounded by a further water jacket, as in the case of Dougill, Hodsman and Cobb's apparatus. Separate streams of water are allowed to flow through both the outer jacket and the calorimeter proper, and this prevents any serious temperature difference between the two. By regulating the streams of water, the temperature gradient of the water entering and leaving the calorimeter may be made the same as the temperature gradient of the water entering and leaving the outer jacket. Though these methods are useful for scientific purposes and precise measurement, for ordinary purposes an apparatus is required by means of which a whole brick may be placed in the calorimeter, and one surface heated to an even temperature by means of, say, an electric furnace, and a reading of the amount of heat which passes through it taken directly, without the use of thermocouples, which are expensive for industrial laboratories.

New Merton Roasting Furnace For Blende

The Merton blende-roasting furnace follows the regu- r standard design of the Merton furnaces in use for yritic ores, but possesses several important modifica- ons which serve to adapt it to the particular condi- ons of zinc-ore roasting. It may, however, be ad- antageously used for roasting other sulphide ores when concentration of SO_2 gas is required for the manufac- ure of sulphuric acid.

The furnace is of the muffled or semi-muffled type, nd a novel feature is the method of conveying the ore rough it. Instead of rabbling from end to end of each earth, as in the ordinary furnace, the ore is fed in two aces to two separate sets of rabbles, and, in its prog- ess through the several hearths of the furnace, is con- ned to the set of rabbles to which it was originally fed. is finally discharged through individual chutes. This rrangement results in a more uniform and complete asting of the ore, with a minimum production of arth accretions; the fuel consumption is decreased by e utilization of waste heat; and the furnace may be adily adapted to different grades of ore by reason of e adequate control of the air supply and hearth mperature.



SECTION DETAIL, MERTON BLENDE-ROASTING FURNACE

The furnace is of the muffled or semi-muffled type, e topmost hearth being available as a drying hearth, ft uncovered, if desired, for the free escape of steam or por. The next three hearths are muffled hearths in ich most of the roasting is accomplished and from ich the gas evolved is collected for acid making. The completely roasted ore then passes on to the fifth arth, which is open to the fuel gases and where all re- ovable traces of sulphur are eliminated. The ore then sses to the bottom hearth, where it is cooled before scharge. The air used in cooling passes to the grade combustion chamber, where the heat is utilized.

If the zinc is to be extracted by a hydrometallurgical process, instead of by the distillation method, the open-hearth could be dispensed with because a dead sweet roast would not be required.

It should especially be noted, as pointed out, that the ore does not traverse the whole length of the hearths, as in the ordinary Merton or other rectangular furnaces, but remains within the rabbling zone of the two adjacent shafts. In a four-shaft furnace two lots of ore pass simultaneously but separately down from hearth to hearth. The object of this separation of the rabbling into vertical zones is to overcome the backward motion of part of the ore which always occurs in existing multiple-shaft furnaces and causes uneven roasting. The ore is fed near to the center of one shaft and rabbled spirally inward and discharged near to the center, on the next hearth—and so on to the final discharge from the bottom hearth. The ore has thus a definite travel direction and is subjected to uniform conditions, both with regard to rabbling and to time of roasting.

A circular furnace fulfills these conditions of ore travel, but the hearth area is limited to the diameter of the furnace, and this, in turn, is limited by the necessity of keeping the roof of each hearth as low as possible. At the same time, it is difficult to obtain a uniform air supply to all parts of a circular hearth. The hearth area of the Merton blende-roasting furnace is four times the area of a circular furnace of similar diameter; and it may be still further increased by the addition of another pair of shafts, if desired, without affecting the efficiency of the rabbling.

The ore passes from hearth to hearth at points far removed from the gas outlets, so that loss in dusting is reduced to a minimum. The fuel gases, which pass through flues between the upper hearths and through the fifth hearth, traverse a regenerator before escaping to the stack. The air required for the combustion of the sulphur in the muffle hearths is pre-heated in the regenerator and delivered under slight pressure, by means of a fan, and is therefore under complete control. The heated air resulting from the cooling of the roasted ore on the bottom hearth is utilized in the grate or fuel combustion chamber.

The formation of accretions on the hearth is largely to be attributed to overheating consequent on inefficient and unequal roasting, especially in the case of ores containing appreciable quantities of iron. In the Merton blend-roasting furnace, hearth accretions are reduced to a minimum

Manganese Deposits in Cuba

Manganese ore is found in Cuba in Oriente, Santa Clara, and Pinar del Rio provinces; in Oriente Province the deposits are in three areas, one north and northeast of Santiago de Cuba, another south of Bayamo and Baire, and the third on the Caribbean coast, states a U. S. geological survey bulletin. The first two include the only extensive deposits on the island. In Santa Clara Province a little ore has been found near the Caribbean coast west of Trinidad, and in Pinar del Rio Province small deposits occur north of the city of Pinar del Rio and further west near Mendoza. The two areas in Oriente Province promises considerable production.

The ores occur principally in sedimentary rocks such as limestone, sandstone and shale, which are in places metamorphosed, but in the most heavily mineralized areas are associated with masses of siliceous rock locally termed "jasper" and "byate." At one locality the manganese and its siliceous associates are in igneous rocks, such as latite-porphyry and latite.

The sedimentary rocks with which the manganese deposits are associated are in some places nearly horizontal, but generally show dips ranging from a few degrees to 45° or more. These inclined beds usually represent portions of local folds. Some faulting is shown in the vicinity of certain manganese deposits and may have influenced the localization of the deposits.

The area north of Santiago and that south of Bayamo are both north of the mountain range known as the Sierra Maestra, but that on the coast east of Portillo is at the south base of this range. The area north of Santiago is, broadly speaking, in the basin formed by the Sierra Maestra on the south and the Sierras de Nipe and del Cristal on the north, the greater part of which is drained westward by Rio Cauto and its tributaries, and small parts of it by Rio Purgatorio and Rio Guantanamo to the south and east. The deposits of manganese ore are found on both sides of the basin. The deposits in the area south of Bayamo are in the foothills of the Sierra Maestra drained by the Buey, Bayamo, Yao, and Cautillo rivers.

The deposits in the two areas north of the Sierra Maestra show an interesting concordance in altitude. They stand from 500 to 1200 ft. above sea level, and most of them are at altitudes of from 600 to 700 ft., suggesting a relation between the deposition of the manganese and a certain stage in the physiographic development of the region. Most of the manganese ore deposits are above drainage level on the slopes of hills of moderate height, the maximum relief in the immediate vicinity of the deposits seldom exceeding 500 feet.

The deposits are rather diverse, but may be grouped into three general physical types—bedded deposits, irregular masses associated with siliceous rock or "jasper," and deposits in residual clay. The bedded deposits comprise several varieties, one of the mos common consisting of poorly consolidated beds of sandy chloritic material cemented with manganese oxide that fill inequalities in the surface of hard rocks. Othe bedded deposits clearly replace limestone, shale, conglomerate, or other rocks, and tabular masses of ore ar interbedded with strata of nearly horizontal limestone

The ore consists largely of pyrolusite, but many deposits contain psilomelane, manganite, and wad, o mixtures of all these minerals. The richness of th deposits varies considerably. Most of the richest masse are associated with the "jasper," but masses that hav replaced limestone thoroughly are also shown on analysi to contain a high content of manganese.

Although the owners and operators of manganes properties in Cuba desire to speed up production whil the need for the ore is great and the prices are good there are certain hindrances, aside from climatic conditions, which tend to retard output. These can be removed to some extent if not altogether.

Difficulties of transportation of ore from mines t railroads have been mentioned, and there seems littl chance for improvement without assistance from th Cuban federal government in building and improvin cart roads. Haulage by caterpillar tractors may eventually supplant some of the haulage by animals. The hig cost of animal haulage of course prevents the production of ore from many deposits at a distance from rai roads. The limitation of this traffic to five or si months of the year further handicaps production.

Shortage of railroad cars and the inability of th Cuban railroad to handle adequately all the manganese ore during the dry season, when traffic is heaviest because the cane-grinding season also falls in this period is an additional and serious handicap to the output o ore. For a time during the spring of 1918 a shortag of ships caused ore to accumulate at the docks i Santiago faster than it could be removed, but it is understood that conditions there have improved.

The marketing of ore by small producers is attende by more or less friction, between buyers and seller over sampling and analyses. It has been suggeste that the United States Government detail two men one of them a chemist and the other a man who ha had experience in sampling ore, to act as umpires a Santiago in the sampling and analysis of manganese ore. Production seems to have been handicapped b the attitude of some owners of lands and leasehold who have raised the price of royalties so high as to discourage operations.

If railway cars and ships are provided for transpor ing the ore, food for the mine laborers, and explosive for blasting, the outlook for a steadily increasing production in 1918 and 1919 is good. It is believed tha the total output for 1918 should be between 110,00 and 125,000 tons, more than 90% of which will contai from 36 to 45% manganese, the remainder being o still higher grade. After the completion of a narrow gage track to certain important mines east of Cristo, i the Santiago district, in the summer of 1918, an increased output in 1919 is assured. Reserves o manganese ore in Oriente Province are estimated a 700,000 to 800,000 tons, more than 85% of which in the district northeast of Santiago.

The 28th Engineers—A Quarrying Regiment

BY HORACE W. EDMONDSON*

ON AUG. 1, 1917, the Chief of Engineers issued orders to form a regiment of skilled quarrymen, to be known as the 28th Engineers. Some commissioned officers and a detachment of enlisted men formed the nucleus, and the regiment has been fully recruited with volunteers from various mining and quarrying sections throughout the United States and from selected men from the engineer training camps. The majority of the commissioned officers are graduates of the training camps of the Engineer Reserve Corps and are experienced mining, mechanical or civil engineers. Among the privates and non-commissioned officers are college graduates and men who previously occupied responsible positions in engineering industries. About 50% of the regiment is made up of men from the Middle and Western states; 45% from the Eastern section, with Pennsylvania representing 15%. In the remaining 5% are men who come from Alaska, Canada, Hawaii, Belgium, France and Italy.

STAFF OFFICERS, 28TH ENGINEERS

From left to right: 1, Capt. F. F. Pike; 2, Capt. A. D. Monteith; 3, Maj. C. T. Starr; 4, Col. C. R. Pettis; 5, Capt. D. Summers; 6, Capt. H. W. Edmondson; 7, Lieut. W. J. Dougherty

Col. Charles R. Pettis, of the Regular Army, is in command. On the staff are Majors Clarence T. Starr, Stuart B. Elliott and John T. Keenan. The Regimental Adjutant is Capt. Daniel Summers and the Personnel Adjutant, Capt. A. D. Monteith. Capt. Horace W. Edmondson is Engineer Officer.

The regiment as such has received training in quarry work as well as in military engineering. Each company has been organized to operate as a unit, by distribution of the skilled men by subsequent training. For training purposes, the authorities took over the quarry and crushing plant belonging to the workhouse of the District of Columbia, situated at Occoquan, and established a tent camp on the north side of Occoquan River, about one mile from the railroad town of Woodbridge, Virginia.

Three faces were exposed in the quarry, varying from 80 to 120 ft. in width and from 50 to 90 ft. high, in a disturbed shale formation, in which 65% gneiss occurs. About 1000 ft. north of the crusher plant lay a massive gneissoid formation, but the fractured condition of the rocks in the quarry afforded more thorough practice in drilling, in stripping and sorting of rock, so the latter site was selected. The bench system of from 15 to 20 sections is used, drilling being done by two Ingersoll rock drills, D-32 and D-44, mounted on tripods, using 1⅛-in. octagonal steel with crossbit. A Jackhamer, with ⅞-in. perforated hexagonal steel, is used in blockholing.

The main-track system and side-track switches are 30-in. gage, with a 25-lb. rail. Two-yard dump cars, hauled by mule to the foot of a 30° incline, dump into a No. 3 Austin gyratory crusher, and the product is elevated to a 48 in. x 12-ft. trommel, from which the plus 2½-in. material is delivered to a No. 6 Austin gyratory, which returns to the same circuit as the discharge from the No. 3 gyratory. The storage capacity is 400 cu.yd., and an adjustable chute permits the direct loading of material into barges.

Power is furnished by two horizontal tubular boilers totaling 200 hp., using soft coal as fuel. These supply steam for one 18 x 24-in. horizontal non-condensing Atlas slide-valve engine, which drives the crushing-plant machinery, and also for the 9 x 9 x 11-in. Chicago Pneumatic air compressor, as well as the pumps.

Under the supervision of the regimental engineer officer, each company operates the quarry for a period of two weeks. The work of the men is changed from time to time, and they are classified and rated according to their aptitude and ability. Individual instruction is given in the care and use of explosives, in machine drilling, tool sharpening, crusher operation, engine care and upkeep, and in boiler firing, the latter with a view to smoke elimination. Cost sheets are kept of operations and posted in both company and regimental offices, a basis of $1.60 per day for privates and $2 per day for non-commissioned officers being adopted. The following costs per cubic yard are for the month of June, 1918, and are based on a total of 2450 yd. shipped, representing about 4000 yd. handled in sorting rock for shipment for road work:

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*Captain, 28th Engineers.

Labor—Stripping, $0.045; drilling, $0.023; loading and sorting, $0.242; crushing, $0.069; power, $0.08; barge and miscellaneous, $0.035. Supplies—Explosives, $0.051; fuel, $0.101, and lubricants, $0.012. Total, $0.668. Four and one-half yards of material was broken to the pound of 40% dynamite used.

A spirited rivalry exists among the companies, each striving for the record in tonnage and cost. This spirit extends to the squads of the individual companies, with a corporal in command. The company commanders were able to classify and distribute their men to the best advantage, so as to be prepared for the more serious work ahead.

Intensive military training has been given the men when not engaged in the quarry, and the regiment is now well fitted to accept any of the responsibilities of an engineer regiment. In fact, as the men perfected themselves in drill, bayonet work and military routine, quarrying became a secondary consideration, the first being a desire to get into the front line trenches and try their skill in "No Man's Land."

California Crude-Oil Prices

The prices of California crude oil at the well in the San Joaquin and the Southern fields, posted on May 1, 1918, and which are uniform in both districts, are the highest paid in recent years in California, and represent a large increase since 1913. In the San Joaquin field this increase ranged from 82c. per bbl. for the highest gravity to 88c. per bbl. for low-gravity oil. The increase in the Southern field ranged from 63c. to 72c. The prices are $1.23 per bbl. for low-gravity and $1.57 for the highest.

In 1913, six prices were named in the San Joaquin field, ranging from 35c. per bbl. up to 75c. per bbl., according to gravity. In the Southern field only four prices were named, ranging from 60c. per bbl. up to 85c. The low-gravity oil in the San Joaquin district was lower than that in the Southern field. The methods of fixing prices are similar in the two districts. In January, 1916, the same range of gravities was maintained, but the prices were fixed for oil above 18° by adding 1c. per bbl. per degree. This method has since been maintained. In September, 1916, the gravities were extended in the San Joaquin field, and in November the extension was applied to the Southern field, providing for an increase of 0.03c. per bbl. per degree for oil of 38° and above. The prices thus announced by the Standard Oil Co. are the ruling prices paid by other marketers and refiners, and are not likely to be again increased during the period of the war.

In the early period of commercial production of oi in California, beginning in 1875, a record of price movements was not kept. But in the period of 35 years to and including 1909 the annual production records are fairly dependable, showing a total production of 309,077,701 bbl., of an estimated total value of $136,693,228. On this basis, the average price during the 35-year period was approximately 45c. per bbl. In the three years following (1910, 1911, 1912), the total production was 252,034,975 bbl., and the recorded value totaled $120,109,974, or an average price of approximately 48c. per bbl. The price in 1909 varied from 45c. to 70c. per bbl., and these figures represent approximately the average movement during a period of about 40 years. Occasionally high prices were paid for high-gravity oil, one record in 1909 showing a price of $1.10 per bbl. But another record in earlier years shows prices as low as 15c. and as high as 75c. for low-gravity oil.

Bounty on Gold Proposed

Improvement of the gold situation was the theme of discussion at the International Gold Conference of the Northwest Mining Association which met in Spokane, Wash., on Sept. 5 and 6. Alaska, British Columbia, Washington, Idaho, Montana and Oregon were represented in the conference. The following resolutions, introduced by Frank A. Ross, mining engineer and vice president of the association, were unanimously adopted by the conference:

> Resolved, That the grant of priority rights in the purchase and transportation of materials, machinery and general mining supplies be enforced, and that, as far as possible, such items of expense as taxes and freight rates be restored to pre-war levels;
>
> That the labor necessary to the operation of mines producing gold-bearing ores be assigned to them;
>
> That main lines of motor-truck roads be built from railroad points into the distributing centers of promising but commercially inaccessible gold fields; for instance, such as those of central Idaho; also, that trails or wagon roads connecting with these main roads be opened to promising camps in cases where the routes thereto lie through Government reserves;
>
> That financial aid or credit be extended to such individual properties as may be judged by Government specialists to be capable of producing appreciable quantities of gold or other metals essential to the conduct of the war;
>
> That a bounty be paid upon every ounce of new gold produced by the mines of the nation, the amount of which bounty shall, from time to time, be determined by the proper authorities to be sufficient to encourage the mining of gold-bearing ores by insuring a reasonable profit therein; the said bounty to be considered a permissible war expedient and expense that in no way affects the international, or standard, value of gold.

The bounty on gold referred to in the resolutions was discussed by Mr. Ross in a paper on "The Gold Situation and Its Remedies," in which he suggested ways of insuring that the proposed bounty should reach only those entitled to it. These provided for indentification of those seeking to sell gold; that the metal be purchased only at designated places; that applicants for the bounty present properly certified settlement sheets from the mint, smeltery, etc., that bought their bullion or ores; and that such sheets be certified by Government "inspectors of ore shipments." These inspectors were to be officials having the requisite technical knowledge and experience and appointed as a war measure to represent the Government at the "relatively few public places receiving and buying gold-bearing ores or crude alloys containing gold." The conference was attended by many representative mining men of the Pacific Northwest.

Argentine-Bolivian Petroleum*

By Stanley C. Herold

Extending from northern Argentine northward into central Bolivia is a belt of petroleum seepages. On account of the remoteness of the district, it has heretofore been little considered by oil operators. The regional geology is comparatively well understood, but the local features have not been carefully detailed. The areas extend in a narrow belt from the north-central part of the Province of Salta, Argentina, northward into the central part of Bolivia. This belt lies in a direction a few degrees east of north, slightly curved, with its concave flexure to the west, passing through the border town of Yacuiva at latitude 22° S and longitude 63° 30′ W of Greenwich. It extends from 18° S to 23° S latitude.

To the west of the field lie the frontal ranges of the Andes system, beyond which extend high rugged mountains, deep, narrow gorges and high plateaus, culminating in the crest of the continental range. Toward the east extends the great expansive plain, reaching over northeast Argentine, southeast Bolivia, northern Paraguay and into southern Brazil. Notable seepages of oil occur in the following political subdivisions of the two countries: Argentine—Department of Orán, Province of Salta. Bolivia—Departments of Tarija, Sucre, (Chuquisaca), and Santa Cruz.

The climate of this region is sub-tropical, with temperature variation between 40° F. in winter and 90° F. in summer. Occasionally more extreme temperatures of 30° and 115° are experienced, though generally for short duration only. The humidity of the summer atmosphere is rather oppressive, and rainfall at this season is heavy. The winter months are rainless, to such an extent that resident natives suffer from lack of good water for domestic purposes.

The terminal at the town of Embarcación, in Argentina, is the nearest approach made by a railroad to the oil region. This road is a narrow-gage line operated under the management of the Ferrocarril Central Norte, connecting the cities of Tucumán, Salta, and Embarcación, with a junction point between the latter two at Güemes. The broad-gage line of the Ferrocarril Central Argentina connects Tucumán with Buenos Aires.

Seepages of oil, and asphalt deposits, have been known to exist in this part of the continent for many years. The native Indians had used oil for medicinal purposes and knew of its inflammability before the arrival of the first Spanish explorers. To this day, small quantities are collected by both Indians and civilized people for domestic use, as it is often of such high quality that it may be used in crude lamps in its natural state. Several springs are persistent in their flow, though they give only two or three quarts, individually, per day. In addition to these, numerous other localities have been reported by competent natives to show signs of oil. These are in creeks crossing the same line, and are said to show oil on the surface of quiet water before the drying-up of the streams. During the dry season the oil can sometimes be detected by odor from fresh soil at these places.

The results of the development attempted in the past have been unsatisfactory, owing principally to lack of sufficient knowledge on the part of the operators concerning the stratigraphic and structural conditions existing in the field. Wells have been placed in localities where there would seem to be no possibility of reaching oil horizons in evidence on adjoining ground, and where local structural conditions are not particularly favorable for the accumulation of petroleum below the surface. Obviously, such wells are unable to give definite proof regarding the possibilities of the field at large, and represent an almost useless expenditure.

Other enterprises have failed on account of financial difficulties, lack of proper organization, or mismanagement. A company intending to work in this field should have sufficient capital to tide it over excessive costs before expected returns. A well of 3000 ft. (914 m.) depth may be estimated to cost between $65,000 and $75,000. Transportation and imported labor are expensive, and delays are frequently due to the large quantity of spare parts necessarily required. Drillers must be carefully selected. Proficiency does not seem to be a more important qualification than personality and adaptability, for in camp the companionship must be agreeable, and modern conveniences are generally absent.

Although thousands of claims have been legally granted by the governments of Argentina and Bolivia, only seven or eight honest attempts have been made to develop various sections of the field. At present, access to the region is somewhat difficult, but no serious problem would be encountered in improving the conditions. The nearest railroad terminal is 114 miles south of the Bolivian border, or 72 miles from the nearest manifestation of petroleum in natural springs.

Native labor is good, and government policies are sympathetic toward foreign exploitation. Though the structural features of the region, as a unit, have been worked out by reconnaissance surveys, there still remain many local sections upon which no detail study has been made. Several small areas have been proved unfavorable for production, though the region as a whole cannot be condemned on this account.

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*Excerpt from a paper to be presented at the New York meeting of the A. I. M. E., February, 1919.

Rights Against Railway Company

By A. L. H. Street*

A railway company is liable for the value of ore shipped at the instance of a third person, after being notified by the real owner of his ownership and not to transport the ore, although such third person furnished the railway company with an affidavit that he was the owner. This is the gist of the decision handed down by the Nevada Supreme Court in the late case of Dixon *vs.* Southern Pacific Co. (*172 Pacific Reporter, 368.*) The court holds that the mere fact that a railway company transports property at the instance of one not the owner thereof does not render the company liable in damages to the true owner, but that, where the true owner makes proper demand, any subsequent disregard of that demand constitutes a wrongful appropriation of the property by the carrier, rendering it liable for the value of such property.

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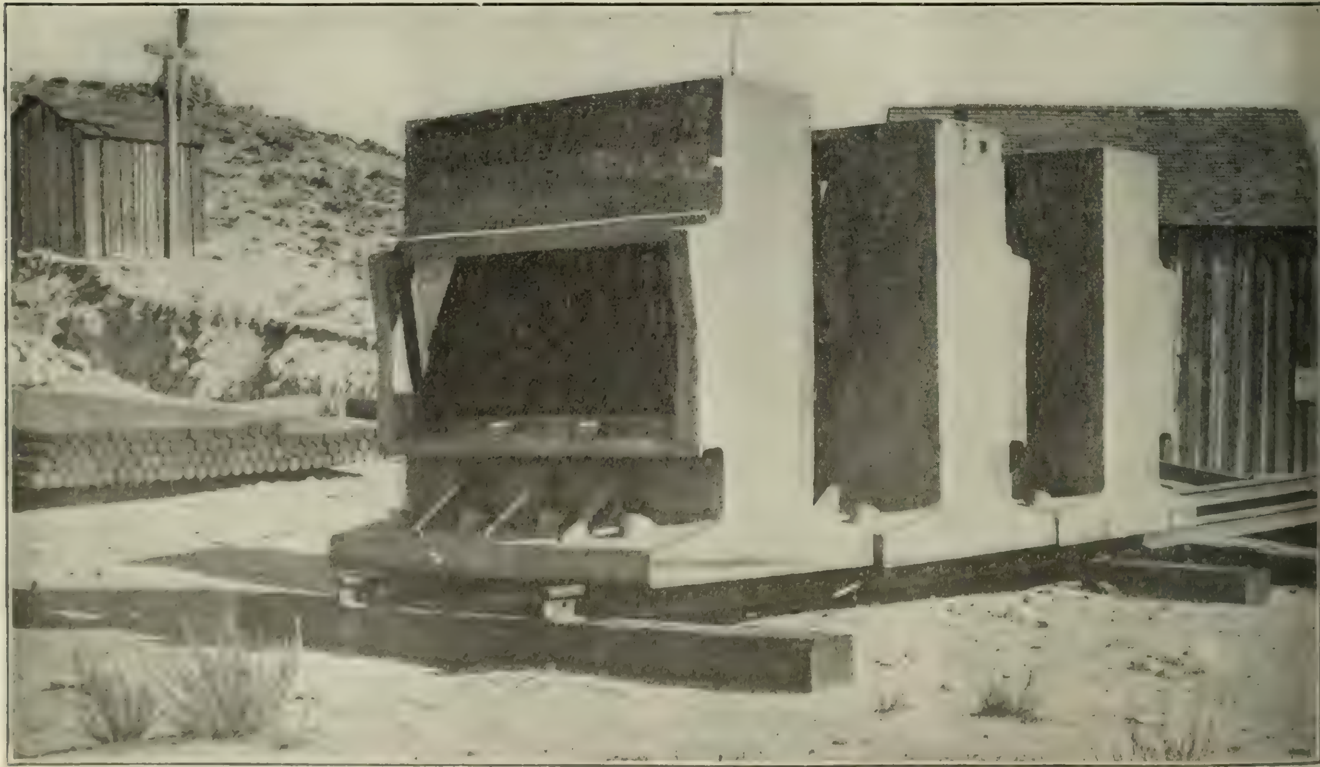
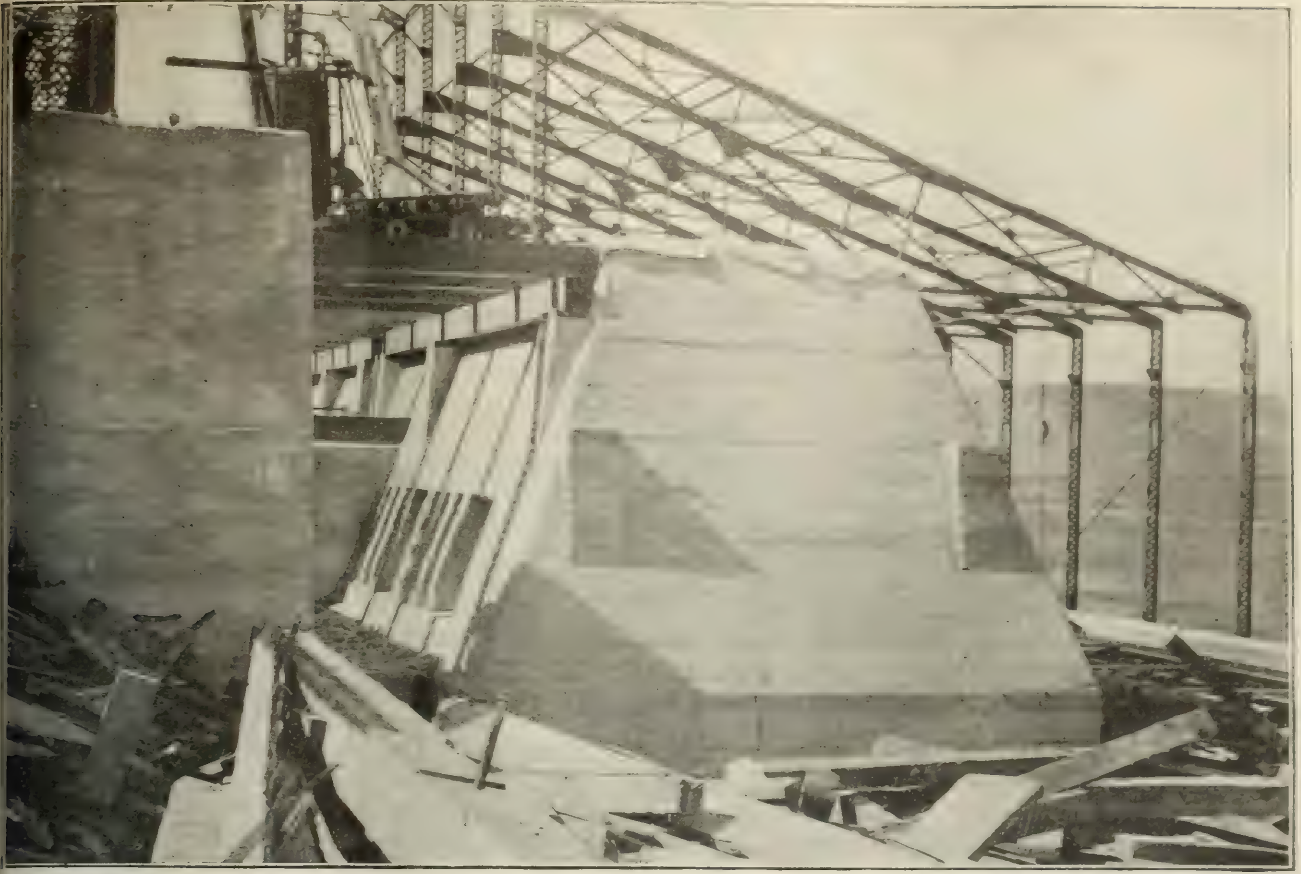
*Attorney at law, 820 Security Bldg., Minneapolis, Minnesota.

Examples of Mill Construction

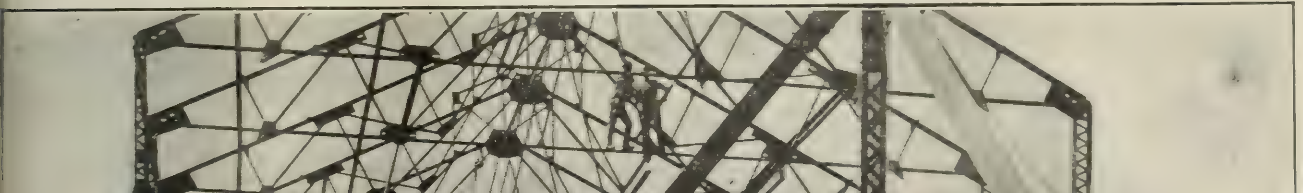
CYANIDE TANKS UNDER CONSTRUCTION AT GOLDFIELD CONSOLIDATED MILL, GOLDFIELD, NEVADA



TEMPORARY STORAGE OF STAMP STEMS AND MORTARS, GOLDFIELD CONSOLIDATED MINES COMPANY



CONCRETE BATTERY BLOCKS AT 100-STAMP MILL OF GOLDFIELD CONSOLIDATED MINES COMPANY



CONSTRUCTING MILL FRAMEWORK AT GOLDFIELD CONSOLIDATED MILL, GOLDFIELD, NEVADA

These photographs, showing portions of the Goldfield mill during process of construction in 1909, will doubtless be of interest as examples of mill construction

Mining Notes From British Columbia

Victoria Correspondence

With reference to the drive being made by officials of the geological branch of the Canadian Mines Department to open up platinum deposits in British Columbia, an effort which is being assisted and supported in every possible way by the Provincial Department, it is interesting to note that some excitement has been occasioned in East Kootenay by the reported discovery, on Toby Creek, of rich platinum and gold placers. Two parties are testing ground and locating bedrock, one from Vancouver and the other from the town of Athlamer, which is situated at the junction of Toby Creek and the Columbia River. The platinum is said to be found in flakes and as small nuggets mixed with the coarse gold. High water and rain have hindered development somewhat, and, meanwhile, numbers of residents of the district are hurrying to the locality, which is easily accessible, to stake and record claims.

Recent mention was made that platinum had been discovered in the Nome property, Cariboo Creek, by J. Nordquist. The first assays made, if the claims are to be credited, showed the presence of the mineral, but samples sent to the provincial analyst failed to disclose platinum.

Discoveries of manganese deposits in the Cowichan district, Vancouver Island, promise to prove of considerable importance, from a mining standpoint to this section of British Columbia, and are all the more important because manganese is essential in munition manufacture. Samples treated by the provincial mineralogist are said to indicate the presence of ore of the character required. A Vancouver firm's certificate shows 46.20% manganese, 26.92% silica, and 0.064% phosphorus, whereas a Seattle assay gives manganese 54% and silica 18.4%. The fact that G. C. McKenzie, representing the geological branch of the Canadian Mines Department, is making a personal inspection of the property, is taken as evidence of the interest excited in official circles by these valuations. The owners are confident that the government will do all in its power to hasten the development of the claims. It is pointed out that the ore, to judge from assays, is of such a character that it can easily be handled. A concentrating mill will be needed. This, it is suggested, might be constructed in a short time at Duncan, the center of Cowichan, the ore being shipped from the claims down Cowichan Lake by water and thence by rail to the town.

The resident mining engineer for the Western District of British Columbia, W. M. Brewer, speaks enthusiastically with regard to present conditions of the mining industry in this section of the province. Some of the activities that have come to his attention are thus summarized: The Phelps Dodge interests have taken bonds on the Fraser group (East Sooke); the Ladysmith Smelting Corporation has bonded the Willow Grouse, Cowichan Lake; and the Sunlock Mines, Jordan River, are being run by Patrick Stewart for a Vancouver company. In the Alberni Canal region, Samuel Ryder, of St. Albans, England, has installed new bunkers and a compressor plant at the old Monitor mine, which was sold three years ago for taxes. It is reported that a large body of ore has been blocked out. At Quatsino Sound, also Vancouver Island, the Coast Copper Co. is working the Old Sport group, on Elk Lal and plans are said to be under way for a 16-mile ra road from the mines to the coast. At Sidney Inlet, t Tidewater Copper Co., of New York, is working on t Indian Chief group, a former Dwedney holding, and Knights Inlet the Princess and Union groups are bei operated. Work is proceeding on the Texada Isla properties, and prospecting forces are working ever where, particularly on Hervis Inlet.

The Canada Copper Corporation is making sat factory progress in the development of its immense d posits of low-grade copper at Copper Mountain, a should be in a position to begin production on a lar scale at an early date. It is estimated that before wo starts in the actual taking out of ore, the company w have expended $3,000,000. Miles of road for the use wagons and automobile trucks have been built to t mill site, situated four miles from Princeton; and a sa mill capable of cutting between 16,000 and 18,000 ft. day has been installed. Some excavating has been do for foundations for the concentrating plant, whi will have a capacity of 2000 tons daily; and some of t timber to be used in construction work has been pr pared. The company has been engaged in the develo ment of its Copper Mountain properties for seven eight years.

Mrs. A. E. Jowett, of Trout Lake, who was the on woman prospector in attendance at the recent mini convention at Revelstoke, has been able to demonstra that, even in a rugged country such as the Kootenays British Columbia, a member of the fair sex can su cessfully locate, record, and arrange for the developme of mineral. Mrs. Jowett has been prospecting in th neighborhood of Trout Lake for a number of years, a is the owner of a number of promising properties. O of these is known as the Foggy Day Claim. It h shipped nine tons of ore giving returns of 4.29 oz. gold, 16 oz. in silver, and 4.6% lead, with an assay val of about $100 a ton.

Labor for Magnesite Production

The Northwest Magnesite Co., with a mine and pla at Chewelah, Wash., produces about three-quarters the magnesite used by the steel companies in the Unit States, and is capable of an output of 10,000 tons p month. The employees are classified as follows:

Classification:	Number
Superintendents	2
Clerks	6
Watchmen and janitors	5
Crushermen and helpers	16
Laborers	80
Conveyormen	8
Weighers	7
Teamsters and trackmen	2
Burners and helpers	12
Coal operators	7
Chemists and helpers	2
Electricians and helpers	4
Carpenters and helpers	12
Blacksmith and helpers	9
General mechanics	5
Foremen	6
Compressormen	2
Miners	10
Muckers	70
Samplers	1
Trammers	8
Timbermen	2
Tramway operators	15
Total	291

Previous to the war practically all the magnesite us by the steel companies was imported from Austria.

Remember the Comfort Fund of the 27th Engineers.

Your Part

By Berton Braley

YOU can't do too much for your country, no matter how much you may do;
The soldier who fights in the trenches is doing enough, but for You,
For you and for me and the others who live here in safety at home,
Our burden is light to the burden of fighting men, over the foam.
We can't do *enough* in proportion to what they're accomplishing there,
But we *can* do our best and our finest, we *can* do our ultimate share.
And that means to toil and endeavor, to sacrifice much that we crave,
To speed up our task and be cheerful, to hold down our outgo—and save!

YOU can't do too much for your country, but why not do all that you can?
Your job is a part of the conflict—you fit in the general plan;
And less than your best is disloyal, it means that you're slacking your part,
When all of your powers are needed, of body and brain, and of heart.
Then, when you have given your utmost of thinking and toiling and sweat,
You still have a duty to finish, the end of your task is not yet.
Dig down, till it hurts, in your income; dig up, till you're broke—and beyond;
You can't do too much for your country, you can't save too much for a bond!

THIS isn't a question of "almost," or "just about," "nearly," and "quite";
Your *all* is the least that is needed to win in this world-shaking fight;
Your all of achievement and effort, your all of possessions and cash,
To build up the might of the nation and strengthen its thews for the smash.
The smash that shall conquer the Teuton—your all is the least you can do!
The limit of human resources is needed *now*, brethren—come through!
Come through with your uttermost service, with every last cent that you own;
Go over the top with your labor—and over the top with the Loan!

Essential and Non-Essential Employees

The vexed question of the status of an employee in an industrial organization—his replaceability or irreplaceability without positive detriment to output—is dealt with in a pamphlet issued by the Northwest Magnesite Co. to its workmen, which certifies the classification of the bearer. Information in relation to various employments is also given, and the data are arranged so that the draft board, or other official body concerned, may have authentic facts regarding the specialized work being performed by certain employees, and may be able to judge as to how the interests of the country may best be served by avoiding unnecessary dislocation of industry, and by exempting from service those who are really indispensable.

The company has developed a property at Chewelah, Wash., and erected a plant, the capacity of which is 10,000 tons per month. The product—magnesite—is used almost entirely in steel manufacture, and is therefore essentially a war material. The employees are classified into 23 groups, and comments are made as to their individual value in the industry.

SUPERINTENDENTS

The plant was designed and erected without the suggestive assistance of precedent or example, there being no installation in the world producing an article under the same conditions. The general superintendent has been in constant touch with operations, and could not be replaced without seriously imparing production. The mine superintendent is the only man in the United States qualified intelligently to mine magnesite, and his continuous training since the property was discovered gives him the necessary knowledge of the character of the rock. It is felt that his loss would seriously affect the industry and that he could not better serve his country than to continue to act in his present capacity.

CLERKS

A chief clerk and three assistants are required, two men and two women. It is not possible to employ women exclusively, and it is therefore essential to maintain the organization as it now exists. The chief clerk is considered essential.

WATCHMEN AND JANITORS

Any one employed by this company under this classification may be replaced without seriously interfering with production.

CRUSHERMEN AND HELPERS

These men are employed in two grinding mills reducing the raw ore to the proper size. The head crusherman and helpers are essential, require special training and would be difficult to replace.

LABORERS

The laborers employed at the mine and at the reduction works are a migratory class, and a certain number are essential to efficient operation. The character of the work which they perform is not skilled, and they may readily be replaced from whatever common labor supply may remain in the United States after drafts are completed. The plant is operated automatically wherever machinery can be employed.

CONVEYORMEN

These workmen are employed in connection with the conveyors which are used in transporting the rock through the various treatments. By having men qualified to maintain these conveyors, the necessity for other labor is eliminated. A conveyorman may be classified as semi-essential to the business, for the reason that if other labor is available it can be trained in a few days to understand the work.

WEIGHERS, TEAMSTERS AND TRUCKMEN

Certain men are required to weigh material continuously, and this work requires only ordinary ability. Teamsters and truckmen are essential, and this work should be done by men over draft age.

BURNERS AND HELPERS

Burners and helpers are essential to operation and require long experience in order to be able properly to burn the material and to manufacture the finished product.

COAL OPERATORS

The burning of powdered coal in the kilns is essential. The powdered-coal plant contains complicated machinery and requires mechanical knowledge and training in order to operate it successfully.

CHEMIST AND HELPERS

A chemist and an assistant are employed, and they have for the last two years been daily analyzing magnesite. These chemists, on account of their experience, are probably the best qualified in the United States to analyze magnesite.

ELECTRICIANS AND HELPERS

Three electricians, one on each shift, are employed in the operation of the power plant and the maintaining of a 1500-hp. installation of small motors. There would be great difficulty replacing them, because any interruption in power causes the idleness of the remainder of the labor.

CARPENTERS, BLACKSMITHS, AND HELPERS

Carpenters may be obtained from men over the draft age. A blacksmith and helper are essential, but may also be obtained from men over the draft age.

MECHANICS AND FOREMEN

A few special mechanics are employed who are thoroughly familiar with the plant and would be hard to replace. The foremen are next in importance to the superintendents, as they have been employed since the beginning, and their familiarity with the process makes them invaluable. They cannot be replaced by any other men, as no one else is familiar with the manufacture of this material as it is being made by this company.

COMPRESSORMEN

These employees operate the air compressor, and though essential to the industry, it is felt that men over the draft age should be employed.

MINERS

On account of the great scarcity of miners in the United States, due to the fact that many of them have already been drawn into the active service, it has been impossible to obtain sufficient men of this class. They are absolutely essential.

MUCKERS

The muckers who are working at the mine are practically ordinary labor, and most of them are over the draft age. There is an insufficient supply.

SAMPLERS

Owing to the fact that the deposit in this district is the only one of its character in the United States, special samplers have been trained, who are qualified by long experience to tell by sight the character of the ore required. These men cannot be replaced without long training and serious loss to the industry.

TRAMMERS AND TIMBERMEN

Trammers are laborers. There is an insufficient supply of this class of labor. Timbermen are a trained class qualified to timber a mine and protect the lives of their fellow workers. The supply is insufficient.

TRAMWAY OPERATORS

These men are occupied in the operation of an aërial rope tramway, and should be placed in the same class as railroad operators. They are essential to the industry.

It will be noted that, of the number of men required to operate the property, certain are essential, whereas others may be drawn from the labor supply that remains after the draft has been completed. The company expects to share in the inconvenience and strain which will be caused by the draft; and the information given is intended as a guide, and should not be construed as a plea for exemptions, other than in the case of those who, on account of their experience in an industry hitherto unknown in the United States, may well be allowed to remain in their present occupations.

John C. Greenway a Lieutenant Colonel

When John C. Greenway, the former manager of the Calumet & Arizona Mining Co., left Arizona for France a year ago, he went as a major of engineers, but he is now a lieutenant colonel of infantry. Lieutenant Colonel Greenway only recently received his promotion, and it was at his own request that he was transferred to another branch of the service. The *Arizona Republican* has recently published a sketch of Colonel Greenway's career, in which it says:

"He won his promotion by fighting in the hottest battle of the front when the German horde was turned back below Chateau Thierry. He is the most distinguished Arizonian in the war. When the Spanish-American War broke out, Mr. Greenway, already established in a promising career, dropped everything, joined the Rough Riders, and so bore himself as to be given distinguished mention in Colonel Roosevelt's book on the Cuban campaign. He retired at the end of the war with a captaincy.

Captain Greenway resumed his work, and seven or eight years ago became the most efficient general manager of the Calumet & Arizona Mining Co. At the time America entered the conflict, Captain Greenway's responsibilities as general manager were heavier than ever. He was developing the great Ajo district. But there was no position in the country, whatever its need of him or its allurement for him, that could have held him.

"Colonel Greenway is not a seeker of adventure; only a doer of what he sees to be his duty. He is as honest as he is courageous and American. Soon after he became general manager of the Calumet & Arizona, the name of "Dividend Johnny" was applied to him because of his highly successful operation of that property.

"During his direction of the operations of the company it was only twice subjected to strikes. One occurred at Ajo a couple of years ago, an I. W. W. agitation. The other was at Bisbee a year ago last summer.

"The mining interests 'über alles' was never the slogan of Colonel Greenway. If the mining interests were in his opinion right, he was with them, but if he believed their claims to be unjust, he withdrew from them. He always worked in the open. Friends and opponents never had to indulge in conjecture as to where Greenway stood. He was loyal to his friends and his affiliations, but he was always his own man."

Fluorspar Output Estimated for 1918

The production of fluorspar in 1918 is estimated by the U. S. Geological Survey at 100,000 short tons for the first half and 118,000 short tons for the last half, the total for the year being 218,000 short tons. The amount as estimated is considerably less than it might be if sufficient labor, machinery, and other supplies were available. The shipments for the first half of 1918 are estimated at approximately 108,000 short tons, and there were about 10,560 tons of spar in stock at the mines, only about 2000 tons of which had not been sold or contracted for on July 1, 1918.

Shipments of spar from the mines in 1917 were 218,828 short tons, valued at $2,287,722, an average price of $10.45 a ton, compared with 155,735 tons, valued at $922,654, or $5.92 a ton, in 1916. This represents an increase in total tonnage of 40.5% and in total value of nearly 148%. The quantity of crude fluorspar mined in the United States in 1917 reached a total of 280,825 short tons, compared with 175,165 tons in 1916, an increase of more than 60%. The stocks of marketable spar on hand at the end of 1917 amounted to 21,655 short tons, compared with 3666 tons at the end of 1916, but a considerable part of this stock was under contract, awaiting cars, boats, or weather favorable for shipment.

The demand for fluorspar may be said to be governed mainly by the openhearth steel industry, so that supplies that are within reach of steel-making centers are certain to be drawn on heavily during war times. Mines in all producing states except Arizona reported an exceptionally heavy demand during 1917, and the high prices stimulated prospecting and led to the opening of many hitherto unworked deposits of fluorspar in Illinois, Kentucky, and Colorado.

Diamond Exports from Amsterdam to the United States totalled $1,419,800 in value for the quarter ended June 30, according to the Department of Commerce.

Notice to All Distributors, Converters, and Users of Paper and Paper Products

It contains sulphur needed for war munitions.

War Industries Board

PAPER IS ESSENTIAL: It has been placed on the priority list only on the express condition that all wastes be eliminated and every economy be practiced. In doing this the Government will use its best efforts to provide sufficient paper for strictly needful purposes but nothing more. Every distributor, converter, or user of paper is hereby notified that the continuance of his supply is dependent entirely upon the strict observance of the rulings of the War Industries Board, one of which is that paper must not be wasted. Failure to comply with this requirement will lead to the withdrawal of any or all priority privileges, without which the supply cannot be maintained.

WAR INDUSTRIES BOARD

A pound of paper saved saves three pounds of coal. Save waste paper but don't waste paper.

War Industries Board

Seven Reasons Why Paper Must Not Be Wasted

1. The Government's requirements for all kinds of paper are increasing rapidly and must be supplied.

2. Paper making requires a large amount of fuel which is essential for war purposes. A pound of paper wasted represents from one to three pounds of coal wasted.

3. Paper contains valuable chemicals necessary for war purposes. Economy in the use of paper will release a large quantity of these materials for making ammunition or poisonous gas.

4. Paper making requires labor and capital, both of which are needed in war service.

5. Paper making requires transportation space. Economy in the use of paper will release thousands of freight cars for war purposes.

6. Greater care in the purchase and use of paper will save money. Your savings will help finance the war.

7. Strictest economy in the use of paper will prevent a shortage. —*War Industries Board.*

The Necessity for the Conservation of Paper

(An amplification of the eight reasons why paper should not be wasted)

I. *General Survey*

PAPER is the most generally used of all articles except food and probably the most shamefully wasted. Prior to the war there was an abundance of paper, prices were low and people paid little attention to economies in its use. Our entrance into the war has completely changed conditions. Some of the materials used in making paper, such as pulp wood, sulphur, bleach, etc., are growing scarcer, and the costs of materials and also of labor are increasing rapidly. The paper industry, not being a strictly war industry, must transfer to the war industries as much of its labor, coal, sulphur, bleach, and transportation space as is necessary to win the war. This means that the production of paper will be considerably curtailed as the war goes on. On the other hand, the Government is becoming a much heavier purchaser of paper and paper products than formerly.

II. *Increase in Government's Requirements*

The various new branches of the Government, organized as a result of the war and the expansion of the regular departments and commissions, have greatly increased the demand for all kinds of office and commercial stationery such as writing paper and envelopes. Recently the War Department has asked for one billion envelopes in addition to its regular requirements. Then there are the demands of the Food and Fuel Administrations and the Liberty Loan and War Stamp Divisions of the Treasury Department and the Red Cross for their posters and other campaign literature.

The Ordnance and Quartermaster's Departments, either directly or indirectly through the private concerns under contract with them, are buying rapidly increasing quantities of paper boxes and containers and strong wrapping paper for shipments of munitions, foodstuffs, and other supplies for oversea. They are also taking practically the entire output of plaster-board mills for the construction of camps, hospitals, etc. A large quantity of Bristol-board index cards is being used for registering drafted men, and recently the Quartermaster's Division contracted for all the lightweight toilet tissue that the mills could make in the next sixty days.

The war has led to an extensive substitution of paper products for those formerly made of wood, tin, etc. Paper containers are now displacing wooden boxes and tin boxes on account of the scarcity of these materials, and paper bandages ,and absorbent packs are rapidly taking the place of cotton for doing up wounds. Paper has also been found most satisfying for making gas masks. The fact is that almost every day the Government finds some new use for paper in connection with its war program.

III. *Consumption of Fuel*

The Paper Industry is a large consumer of fuel. On the coarser grades of paper one ton of coal is consumed on the average for each ton of paper produced, while on the finer grades two or, in some cases, even three tons of coal are consumed for each ton of paper. Estimating the total production of paper during the year 1918 at 6,000,000 tons, the consumption of coal would be from 8,000,000 to 16,000,000 tons. In addition a large part of the coal consumed by the Canadian paper industry comes from the United States.

A saving in the consumption of paper of 25 per cent would mean the release of nearly 2,500,000 tons of coal for war purposes, together with the car space required to transport this tonnage. It is conservatively estimated that there will be a shortage of coal this year of from 50,000,000 to 60,000,000 tons.

IV. *Consumption of Chemicals*

Most of the chemicals used in paper making are also indispensable for making ammunition and poisonous gases. The scarcity of sulphur has recently forced the Government to take over the two mines in Louisiana and Texas in order to assure itself of an adequate supply for war purposes. Present indications are that there will be enough sulphur allotted to the paper industry to manufacture the paper actually needed, but the Government cannot supply sulphur to be made into paper that is wasted.

The same situation exists with respect to chlorine. In order to break through the German lines with a minimum sacrifice of the lives of our boys the Government must greatly increase its production of poisonous gases. Chlorine is indispensable for this purpose, and the people may be called upon to dispense entirely with white paper, bleached with chlorine, in order that the Government may increase its supply.

Caustic soda is another valuable chemical needed for war purposes and also used extensively in paper making. The problem facing the Government now is how it can make up a shortage of 80,000 tons. If all wasteful and unnecessary uses of paper are eliminated, some of the shortage can be made good.

V. *Consumption of Labor and Capital*

The pulp and paper mills of the United States employ about 90,000 wage earners, practically all males, and require a working capital which probably exceeds $150,000,000. Merchants, jobbers, and other middlemen, together with the converters or manufacturers of paper products, represent a much larger number of wage earners and a much larger working capital. The paper industry, like other nonwar industries, must contribute whatever proportion of its labor and capital is necessary to win the war. This means that no labor or capital can be spared to make paper or paper products that are not absolutely necessary.

VI. *Consumption of Transportation Space*

It is estimated that about three tons of materials on the average, in addition to coal, are consumed to produce a ton of paper. This includes the tonnage represented by the pulp, waste-paper stock, repair parts, etc.

We have then a demand by the paper industry for something like 25,000,000 tons of freight that has to be moved annually. This represents nearly a million carloads required for the original manufacture and distribution.

A large part of the ~~paper~~ produced is converted into various articles which have to be transported again. For example, news print and book paper are converted into newspapers, magazines, books, etc., many of which are sent through the mails as second-class matter. Paper board is converted into folding boxes, set-up boxes, corrugated and fiber containers, and these are delivered to the concerns using them, filled with the various articles, and again shipped to the wholesaler, retailer, or the ultimate consumer. Paper is converted into stationery, envelopes, tablets, into drinking cups, towels, wearing apparel, and a thousand other forms, and in each case a further shipment usually takes place. Any economies effected are, therefore, cumulative in respect to the transportation space saved.

A reduction of 25 per cent in the consumption of paper would release 6,000,000 tons of freight in and out of the mills in addition to the 2,500,000 tons of coal. This represents 400,000 carloads. The surplus car capacity not needed for the shipment of munitions, food, fuel, and Government supplies is now not over 10 or 15 per cent and is steadily decreasing.

VII. *Waste of Paper Means Waste of Money*

Paper is a valuable commodity and its cost is increasing steadily. Every pound of paper wasted represents the waste of money that might better be used to help finance the war, or to help the Red Cross or Y. M. C. A. The aggregate saving that could be realized by the more careful purchase and more economical use of paper would be enormous.

VIII. *Importance of Preventing Shortage*

Paper is an article of such general and necessary use that if a shortage were allowed to develop it would inevitably lead to serious consequences. The efficiency of the agencies for the dissemination of news, such as newspapers, magazines, trade journals, books, etc., would be impaired. The transaction of business, which depends so largely upon paper, would be interfered with.

In order to avoid the possibility of such a shortage several important steps have already been taken.

1. The Priorities Committee of the War Industries Board has placed all pulp and paper mills on the preferred list with the express understanding that every economy shall be practiced.

2. The Pulp and Paper Section of the War Industries Board has issued rulings affecting all the principal grades of paper which will result in eliminating wastes and increase the productive capacity of mills. The standardization of weights, sizes, colors, etc., will enable mills to run their machines more continuously than heretofore. This will make possible a larger output with the same equipment, working capital, and labor force.

By standardizing products in this manner mills and distributors will be able to confine their stocks to the essentials, thereby increasing the rapidity of their turnover and the efficiency of their working capital. The stocks which wholesalers and retailers are now obliged to carry can undoubtedly be very materially reduced by this means. The consuming public may be slightly inconvenienced in some cases by not being able to purchase just the same article that they formerly bought, but every patriotic citizen should be glad to make the small sacrifice in order to help win the war.

3. The Pulp and Paper Section has also adopted recommendations for curtailing the consumption of paper by newspapers, magazines, trade journals, textbook publishers, etc , which should result in the saving of from 15 to 25 per cent.

What now remains to be done is for every consumer of paper from the housewife and corner grocery or drug store to the large bank, department store, or business house to reduce the consumption of paper to that which is strictly necessary. A prompt and whole-hearted response to the Government's appeal to economize in the use of paper will remove the possibility of a shortage and help materially to win the war.

Every consumer of paper must realize that the failure to observe this requirement may result in the withdrawal of any or all of the priority privileges, without which the supply cannot be maintained

The Importance of Saving Waste Paper

WASTE paper of all kinds can be used in making new paper or paper boards. All the chip board from which ordinary pasteboard boxes are made is manufactured out of mixed waste paper scraps gathered up in the stores and other places. Newspapers make a better grade of board known as news board. Strong wrapping papers mixed with sulphate pulp are used in making test or strong chip board from which shipping containers of all kinds are made. These are taking the place of wooden boxes. thereby conserving the forests.

The fewer grades of waste paper such as old magazines, books, stationery, etc., are sorted out, deinked, and used again in making books, writing and other grades of paper. In making boards and ledgers, etc., a considerable quantity of rags are necessary, the supply of which is becoming very scarce. It is imperative, therefore, that all old rags be saved. Every household should save all of its old paper and rags as well as old rubber, leather, etc., and dispose of them to the school children, Salvation Army, junkmen, or other collectors, so that the supply may be kept adequate to meet the demands of the Government and other essential uses.

Why You Should Save Paper

SULPHUR is used in the manufacture of practically all kinds of paper.

It is used in the form of SO_2, or Sulphur Dioxide.

Our Government needs great quantities of sulphur for war munitions.

Much of this is used in the manufacture of gas to be used in warfare.

Germany began the use of poison gas in warfare.

It is necessary to fight back with the same weapon.

Otherwise our soldiers will be needlessly sacrificed.

Our Government has beaten Germany at her own game.

We make a better gas, one that is deadlier and drives back the enemy more efficiently than any gas they have.

There must be no shortage of sulphur because every pound of it made into gas saves our own men and helps speed up our final victory.

Every piece of paper contains a certain amount of sulphur.

There are only two sulphur mines in America.

There is not enough sulphur for both the great quantities of gas needed and the tons of paper that we thoughtlessly waste.

Every sheet of paper, every bag, every bit of wrapping paper, every sheet of letter paper we save by not needlessly using or by not thoughtlessly wasting allows just so much more of the precious sulphur for our war use. Save the paper and help choke the fiendish Hun at his own choking game.

How Economy in Paper Helps to Gas the Hun

EARLY in the war the Germans, with fiendish delight, invented poison gas and killed many brave British and French soldiers.

German newspapers said: "We are the greatest chemists in the world. We will win the war with our science."

It became necessary for the Allies to use gas, to even up matters.

Not long after we got into the war our chemists beat the German chemists at their own game. Our chemists have made gases for use in war that are far superior to the German-made brand.

Not long ago we put 500 Germans out of the fighting with one dose of our new gas. German army reports admitted that it was a deadly gas and more efficient than their own. Their boasted skilled chemists are unable to find out how to make it.

But all the world knows that one of its bases is sulphur.

There are but two sulphur mines in this country, one in Louisiana and the other in Texas.

In every sheet of paper that is made there is a certain amount of sulphur.

We have for years been wasting our paper.

There is not enough sulphur available to make all of the gas we want in carrying on our fighting against the inhuman Huns and to also make the usual amount of paper.

We can get along with at least one quarter less paper than we now use.

Every time you economize in paper, every time you do without a sheet of letter paper or a sheet of wrapping paper or paper bags—every sort of paper in fact, you are saving just so much more sulphur for our Government to put into war gases.

The more of this powerful gas we have at the battle front the more of our boys' lives we save and the quicker we will win the final victory.

Do not waste a scrap of paper.

Do not use any paper unless it is absolutely necessary.

In this manner everyone, from the smallest child to the oldest person, can help win the war.

Correspondence and Discussion

Alleviation of Gold-Mining Conditions

Observing a statement in the *Journal* of Sept. 7, 1918, to the effect that the committee which has undertaken to ascertain the increase of cost of gold production is experiencing difficulty in obtaining data from producers, I would like to point out:

1. It is extremely difficult to furnish, from mine accounts, data which shall not be inaccurate, or at all events misleading.

2. The form of questionnaire sent out is not well adapted to elicit the facts concerning the operations of a large proportion of mines which produce gold in ores and concentrates sold to smelters, as distinct from gold bullion.

Mine accounts are based on the actual facts of operation, and, therefore, do not show costs for successive years under similar conditions which would permit fair comparison. The manager's primary object is not to obtain equivalent cost data, but to operate at a maximum profit, if profit is attainable; and, if not, to reduce the loss to a minimum. When faced by conditions such as have existed during the last two years, he is compelled, in order to make both ends meet, to adopt many expedients which reduce costs temporarily at the expense of ultimate loss. In fact, he curtails his expenditure by drawing indirectly on capital, in some form. If he does not resort to such expedients of his own volition, pressure from directors and stockholders soon compels him to do so; for there are few companies which will, or can, operate mines continuously at a loss.

But for the resource mentioned, few gold mines would be in operation today. It is well known that the average percentage of increase of cost in other mines which can increase the selling price of their products, and therefore are not compelled automatically to limit their costs at all hazards, has been far greater than the profit margin of any but a few exceptionally fortunate gold mines. Moreover, in gold mines, which usually exploit veins or other narrow or discontinuous orebodies, the increase in costs, other things being equal, will tend to be relatively greater than in base-metal mines. A large proportion of the expenditure is for labor or explosives, and a smaller proportion for power.

The directions in which most gold-mining companies have been compelled to try to reduce expenses include: (*a*) Concentration of production on the richest or most cheaply worked orebodies; (*b*) reduction of development cost; (*c*) reduction of maintenance expenses; (*d*) use of old stores purchased at pre-war prices, and failure to replace them at present prices; (*e*) suspension of all expenditure on investigation and experiment; and reduction of staff.

I know that all these methods of reducing costs are likely to be practiced, for I have had to adopt them myself. Probably there are many other expedients besides those enumerated. All may be justifiable, even necessary, under the conditions; none show in the accounts; and yet it is certain that every one of these forced economies is made at the expense of the ultimate value of the mine, i.e. it is made out of capital. The statements furnished to the committee will not include them; and it will be difficult to establish their precise amount; yet they represent, in most cases, a large addition to the working costs, and should be fully taken into account if it is desired to ascertain the true rate of increase.

In case it should be represented that (*d*) should figure in the accounts, I may explain that few, if any, mines keep storehouse accounts of material in use. I myself, for instance, have not purchased a pound of new drill steel, or a foot of new rail, during the last two years, but have drawn on old stocks of other material, or used and re-used it to the utmost possible extent. The reduced scale of working, enforced by scarcity of labor, has made it easy to dispense with purchases of materials at the rate heretofore usual.

The process above outlined, however, cannot go on forever. The acute danger of the situation is that mines are getting down to where they can no longer resort to such expedients. My own conviction is that a large proportion of the mines in this state are reduced to a situation where they *must* spend more on development and maintenance, *must* have new stocks of supplies, etc., or go out of business altogether. I need hardly explain to readers of the *Journal* that, in most cases, mines which shut down now will never reopen, or will reopen only after a wasted expenditure of capital, in comparison with which the subvention from the Treasury, required to keep them in existence now would be relatively small. In other words, I am convinced that the general situation of gold producers is far more critical than the figures of output indicate; and that relief, to be effective, should be prompt.

One further point. Opinions expressed editorially in the *Journal* suggest that it is only the mines which produce gold without silver or base metals that should receive assistance. Nothing could be more mistaken. The latter class of mines are those which depend entirely on smelters and railroads. Smelting and freight charges have been greatly, and perhaps justifiably, increased; so that most of the increase in the value of the associated silver, lead, or copper has already been absorbed. Bear in mind that, for the miner, smelting and freight charges are a first charge on his products, and he must meet his expenses and make his profit (if any) out of the balance. I know many cases in which the increased rates have left nothing at all for the actual producer, who is, therefore, in a relatively worse condition than his confrère who produces gold as bullion from amalgamation or cyanidation. A visit to Gilpin County would provide a forcible object lesson as to this point. **George E. Collins.**

Denver, Colo., Sept. 16, 1918.

Virginia and the Manganese Shortage

Virginia has more known deposits of manganese than any other state in the Union and more localities have been worked and more manganese has been produced than in any other state. Deposits of manganese occur in the Costal Plain, Piedmont, and the Mountain (Valley) districts. The production of the Costal Plain area is comparatively small, and only a few deposits have been worked. Those near City Point, in Prince George County, are the most prominent, although only a small production may be expected from this field. Workable deposits of manganese have been found in Albemarle, Amherst, Appomattox, Buckingham, Campbell, Nelson, Pittsylvania and Spotsylvania counties, in the Piedmont area. Some of the mines in these counties are yielding a considerable amount. They have been operated for many years and are now in a favorable position to double their production in a short time. The Mountain (Valley) district includes the valley proper, and the area west of the valley known as Appalachia. The principal ore belt lies along the western base of the Blue Ridge Mountains and has a length of 300 miles. The 13 counties in this belt have all produced manganese, the famous Crimora mine having shipped more than all the other mines in the United States combined. Another heavy producer in this district is the Kendall and Fleck mine, situated near the town of Elkton.

Capitalists have been slow to investigate the possibilities of large and speedy profits from sound investments in the manganese industry. This may be caused by the fact that often a few would-be miners with no knowledge or experience in mining have come to Virginia, purchased for a song what they considered a manganese deposit, and then proceeded to develop the property. Frequently this "development" consists of erecting an elaborate mill before a ton of ore is in sight, and after spending all they have and can borrow, the operators return to their starting point complaining that "there is nothing in the manganese industry." It may be well to state in this connection that a few hundred dollars paid to a reputable mining engineer to examine the proposition would be money well spent. The larger investors would not think of operating a manganese mine without an engineer, any more than would a banker consider treating his family for typhoid. But not infrequently, business men, after making a financial success in their particular line, seem to think they are competent to attempt anything.

Recently a group of bankers requested me to examine a property on which they had spent over $30,000 in "development." As soon as I reached the property I saw that they had practically thrown their money away, whereas $15,000 spent in the right direction would have put the property on a dividend-paying basis, for there was no question as to the supply of high-grade ore. Afterward they told me that they had placed the development work in charge of a bank clerk whose health would not allow him to remain longer in the bank. The bank clerk's intentions were undoubtedly good; but such failures are often most discouraging to the financial backers, and do much to hinder and postpone legitimate development. Often the owners of valuable deposits are "dogs in the manger." They do not have the capital, enterprise and experience to develop their property, and seem afraid that, if they lease it, the lessee will mak a few dollars. A fair royalty on a manganese property where the risk is small and the ore can be mined quickl and without expensive equipment, may be considere as 10% of the value of the ore on the railroad cars, and in exceptional cases, from 5% to 10% of the profits On propositions where returns are slower, and larg sums must be spent for equipment before any return are made, I think a smaller royalty should satisfy reasonable man. Our country needs manganese, and i a man has ore that can be of service in winning the war it is his particular duty to make such concessions a will secure the ore for immediate use where it is needed The owner should remember that a small percentage o the present high price will yield him larger returns than a 50% royalty in normal times, and that present high prices will be obtainable for only a limited time.

To sum up, the principal cause of low production i that many manganese mines that are practically de veloped to the producing point are now lying idle. A few capitalists have recently taken hold of this industry with favorable results, but in order to increase produc tion it is necessary that more become interested.

MARSHALL HANEY.

Geer, Green Co., Virginia. Aug. 17, 1918.

Grinding Ore in Ball Mills

Referring to the *Journal's* comment on my article on "Grinding Ore in Ball Mills" in the Sept. 7 issue, I frankly agree that "all-sliming" is a very loose word, and should hardly ever be used, but it often is where final grinding is barely through 60 mesh. We speak of treating slimes by flotation when these slimes carry 2 or 3% plus 48 mesh, and not more than 60% minus 200 mesh.

I think your corrections altogether are not correct, as Mr. Bosqui specifically states in his papers that 39% of the total pulp is for sand treatment by cyanide leaching, and, of this, 11% is minus 200 mesh. You state "the greater portion of the final product is sand." The product made by these Rand tube mills is as fine as the material from many of the so-called all-sliming cyanide plants of this country.

It is well known that rock is used in place of pebbles in this district. Mr. Bosqui, however, uses the word pebbles. F. E. MARCY.

Salt Lake City, Sept. 11, 1918.

[We must disclaim responsibility for the opinion with which our correspondent is in agreement. No mention was made of the looseness of the term "all-sliming" in the editorial note in question; neither did we suggest any restrictions in its use. We explained that Rand practice is not "all-sliming"; and, in reaffirming this, we would say that it is not feasible to class the average Rand tube-mill product in the same category, as regards fineness, as the material from any all-sliming plant either in this country or elsewhere. Our explanation as to the character of the grinding medium used on the Rand was not a meticulous differentiation between the words "pebble" and "rock," but was given, as we stated at the time, to emphasize the difficulty of using Mr. Bosqui's data for comparison with the results of the operation of a short mill using heavy steel balls.—EDITOR.]

Referring to Mr. Donald H. Fairchild's article in the Aug. 17 issue of the *Journal* in which he states that it took four months for the operators to learn how to operate a Marcy mill, I have before me a reprint from the April, 1918, Bulletin of the A. I. M. E. in which Mr. Kennard makes the following statement: "After the strike at the Inspiration Co.'s concentrator, new operators, not experienced with the Marcy mill, were able to obtain a tonnage of only about 750 tons per 24 hours from each section of two mills, this being the same tonnage as was obtained during the first year's operation of the Marcy mills in this plant. This indicates that it is the high-priced millman, and not the machine, that should be given credit for excess efficiency." Mr. Fairchild confirms Mr. Kennard's statement as to this condition.

The thought has been running through my mind of what would happen if millmen should leave every two or three months, or just about the critical time when they had learned to operate the cylinder mills. This may not be general as applied to the Marcy mills, and I think that if the grated cylindrical mill has any champions, they could take up the cudgels and prove that Messrs. Fairchild, Del Mar and Kennard are in error.

E. W. LAWLER.

Hardinge Conical Mill Co., New York, Aug. 31, 1918.

Although I am considerably interested in ball mills and their adaptability to the grinding of various ores, I had not intended commenting upon Mr. Del Mar's or Mr. Fairchild's letters on this subject. Mr. F. E. Marcy, in his discussion of this matter, quotes an extract from a paper by Mr. F. L. Bosqui, which is published in Vol. 52 of the Transactions of the American Institute of Mining Engineers, and not Vol. 53, as stated by Mr. Marcy. In fairness to Mr. Del Mar, I believe that if Mr. Marcy takes it upon himself to quote from Mr. Bosqui's paper, he should also quote from the other portions of the paper containing matter pertinent to this discussion.

Mr. Bosqui states that the "crushing efficiency" is the tons of minus 90-mesh material produced per mill and that the mechanical efficiency is the tons of minus 9-mesh produced per horsepower. He also states that the use of the quick-discharge device increases the wear on the crushing media by 300 to 400%, thus substantiating the statement made by Mr. Del Mar. Mr. Bosqui also states that varying this quick-discharge device from the maximum possible (or peripheral discharge) to the ordinary trunnion discharge, a steady decrease in crushing efficiency (tons of finished material produced per mill) is accompanied by a proportionate decrease in power consumption, thus maintaining the mechanical efficiency, or tons of finished material produced per horsepower, at a comparatively constant figure.

At the plant of the Smuggler Union Mining Co., at Telluride, Colo., two trunnion-discharge ball mills are used, as well as one grated ball mill. The consumption of cast-iron balls in the grated mill is approximately 2 lb. per ton, the trunnion discharge ball mills using only 2 lb. per ton. The grated mill also handles only 3 tons per horsepower day from minus 4 mesh to all minus 60 mesh, the trunnion discharge ball mills handling 4.67 tons per horsepower day between the same limits.

At this plant the grate and lifters were removed from the grated mill, making it an ordinary trunnion-discharge short tube mill. As a result of this change, the ball consumption was decreased, and the capacity increased over what it had been when operating with the grate.

Referring to Mr. Marcy's third point, that the diagram given by Mr. Del Mar as illustrating the pulp line in the Marcy mill is incorrect, Mr. Marcy states that the pulp line is away from the influence of the balls, and is nearly a straight line over the entire length of the mill. This does not agree with the pulp line as indicated by Mr. Fairchild, who was formerly a salesman for Mr. Marcy, nor with the cut on page 7 of Mr. Marcy's catalog No. 42. There are apparently four different ideas of the pulp line in this mill, and Mr. Del Mar and the Marcy catalog seem fairly well in agreement as to the pulp line, both showing that there must be a considerable volume of balls above the pulp, which must naturally be worn more than would be the case if they were covered with pulp. It should be noted that Mr. Bosqui and the Smuggler Union Mining Co. both agree that the consumption of grinding media in a mill when using the quick-discharge device is greater than when this is not used. This has also been the experience of a mining company at Cobalt, Ont., where the grates were removed from the mill, and lower ball consumption and greater capacity resulted from the change.

With reference to Mr. Marcy's fourth point, that at Inspiration there is no greater wear at the discharge end than at the feed end, I beg to differ with him, since I have been advised that all the liners used in Marcy mills at Inspiration show considrably greater wear at the discharge end than at the feed end, and that the liners must be scrapped, owing to excessive wear at the discharge end, although the feed end is still in fairly good condition.

In the grated ball mill there is a segregation of the large balls at the discharge end and of the small balls at the feed end. This has been observed several times at the Vindicator Consolidated Gold Mining Co.'s mill, at Cripple Creek, as also at the Inspiration plant, in Arizona. If one of these Marcy mills at Inspiration is investigated after the mill has been removed from its bearings and taken to the repair shop for relining, this segregation will not be found, owing to the fact that the feed is shut off for several hours before the mill is stopped, in order to grind out all the ore contained in it. If one of these mills is stopped, however, at the same time the feed is shut off, such a segregation will be found.

I certainly agree with Mr. Del Mar in his opinion that it is a fallacy to use a grated mill when grinding a classified feed, or grinding a feed already fine enough to pass the grate openings, for then the ore is pumped out of the mill by the action of the lifters, before it has an opportunity to be sufficiently ground.

ALF. TELLAM.

Denver Engineering Works Co., Denver, Colo., Sept. 13, 1918.

Assayer and Chemist

Rapid Estimation of Cadmium In Spelter*

By H. Isaacs

I have done a considerable amount of work in the analysis of zinc slab and spelter, using exclusively the method approved by the American Chemical Society (*Journ. Ind. & Eng. Chem.*, Vol. 7, No. 6, pp. 547-548), and have evolved a modification of the method prescribed for the determination of cadmium, whereby from three to four hours is saved in the analysis. The principles involved are identical with the original scheme, but the details and manipulation vary somewhat.

Twenty-five grams of borings are weighed out into a 500-cc. beaker, 250 cc. water, and 59 cc. conc HCl added. The beaker is placed upon a low hot plate, and allowed to stand overnight. In the morning, it will be found that all but a gram or two of the zinc has been dissolved, and the cadmium is untouched. Filter, transferring a piece of the undissolved zinc first to the filter paper, wash two or three times with hot water, and wash the residue into a 500-cc. casserole. Add sufficient nitric acid to dissolve, keeping covered meanwhile with a watch-glass, add 20 cc. of 1:1 sulphuric acid, and evaporate to sulphur trioxide fumes. Allow to cool, add 150 cc. hot water, and bring just to a boil. The precipitated lead sulphate may be filtered off immediately.

Collect the filtrate in a 350-cc. beaker, dilute to 200 cc., and add 5 cc. of a saturated solution of ammonium chloride. Insert in beaker a piece of glass tubing, 5 to 7 mm. in diameter and about 5 in. long. Connect this tube with the hydrogen sulphide generator, and allow a steady stream of the gas to pass through the solution for half an hour. A drop or two of ammonia may be necessary to start precipitation. The official method recommends the hydrogen sulphide for one hour, but I have found half this time with a steady stream to be ample. Remove beaker from generator, retaining tube for use as a stirring rod.

Filter rapidly through a double 12½-cm. No. 41 Whatman paper, wash two or three times with hot water, and transfer paper entire to a 150-cc. beaker. Do not scrub the sides of the beaker to remove adhering particles of sulphide. Pour 60 cc. of 1:5 sulphuric acid into beaker upon filter paper, and break up latter with a stirring-rod. Boil until all sulphide has been decomposed. Filter at once into original beaker in which precipitation was made, dilute to 200 cc., add 5 cc. ammonium chloride solution, and re-precipitate as cadmium sulphide, using original glass tubing as hydrogen sulphide conveyor. Filter, and wash slightly, as before. Transfer filter paper to original beaker in which precipitation was made, and boil up with 60 cc. of a 1:3 hydrochloric acid solution. Add a few drops of nitric acid in order to oxidize the sulph

When dissolved, filter into a 200-cc. electroly beaker, and wash three times. Add a few drops phenolphthalein, then an excess of a saturated Na(solution, until a deep red is obtained. Add a fresh prepared saturated solution of KCN until the prec itated cadmium hydroxide redissolves. Electrolyze, ke ing solution stirred by air or mechanically. All the met lic cadmium is deposited within half an hour. Str adherence to the directions prescribed by the offic method lengthens the time for the determination by least four hours. Weighing a sample at 5 p.m., befc stopping work, and digesting it overnight, makes possible to finish the determination before noon t following day.

Assay Practice Economies on the Ranc

By C. Toombs

In the modern up-to-date assay office there is not t same scope for economies that existed some years ag still there are a few points which may be touched up The biggest item in the aggregate of stores costs litharge. Many who believe in "parting" everythi would be glad to be provided with a cheaper brand litharge, free from gold, but unrefined as regards silv This might suit the manufacturers, and would be saving to the user—cheaper litharge, and less silver be added to a charge. I now raise this question: litharge being used for its proper function; namely, lead producer for gathering the gold contents in charge under fusion, or is it also being used as a flu Litharge as a flux at $15 to $17.50 per 100 lb. is luxury, when sodium carbonate at $3 per 100 lb., pl a good heat, is all that should be necessary. I ha recently seen a flux for a 5 A.T. charge in which A.T. litharge was used; presumably a 40-gm. butt would be reduced, thus leaving 2½ A.T. litharge in t slag. Personally, I agree with the theory that "bor is an effete superstition." If the furnaces are ke in good condition, and run at a high temperature, have found the use of borax unnecessary, and the sulting lead button comes away cleaner and bright from the slag.

For many years I have used only cupels made in own department. They are made with a cement b tom and cupel powder top—two-thirds cement, o third cupel powder—a decided economy. I still the old swinging screw type of cupel machine, a on the whole, find it satisfactory. One boy can turn o almost 20,000 cupels per month, at an average cost about 50c. per 100.

All silver used should be re-precipitated and recovere by flattening and rolling into thin strips it can used over and over again, a small additional amou monthly making up the working losses. I find that the working loss on 17,000 to 20,000 partings per month averages about 3 ounces.

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*Abstracted from "The Chemical Analyst."

*Excerpt from "Journ. Chem. Met. & Min. Soc. of S. Africa."

In solution assaying, the old method of reduction and precipitation by means of sodium sulphite and copper sulphate, in a hydrochloric acid or sulphuric acid solution, may be safely abandoned for the more economical one of precipitation by means of prepared cuprous chloride. Commercial hydrochloric acid, commercial copper sulphate, and scrap copper wire are all that is required to make cuprous chloride solution, giving instantaneous precipitation of gold from solution in the cold.

Chemically pure nitric acid especially free from chlorine and iodine is an essential in gold assaying, but something might be done by economizing in its use. Keep the quantity used in parting as small as possible—a big excess is always used, probably a hundred times more than is theoretically necessary for the average small beads. Then in bullion parting, the strong acid from today's bullions can be diluted down for tomorrow's first weak acid, with considerable advantage.

Determination of Tungstic Acid In Wolframite*

Inconsistent and unsatisfactory results were obtained with various methods for the determination of tungsten in wolframite. The precipitation method originally described by Treadwell, embodying the precipitation of tungstic acid with nitric acid, is not quantitative for this purpose and is subject to losses of 8 to 10% or more; the filtrate from this precipitate was always found to contain an appreciable amount of tungsten. The method more recently employed by Treadwell, involving the fusion of the mineral with sodium carbonate and extraction with hot water and treatment with concentrated hydrochloric acid, failed to give any better results. The same was true of the Berzelius method, involving fusion with alkali and final precipitation with $AgNO_3$.

Incomplete precipitation of tungstic acid by treatment with a mineral acid, such as nitric or hydrochloric acid, is due to silicic acid, which is always present in wolframite; this reacts with tungstic acid to form very soluble silicotungstic complexes, which are only slightly hydrolyzed by acid under the conditions of analysis and are not destroyed by repeated evaporation with nitric acid nor even by heating to 130°. The Berzelius method is also inaccurate because the mercury salt of the silicotungstic acid formed is rather soluble in warm slightly acidulated water.

The G. von Knorre method was employed in the following manner and was found to give satisfactory results: The mineral was decomposed by fusion with sodium carbonate; the aqueous solution obtained therefrom was neutralized with hydrochloric acid, using a methyl orange indicator; 10 c.c. of N/10 sulphuric acid was added and tungstic acid was precipitated at ordinary temperature by addition of excess of benzidine-hydrochloric-acid solution; silica after ignition was eliminated by evaporation with sulphuric and hydrofluoric acids. The filtrate was free from tungsten.

Satisfactory results were obtained when the method was applied to pure, crystallized sodium tungstate and tungstic acid. All of the above methods are satisfactory for analysis of compounds such as pure sodium tungstate, etc. The von Knorre method alone is recommended for determination of tungstic acid in minerals such as wolframite and scheelite, which contain silicic acid. This method has the following advantages: (1) the formation of the silicotungstic complex at ordinary temperature is practically *nil,* and consequently the amount of silica so obtained is so insignificant as to require no separation in most cases; (2) formation of the silicotungstic complex has no appreciable influence on separation of tungstic acid and precipitation of benzidinesilicotungstate is quantitative; (3) after incineration the silica present (from decomposition of the silicotungstate) may readily be eliminated, and the total content of tungstic acid may thus be obtained.

Determining Molybdenum in Steel*

The steel to be analyzed is dissolved in dilute sulphuric acid, the ferrous sulphate oxidized by the addition of powdered potassium permanganate, avoiding an excess, and the mixture is then rendered alkaline with potassium hydroxide, boiled, and filtered. An aliquot portion of the filtrate is diluted, faintly acidified with hydrochloric acid, and treated with an excess of standardized titanium trichloride solution; the excess is then titrated with ferric chloride solution, using potassium thiocyanate as indicator. In solutions containing less than 0.05 gram of molybdenum per liter and naving an acidity corresponding with 1 c.c. of free HCl per 100 c.c., the reduction proceeds according to the equation $2MoO_3 = Mo_2O_5 + O$. Vanadium may be determined in a similar way, the reduction being according to the equation $V_2O_5 = V_2O_4 + O$. If molybdenum and vanadium are both present in a steel, they are determined together as described; the vanadium is then determined colorimetrically (with hydrogen peroxide), and the molybdenum is obtained by difference.

To Help Detect a Titration End Point †

By W. R. Goddard

To those who do much titrating it may be of value to know how to eliminate the dark shadow which appears in the bottom of the beaker in which the titration is being made. Although the beaker is usually placed on white paper, milk glass, or porcelain (in order to get a white background) there is always a dark shadow formed in the bottom of the beaker owing to the light having to pass lengthwise through the glass at the bottom of the beaker. This can be completely eliminated if the beaker is set on a piece of plate glass placed an inch or more above the white background. This allows the light to be reflected up through the bottom of the beaker as easily as through the sides.

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*Luis Guglialmelli and Ulaus Hordh. Anales. Soc. Quim. Argentina 5. 81-90, 1917; Chem. Abstr.

*Travers, Comptes Rend. 1917; abstr. "Journ. Soc. Chem. Ind.", Oct. 31, 1917.

†Abstracted from the "Chemist-Analyst."

Events and Economics of the War

While the British and French are forging their grip on St. Quentin on the Hindenburg line, the Allied arms are meeting new successes on the Eastern fronts; the drive in the Balkans continues, with the Italians joining in east of Monastir; in Palestine, the Turks have been routed, the British capturing 25,000 men and 260 guns in a 60-mile advance reaching beyond Nazareth. The British have withdrawn from Baku. A protectorate has been temporarily established in Archangel by the Allies. The origin and development of the Franco-Russian alliance has been revealed in the French "Yellow Book" just published.

In the United States, condemnation by the Allied and neutral governments of the massacres carried out by the Bolsheviki has been invited by Secretary Lansing. The President has set Oct. 12 as "Liberty Day" for the Fourth Liberty Loan campaign. John W. Davis, of West Virginia, Solicitor General of the United States, has been appointed Ambassador to Great Britain, succeeding Walter H. Page, resigned.

Silver Export Rules Stricter

More stringent requirements have been demanded of silver exporters by the Federal Reserve Board to prevent the available domestic supply from being drained away. Though licenses have hitherto been necessary, purchasers of goods in the Far East have had little difficulty in securing all the silver they needed for meeting their bills. The board recently published a ruling in which it says:

> In order to conserve the use of silver, export licenses for silver will be granted only for civil or military purposes of importance in connection with the prosecution of the war, and only in cases where the exporter certifies that the silver to be exported has been purchased at a price which does not directly or indirectly exceed $1.01½ per oz. 1000 fine. This quotation applies at the point where silver is refined in the United States or at the point of importation, in the case of imported silver.
>
> It has been apparent for some time that applications for the exportation of silver were increasing and that the amounts licensed for exportation would grow greater as the difficulty of obtaining gold or securing exchange at satisfactory rates increased.

According to the board, licenses to export approximately $155,237,725 had been issued from the time the embargo was placed, late in 1917, up to May 24, 1918. From this latter date to Aug. 23, licenses were granted for $105,290,285 of silver as coin or bullion. Further applications have also been acted upon favorably for the export of $5,328,110 of silver or currency, at shippers' option.

Oil Conservation Urged

The unmined supply of petroleum now available in the United States is only about 70 bbl. for each person, states a bulletin issued on Sept. 17 by the Smithsonian Institution, in urging the necessity for conservation in the use of oil and gasoline. The bulletin, which is based on an exhaustive survey of the oil resources of the nation, says that, under prese conditions of mining, a notoriously high percentage waste is involved, amounting, according to conservati estimates, to nearly 90% of the total resource valu

The presence in this country of extensive deposi of oil shale, it is said, removes that danger of earl physical exhaustion in respect to oil, but does n necessarily insure a deferment of the period economic exhaustion which is being rushed prematurel into the present by the current wasteful use of th limited petroleum resources.

Aid for the oil producers was sought of the Senat Finance Committee on Sept. 13 by Judge Henry Covington, formerly a member of Congress. Judge Covington asked for the insertion of a depletion clause in th Revenue Bill for oil wells such as the one alread allowed for mines; also that the income of individual derived from the sale of oil wells should be taxe 20% in the place of war or excess profits or othe income taxes. He forecast a serious oil shortage i the United States unless some encouragement wer given to new development enterprises. There are n war profits in the oil business, according to a representative of interests in the mid-continent field, wh also appeared before the committee.

Civilians May Enter Officer Schools

Applications of civilians for admission to centra officers' training schools may now be received, the Wa Department announced on Sept. 19. The age limits fo admission of civilian applicants are from over 18 t less than 46 at the date of registration. Special induction for training at these schools will be regulate so that a fair proportion of candidates shall come fro (1) the Army at large, in accordance with existin instructions; (2) civilians in Class 1-A; (3) civilian of the deferred classifications, on grounds other tha industry, occupation or employment, including agriculture. The announcement further reads:

> Civilians in Class 1-A, who may be admitted to central officers' training schools, with a view to obtaining commissions a the close of the prescribed course, will, upon entrance to th schools, be inducted into the service for the duration of the war and should they fail to obtain such commissions they will b required to remain in the service.
>
> Civilians in the deferred classifications on grounds other tha industry, occupation or employment, including agriculture, wh may be admitted to central officers' training schools, with a vie of obtaining commissions at the close of the prescribed course will, upon entrance to the schools, be inducted into the servic for the duration of the war, and should they fail to obtain suc commissions, they may be given the option of a discharge fro the service and a reversion to their original classifications unde the selective service regulations.

The applications of civilians will be submitted, a heretofore, to the Army officers on duty at the variou educational institutions throughout the country, as prescribed in the memorandum of information issued b the War Department. No applications will be considered by the War Department.

Drive To Secure Mine Labor

Through its mining division, the U. S. Employment Service of the Department of Labor has opened a drive to secure adequate working forces for the coal and war-metal mines of the country. The campaign will be handled by James Lord, chief of the mining division of the Employment Service, who also is president of the mining department of the American Federation of Labor; E. B. Chase, general manager of the Berwind-White Coal Mining Co., of Philadelphia, representing the mine operators, and William Diamond, former statistician of the United Mine Workers.

As the opening step, a circular letter, signed by Director General Densmore, is being sent out to the secretaries of 3500 locals of the United Mine Workers in all parts of the United States. Through the use of their transfer card records these secretaries are expected to report to the mining division of the Employment Service the names, addresses, and present whereabouts of all practical mine workers who to their knowledge have in the last few years left the mines for other work. As soon as the reports of transfers have been received, the Employment Service will get in touch with all those who have left the industry for less important occupations, and by means of personal solicitation urge their return to the mines.

Fourth Loan Campaign Opens

The Fourth Liberty Loan, the selling campaign for which opens today, Sept. 28, is expected to dispose of about $6,000,000,000 in bonds. These will be 20-year 4¼% bonds dated Oct. 24, 1918. The first coupon will be payable Apr. 15, 1919, and will be for 173 days' interest. The bonds will be issued in the following denominations: $50, $100, $500, $1000, $5000 and $10,000; $50,000 registered, $100,000 registered.

Payment must be made at the rate of 10% of the subscription with the application; 20% on Nov. 21; 20% on Dec. 19; 20% on Jan. 16, 1919; and 30% and interest on Jan. 30. The campaign will close on Oct. 19.

The Administration bill designed to stimulate the sale of Liberty Bonds by exempting from income tax and surtaxes the interest on the Fourth Liberty Loan up to $30,000, and up to $45,000 on earlier issues, was sent to the President on Sept. 23.

Tin and Platinum Drive Pending

The American Red Cross is putting its machinery into operation in all parts of the United States for salvaging platinum and tin. The drive for platinum is for the purpose of building up a reserve stock needed for making contact points for magnetos to be used in tractors, trucks, automobiles, motorcycles, and gas engines; contact points for telegraph and telephone systems, and chemical apparatus and scientific instruments.

The forms in which tin will be collected are limited to three, namely, foil of every kind, collapsible tubes, and pewter articles, in which a very large percentage of tin is found. Tin cans are not worth collecting.

The drive will be under the general direction of the Red Cross Bureau of Conservation at national headquarters in Washington, operating through similar bureaus at divisional headquarters.

New Passport Rules in Effect

New rulings on passports became effective on Sept. 15, to the end of insuring greater public safety by establishing more accurately the status of passengers traveling between this country and foreign ports. Engineers and other citizens desiring to leave or enter the United States will find greater difficulty in securing passports than heretofore. Passports will not be issued unless the applicant can make it affirmatively appear that there are adequate reasons for his departure or entry and that such departure or entry is not prejudicial to the interests of the United States.

Export Conservation List Increased

The War Trade Board has announced in a new ruling (W.T.B.R. 216) the addition of the following commodities to the Export Conservation List, which became effective on Sept. 11, 1918: Aluminum, metallic and all articles containing 10% or more in weight of metallic aluminum (individual licenses not required in Canada or Newfoundland); cartridge shells loaded and unloaded; pig lead, lead pipe, sheet lead; oxide of tin, bichloride of tin, tin salts, tin crystals, sundry articles either made of tin plate or coated and dipped in tin; titanium alloys, titanium compounds, titanium ores, uranium alloys, uranium ores and uranium salts; also luminous compounds, ores and salts of radium.

British Army Returns Miners

"The government is making every effort," says a mining correspondent of the London *Times*, "to expedite the release of miners of low medical categories. During the last three months such men have been sent back from the army at the rate of nearly 100 a day, but the need for more coal is so great and urgent that extraordinary measures are now being taken to get men quickly from France into the mines in order to increase the output of coal. Soldiers who are eligible for release should take steps at once to be sent home. Any man (excluding members of the administrative, managerial, and clerical staffs) who was employed above ground or below ground at coal mines before the war, and continuously up to the date of his enlistment, and is in medical category B2 or B3, and serving at home, is eligible for release, provided he can be spared from the unit in which he is serving. Particulars of the scheme have been circulated by the military authorities in regimental orders."

The training camp for the Chemical Warfare Section, now under construction at Lakehurst, N. J., will be named Camp Kendrick, in honor of Professor Henry L. Kendrick, a retired Army colonel who served as professor of chemistry, mineralogy, and geology at the Military Academy.

Prohibition of the sale of intoxicating liquor within five miles of coal mines for 60 days after Oct. 1 is proposed in a bill introduced on Sept. 18 by Senator Myers, of Montana. It was referred to the Judiciary Committee. Senator Myers said such a step would aid greatly in overcoming the threatened coal shortage this winter

Industrial News from Washington

By Paul Wooton, Special Correspondent

The War-Minerals Bill

An agreement on the War-Minerals Bill has been reached by the conferees for the Senate and the House. Two new sections were added to the bill, and the Shafroth amendment, providing administrative headquarters be situated west of the Missouri River, was stricken out. Several other minor changes were made in the bill as it passed the Senate.

In Section 2 of the bill, the portion referring to sales was changed so that such sales "shall not be at a price less than the purchase or cost of production thereof." One of the new sections provides that "no person having a pecuniary interest in any transaction in pursuance of this act shall have any official connection under this act with such transaction." Penalties are provided for the violation of the act. The termination of the act upon the proclamation of peace is additionally safeguarded. In the other section, provision is also made that no person is to be exempt from military service because of employment in the administration of the act.

The President has written Senator Henderson congratulating him on the unanimous adoption of his bill by the Senate. "You have rendered the country a generous service," wrote the President, "in your management of this piece of legislation. I am sure it will be fruitful of the most useful results."

Revenue Bill To Cover New Orebodies

The Senate Finance Committee has been asked by James F. Callbreath, the secretary of the American Mining Congress, to add a paragraph to the revenue bill to provide for new orebodies. The paragraph proposed is as follows:

> Provided that in the case of mines, oil and gas wells there shall be included in surplus a reasonable amount to represent the value of after developed orebodies or deposits; said amount to be determined under rules and regulations to be prescribed by the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury.

Another proviso was suggested as follows:

> Provided that in the case of mines, oil and gas wells, the excess-profit credit shall consist of a specific exemption of $3000, plus an amount not less than 10 nor more than 25% of invested capital, such percentage credit to be determined by the Commissioner of Internal Revenue under such rules and regulations as he may prescribe.

Lead Output Meeting Demand

Reports to the War Industries Board indicate that lead producers are holding their own against consumption. The discontinuance of exports of pig lead to foreign commercial buyers is helping matters.

Some consumers are not getting as much lead as they want, but all appear to be making the best of things, judging from their communications to Washington. The clearing of all lead through the committee is believed here to be having an important bearing on making consumers more careful. Great savings are being made by curtailing unimportant uses of the metal. Bird shot, for instance, was used at the rate of 20,000 tons annually during the first six months of 1918. This is a reduction from 24,000 tons used in 1917 and 28,000 tons in 1916. The rate of use of bird shot will be further reduced during the latter half of the current year, it is believed.

Pope Yeatman and his staff, who are in charge of non-ferrous minerals for the War Industries Board, are paying particular attention at this time to the paint problem.

Pig Tin Licensed

Extension of the licensing system to pig tin was announced by Bernard M. Baruch, chairman of the War Industries Board, on Sept. 20. The official announcement reads in part as follows:

> All users and dealers in pig tin will be licensed, and a complete inventory of stocks on hand and contracts unfilled will be made, and, if necessary, supplies will be redistributed to equalize same according to essential uses. Full details of licensing plan will be announced later.
>
> In accordance with this decision of the War Industries Board, questionnaires are being sent out to the 2000-odd individuals and plants affected, calling for the information, under oath, demanded by the inventory. On the facts to be thus gathered as to the actual supply of pig-tin stocks and the unfilled contracts, and the manner and quantities in which the pig tin is being held, the War Industries Board will decide whether essential uses demand an equalization of such stocks through redistribution and a matching-up among the plants.
>
> The tin section of the board has been informed there is considerable uneasiness in the trade as to control by the War Industries Board of the pig-tin situation, and it is the belief of Mr. Cranwell that announcement of positive plans of control will prove beneficial. He says that the control plan will affect only the users and dealers in pig tin, and that the public, which uses tin plate, will be benefited by the licensing system of control.

The announcement then sketches the method by which the world's supply of pig tin will be distributed under the newly formed inter-Allied pool, which has already been described in detail on page 541 of the last issue of the *Journal*. T. G. Cranwell is acting chief of the tin section of the War Industries Board.

Zinc Men Seek Protection

Protection of American zinc producers from foreign competition was asked last week of Bernard M. Baruch, chairman of the War Industries Board, by Missouri's delegation in Congress, which was headed by Senator Reed and Speaker Clark. They stated that the present rate of importation from Mexico is keeping the price of zinc at a point where a large number of American properties cannot operate.

A decree published at Mexico City exempted from import duty all mining and industrial machinery from Sept. 1, 1918. Before that date the duty was 45c. per 100 pounds.

exican Mine and Metal Taxes Fixed

A presidential decree, effective Apr. 26, has imposed a internal stamp tax on gold, silver, and industrial etals in Mexico, according to the *Bulletin of the Pan-merican Union.* The decree reads as follows:

A. Eight per cent. on the value of gold and silver exported in e form of ore, concentrates, cyanide or sulphides or smelting siduums, or in any other form combined or mixed with sub-nces not properly known as metals.

B. Seven per cent. on the value of gold and silver exported ter the same has been treated in the country up to the grade being combined or alloyed only with metals, no matter what ay be the proportion of the mixture.

C. Six per cent. on the value of copper exported in the form ore or concentrates of less than 50% copper. When the New rk price of electrolytic copper is less than 20c. U. S. currency r lb., this tax will be 5 per cent.

D. Five per cent. on the value of copper in bars, mattes, or ncentrates of more than 50% copper content, and 300gm. of ver and 5gm. of gold per ton, the New York price of copper being c. per lb. or over. The silver and gold pay under paragraphs and B, except as hereafter set out.

E. In the case above, when the New York value of copper is ss than 20c. U. S. currency per lb., the import on the copper ntent is reduced to 4 per cent.

F. Two and a half per cent. of the value of copper in bars, attes and concentrates having a copper content of more than % and less than 300gm. of silver and 5gm. of gold per ton, ithout regard to the New York market price of copper.

G. Three per cent. of the value of lead, tungsten, molybdenum, anganese, graphite, and mercury.

H. One per cent. of the value of zinc, tin, antimony, and other etals or minerals and substances containing the same not classi-ed in the paragraphs above.

I. Seven per cent. of the value of gold and silver presented at he mint for coinage.

The mint will receive for coinage, gold and silver from private dividuals, without limit as to gold, and as to silver on special rder from the Treasury Department. Pure gold is to be taken t the rate of 1,333.33 pesos (Mexican gold) per kilogram and ure silver at the New York price in Mexican money as of the ay of presentation at the mint.

The import is not to be collected on:

A. Old national or foreign gold coins presented at the mint or recoinage.

B. Gold and silver exported in the form of ore, earth or owder, in the natural state or mechanically concentrated, and in yanides, sulphides, or smelting residua, provided that the amount f gold does not exceed 2gm. per ton and the amount of silver 50gm. per ton.

C. Copper ore of less than 3% copper content; lead ore of less han 8% and zinc ore of less than 15% zinc content.

D. Gold and silver produced by smelting foreign ores. Four onths' period for smelting allowed.

E. Gold and silver employed in national industries.

F. Mineral specimens in the natural state up to 10kg. in eight and 10 pesos in value.

Included in the same decree, the annual mine prop-erty tax is fixed on a progressive scale as follows:

From 1 to 5 pertenencias (claims), at the rate of 6 pesos yearly per pertenencia, or 2 pesos per tercio (third).

From 6 to 50 pertenencias, at the rate of 9 pesos yearly per pertenencia, or 3 pesos per tercio.

From 51 to 100 pertenencias, at the rate of 12 pesos yearly per pertenencia, or 4 pesos per tercio.

Above 100 pertenencias, at the rate of 18 pesos yearly per pertenencia, or 6 pesos per tercio.

The progressive feature is to be applied in all cases where pertenencias belong to the same owner and are registered in the same mineral district.

South African Mining Prospects

In a presidential address before the Science Association, Dr. Percy A. Wagner stated that the Union of South Africa is not only the world's leader in the production of gold, diamonds, and corundum, but possesses the greatest known reserves of these minerals. The recorded gold production to date amounts to 4609 tons, valued at £571,400,000; and on the basis of pre-war costs he estimates the gold still capable of being profitably recovered on the Witwatersrand to be worth £1,200,000,000. There can be no question that 50 years hence gold-mining operations on a large scale will still be conducted on the Far East Rand, and possibly also in some sections of the Witwatersrand. Dr. Wagner urged the establishment at Johannesburg of a mint. He stated that the diamond production to date has amounted to 31 short tons, of a declared value of £216,-165,764, which was probably not much more than one-half of what the diamonds finally realized in a cut state. At the present time, owing to the policy adopted by the leading producers of carefully adjusting the output to the amount of money the world was prepared or inclined to spend on the purchase of diamonds, the industry is in a sounder position than it has ever been before.

The coal industry is making steady progress, and is capable of considerable expansion. An export trade to South America seems to offer great possibilities, and it is to be hoped that after the war a direct service of steamships will be established between the Cape and Buenos Aires. In regard to South African coal reserves, it has been generally conceded that the estimate made in 1911 which placed these at 56,000,000,000 tons erred considerably on the conservative side. The prospects of the coal byproduct industry are excellent.

As a result of conditions created by the war, South Africa is at last about to enter the ranks of the world's iron producers, Dr. Wagner said. Four small blast furnaces are either actually completed or nearing completion, and the prospects of the iron industry are hopeful. The dimensions which the industry may ultimately attain depended upon the success of the efforts to be made at Pretoria, as soon as practicable, to smelt the rich titaniferous ores of the Bushveld complex in admixture with the siliceous ores of the Pretoria series. Dr. Wagner estimated that there were over 3,000,000,000 tons of these ores available; and if they could be smelted on a large scale, using cheap Transvaal coal as fuel, South Africa would be able to export iron and steel in competition with the leading iron-producing countries.

The copper industry received a severe set-back by the decision of the Ministry of Shipping to stop the shipment of copper concentrate and matte. In any case the outlook of the copper industry is none too bright, owing to the serious fall in grade that has taken place of recent years in the mines of Little Namaqualand and at the Messina mine. The future of the Namaqualand copper district depends on the introduction of economical methods, such as leaching or flotation for the beneficiation of the enormous reserves of low-grade ore in the existing mines. The tin-mining industry, on the other hand, is in a flourishing condition owing to the high price of the metal; and asbestos and corundum are being produced in ever-increasing quantities.

Henry R. Merton Co., Ltd., of London, have begun an action for libel and slander against W. M. Hughes, the Prime Minister of Australia. However, Mr. Hughes continues to attack that company in the series of political speeches that he is now delivering throughout Great Britain.

Here's to the Twenty-Seventh

Here's to our gallant regiment, whose spirit knows not fears—
The glorious Twenty-seventh of mining engineers.
They set the guns that kill the Huns. Then here's three rousing cheers!
They'll surely win, they'll reach Berlin, our mining engineers.

So say we all of us, as the Institute members sang above at their banquet in Colorado Springs before their recent meeting ended. Mrs. George M. Taylor, of Colorado Springs, wrote the words, and the members furnished the harmony. They had previously "passed the hat" for the Comfort Fund, as has been told before, so they had a right to sing in this strain.

Many who have been interested in the way the mining regiment was raised and have admired the men who had nerve enough to enlist in it, have no doubt had the desire at times to express their kind regard for the men without knowing how to go about it. To such the Comfort Fund will be a welcome means for demonstrating their feelings in a way that counts and that is unmistakably sincere. The Fund proves how the givers stand.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$14,436.50
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	10.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	25.00
Richard McCarthy	100.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
A. F. Taggart	10.00
G. E. Farish	25.00
H. K. Sherry	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
P. M. Arnold	10.00
W. A. Wolf	5.00
Employees of Utah Leasing Co., Newhouse, Utah	20.50
Employees of Braden Copper Co.	112.
Charles A. Mitke (second contribution)	10.
G. M. Colvocoresses	25.
Charles Le Vasseur (monthly)	5.
A. H. Wethey	25.
S. Ford Eaton	25.
H. H. Hunner	5.
N. G. Thomson	25.
Members of the A.I.M.E. meeting in Colorado Springs, Sept. 4, 1918	215.
Glen Miles	25.
J. B. Wilmarth	25.
Frederick MacCoy	5.
Balance of a certain Joplin contribution received through Lieut.-Col. Gilmore	590.
H. V. Croll	5.
American Zinc Institute	1000
Thomas H. Leggett	15.
W. F. Pyne	10
Earl B. Crane	5.
Total	$18,347.

Make your checks payable to W. R. Ingalls, treasur of the Association of the 27th Engineers.

Payrolls vs. Fourth Liberty Loan

The following letter, written on Sept. 5 by Lewis Franklin, director of the War Loan organization a Washington, to Benjamin Strong, Governor of the Fe eral Reserve Bank, New York, emphasizes the nee of increasing the number of individual subscribers t the Fourth Liberty Loan bonds, as well as the necessit of boosting the amounts of individual subscription Such action must characterize the work of the variou committees to insure a successful floating of the issu and that Americans, particularly American labor, wi whole-heartedly meet this opportunity of expressin patriotism there is no doubt:

> In the Third Liberty Loan campaign, the subscription amounts of $50 to $10,000 each brought in a total of $2,765,489, 400, out of a grand total of $4,176,516,850. In view of the increased rates of taxation, both on corporate and individual incomes, provided for in the bill now under consideration by Congress, it is probable that in the Fourth Liberty Loan campaig we must largely increase the volume of subscriptions in thes smaller amounts.
>
> I know that committees throughout the country will us every effort to increase the number of subscribers, but I wan to take this opportunity of emphasizing the necessity of increasin not only the number of subscribers, but the size of individua subscriptions, in order to make up the increased amount whic it is necessary to raise.
>
> Wages throughout the country are higher than ever before, an the cost of living has in few cases kept full pace with this increase. I am convinced that the wage-earners of this countr have at this time a capacity for war savings and investmen which until now has been only partially demonstrated.
>
> In factories and other establishments having large number of employees emphasis has heretofore been placed chiefly o the number of subscribers, and this has enabled the more highly paid employees to subscribe to a $50 bond with as much credi as a similar purchase on the part of those receiving less libera wages.
>
> In planning campaigns in establishments where the rates o pay are high, careful analysis should be made not only of the number of employees, but of the aggregate amount of payroll. It is suggested that in addition to the honor roll competition, indicating the percentage of employees subscribing, local committees might institute a competition showing the percentage o payroll which has been subscribed to the Fourth Loan. Such a competition would put the employees of a steel mill, receiving high wages, on the same basis as those employed in a department store receiving wages only slightly higher than in the pre-wa period.
>
> A very large percentage of the cost of this war is going t labor, and labor will respond to the demands of the Governmen if approached in an intelligent way. I am sure that with proper effort, local committees can readily increase the per-capita subscriptions of the wage earners of their districts.

A New Cutlery Metal has been developed from combining iron, chromium and cobalt, according to *Iron Trade Review*, the announcement having been made by Prof. W. L. Goodwin, of Queen's University.

Editorials

The Gold Question

WE TAKE the following from a financial paper, which commonly expresses sound opinions:

> Suggested "readjustment of the gold standard," by what amounts to a subsidy for gold mining, while it would benefit the gold miner and stimulate production, would not help the present world-wide problem of high prices. It would only aggravate the difficulty. By paying the producer 20% more for his gold at mouth of the mine, purchasing power of gold is automatically lowered so much all along the line. In a short while the mine owner would inevitably again be importuned by his laborers and workers to increase their wages, and he would also be confronted by a further increase in the cost of his materials.
>
> Moreover, it would be nothing short of an economic crime to alter the standard of value at this time. It would amount to a breach of faith, since it would be aiding the debtor at the expense of the creditor.
>
> Unfortunate as is the lot of the gold miner, it is a question of who is to suffer in the present predicament. His difficulty would only be alleviated for a time, while a subsidy extended to him through an arbitrary increase in the price paid for his gold would be a constant source of suffering and confusion to the whole community.
>
> But this fallacious step would not end here. To raise the normal value of gold and, therefore, lower its purchasing power at this time, is on a par with all "easy-money" schemes, even bimetalism, advanced to meet the existing pinch in living caused by war. If it were ever a mistake to alter the gold standard it would be more than ever so now. As gold is the basis of all commercial effort in the world, so in its very scarcity today lies solution of the world-wide problem of prices. To change the standard now looks like the easiest way out of the difficulty. But it is not the best. It is only putting off the day of readjustment.
>
> To fortify and buttress the huge volume of paper money put out during the war there will be an intense demand for gold on the part of those nations that have been using their credit to the utmost. Nations which have been injecting into their currency paper valued according to the government fiat, and central banks of issue expanding their circulation into billions, will seek in every corner of the globe to gather in the precious metal.
>
> With the great gold scarcity that must exist after the war, added to the inevitable competition between nations to rehabilitate the world's trade and commerce, prices must fall and credit become cheap. When inflation (which is now acting like an over-supply of gold to force up prices) is checked, and gives way to a gold famine, and intensified commercial and industrial production is turned into regular business channels, the dollar will be able to purchase more, and the wage earner, investor and those with fixed incomes will come into their own.
>
> Thus, the influences that are now at work to put difficulties in the way of gold production are the natural result of economic laws, working to corrective ends. The falling off and comparative scarcity of gold is the natural check to high prices. Scarcity of gold brought about a price readjustment after the Napoleonic wars and early struggle of the past century. Stimulated production of gold after the Boer War, on the other hand, was followed by steadily rising prices. In its relation to the great volume of new credit, gold is as scarce today as it was a hundred years ago. Its bearing upon prices will be the same now as it was then. To take, therefore, from gold any measure of its inherent corrective quality just now, by stimulating its production through artificial means, would be only delaying return to normal conditions.

The above excerpts reflect the conventional economic and banking opinion. We say "conventional" advisedly, for there is dissent, both among economists and bankers, respecting some important particulars. This dissent does not refer to such a simple thing as the fallacy of proposals to change the gold standard by saying that an ounce of gold heretofore worth $20.67 shall henceforth be worth twice as much. The dissent applies to more fundamental things, such as inflation of currency, the nature of money and the quantity theory of money. Consideration of the present gold question necessarily reverts to these fundamentals.

According to what is commonly known as the quantity theory, money is gold, or currency based on gold, and the more money there is the cheaper it is, that is, the less of commodities will it buy, and consequently the prices of commodities rise. Ever since the discovery of gold in California it has been argued by some economists, Chevalier being among the first, that increasing supply of gold would necessarily be followed by rising prices. This view was not accepted by many economists of the classical school, including Mulhall, Schoenhof, Cliffe Leslie, Tooke and Newmarch, Jevons, and others, and much less was heard of the theory when for a long series of years facts went against it. Soon after 1898, however, there was a recrudescence of the theory, especially through the expositions of Irving Fisher and other economists of Yale University, who attributed the rising prices of 1898-1907 to increased gold production and made freakish proposals for the regulation of the standard of value.

Since 1914 we have had the most stupendous rise in prices recorded in history, and the rate of gold production has been substantially stationary, or even recessional. However, there has been a greatly expanded issue of currency. The quantity of money has been greatly increased, but the gold basis is proportionately smaller than it used to be. This is what is called inflation, and to it is attributed the rise in commodity prices. Thus we revert to the quantity theory of money, in its narrow, commonly used sense, and money in this sense means gold. Among American economists the quantity theory is held firmly by the majority, without any doubt, and perhaps the same may be said of the British. But among the dissenters are such distinguished names as those of Laughlin, of Chicago, and Hobson, of Great Britain, the latter being one of the most brilliant of modern economists.

Now, according to the quantity theory and its exponents, the present plight of the gold mines of the world is just what ought to be. It has been taught consistently that increased production of gold would elevate prices to such a degree that the production of gold would be checked. So far events have been true to the theoretical form. But whether this will be the natural corrective and whether diminished gold production will be followed automatically by a fall in commodity prices remains to be seen.

Opposed to these theoretical considerations are some sober facts and opinions. Instead of there being too much gold, instead of our having inflated ourselves by absorbing a large part of the gold supply of Europe, the Treasury Department and our bankers are firmly of the opinion that we have none too much. Gold has been withdrawn from circulation, none is permitted to leave the country (even at the penalty of letting the American dollar depreciate in South America and elsewhere), the Government has bought silver at an inflated price in order to use it in settling adverse balances with Oriental countries that were willing to take silver, and, finally, the industrial use of gold has practically been forbidden. All of this sounds very much as if gold were earnestly desired, and as if our financiers did not care very much about seeing the curtailment of gold production as a natural corrective, as called for by the quantity theory.

Nor is the idea of giving to American mines a bonus for the production of new gold either so ridiculous or so dangerous as some affect to view it. Such could be done without disturbing the gold standard at all. It need not be a bonus per ounce of gold. It might be an outright subsidy to producers on the basis of number of men employed, number of tons of ore hoisted, or anything else that would be reasonable. It would be expensive. Very true. But it would be no more expensive and would absorb no more man-power than to pay the bills for a depreciated dollar in neutral countries or to buy silver at $1 per ounce in order to settle Oriental balances. The maintenance of gold production by subsidy would certainly make us no richer, but neither would it make us any poorer, and it would have the advantage of preventing the disorganization of gold mining and the danger of allowing the gold mines to fall into a state in which they could not produce much at a time when gold might be more badly wanted than it is now

This raises the question For what is gold needed? and carries us back to the quantity theory of money. Hobson, in his "Gold, Prices and Wages," published in 1913, a date when no one dreamed of such events as the world has since witnessed, but which is yet recent enough to exhibit modern ideas, offers the latest and the most brilliant challenge to the quantity theory. "Suppose" says Hobson "that the gross income of this country (Great Britain) were one-tenth of the gross income of the whole world; this would give £100,000,000,000 as the quantity of money operative for a year. To this sum there has been added from an extraneous source the gross income from the gold mines, an amount of £67,000,000. The gross income from gold mining will have precisely the same amount of influence on general prices as the gross income got from the textile or metal industries. The effect would be an increase of the aggregate quantity of money to the extent of $\frac{67}{100{,}000}$. The influence upon prices would thus be considerably less than 0.1%. The actual influence of this addition to money in raising prices would, of course, be much less, if allowance were made for the increase of goods which has been going on. Assuming, then, that the entire output of gold was directly expended by those who get it from the mines in purchasing goods, the effect in raising world prices would be very trifling."

In his concluding chapter, Hobson discusses the paradox that has always been very troublesome to the quantity theory, namely, why is it that often when the quantity of money is greatest discount rates are highest. During this war we have had the most striking record of this sort. With huge expansion of money, with inflated currency, why should interest charges be so high? Let us quote Hobson again:

> Gold is not a base upon which is reared a block of credit that enlarges and shrinks with the length of the base line. It is not a weight to which the weights of other monetary instruments must adjust themselves. It is not even an anchor securing the vessel of finance in times of storm. The real basis of credit is goods, and the increase in actual credit is attributable to the increase of this goods basis and the concomitant increase in the demand for credit arising from the expansion of new large profitable business enterprises. . . .
>
> What plausibility attaches to the quantity theory interpreted as a gold control rests upon a hidden acceptance of the assumption that every piece of money with which payment is made must either contain, or be able to procure, a quantity of gold of the same value as the goods which it helps to exchange. But this assumption rests upon a totally erroneous assumption as to what people want money for. If every one who receives a sovereign for a sack of wheat or a pair of shoes were going to consume that sovereign, as the other will consume the wheat or shoes, the assumption that the monetary form must be equal in value to the wheat or shoes would hold. But the recipient of the sovereign paid for wheat has no intention of consuming it—what he wants it for is to use it to get hold of something which he does want to consume. . . .
>
> Since this single act of service is all they want to get from it, they must not rightly be regarded as the owners of the sovereign, in the sense in which they own either their consumable goods or their capital instruments, but as the hirers of the pieces of money which thus pass into and through their hands. Accept this standpoint and it becomes apparent that the real price of money which concerns us is not the market price of goods, but the hire-price paid to owners of money for the use of money. . . .
>
> Goods, not gold, are the basis of the modern money system. Once grasp this principle, and it becomes intelligible why gold itself when used as money is sinking from its old character of intrinsic value and becoming a form of token money.

Similar ideas were expressed by the chairman of the Ionian Bank at its last annual meeting, who argued the needlessness of gold, the Grecian finances being successfully conducted on the basis of goods. Indeed, goods and the credits for them underlie our own modern banking system, which has successfully permitted a great diminution in the gold reserve. Gold and gold certificates are rarities in this country nowadays. Yet, although the experiences during the war have pointed more and more to the ability of countries to carry on their internal affairs without gold, they have shown with equal emphasis the necessity for gold in international business. Indeed, the settling of international balances is the chief modern function of gold.

This article is not intended to be an argument in favor of a bonus on gold production, which may or may not be advisable, and pending careful consideration of many things, judgment should be reserved. But it is intended to show that certain doctrines that are held to be adverse to giving consideration to that proposal are not doctrines that are accepted by all economists; and the merit of some of them is not only doubtful but is denied. There is a form of the quantity theory of money that is clearly correct, though it is not the form that the emotional economists mean. Token money may be so debased as to put prices to an extravagant figure, as may be seen from what has happened in Russia. It is even conceivable that gold might become debased, but not by any ordinary production, as Hobson has clearly showed.

The Administration has assiduously catered to the labor unions. Now the labor unions want beer and want the President to veto the bone-dry legislation that Congress has about enacted. This is an awkward demand.

Is the Clock About To Strike 12 for Labor?

DISAPPOINTMENT was expressed last week by Emergency Fleet Corporation officials over the failure of some of the riveting gangs at the Hog Island shipyard to speed up and give the Government their best efforts.

"They are doing only 50% of what they can do at Hog Island," said Charles E. Piez, vice president and general manager of the corporation. Mr. Piez said some drastic action would be taken if an improvement is not shown.

It was remarked that on one day recently the men drove 195,242 rivets under a spur of wagers made by certain officials of the yard to see what they could do, and that on a later day only 89,407 rivets were driven.

Francis T. Bowles, assistant general manager, also expressed dissatisfaction with the work of some of the gangs.

"A situation in which a man can earn in two or three days more than enough for his weekly needs," said Mr. Bowles, "is not conducive to a steady and earnest application to his work."

It has been declared officially since then that the ship production of Hog Island will be much less than was expected this year, and will, in fact, be a great disappointment, owing to the failure of labor to work as it should.

It is alleged, moreover, that it and other shipyards have been shelters for evaders of the draft, who have obtained places on the rolls without ever intending to work.

These revelations have burst upon official Washington like a bombshell, and the press dispatches report great indignation there. The departments talk vigorously, and in Congress there are echoes, of driving out the slackers and the shirkers, giving them the choice of working, really working, six days a week, or fighting. It is declared, moreover, that no man dismissed from a shipyard will be able to get employment in another one unless he can show a proper clearance paper from the first. When official Washington talks this way we cannot help feeling that it is upholding the principle of the Butte "rustling card."

But this revelation of the real labor situation to Washington is only what every industrialist has known to be going on not only in the shipyards, but almost everywhere. In mining and manufacturing generally there has been notoriously diminished efficiency in work per hour, fewer hours worked per week, and squandering of the extravagant earnings in the short time of work. The plea for increased wages to compensate for increased cost of living has been the purest buncombe, as economists have repeatedly shown.

This behavior of labor has been, and is, a crime against the country. With the young men patriotically offering their lives, with the earnest citizens at home working as never before and cheerfully paying stupendous taxes, with the splendid women of the country going to work in the factories and the fields, there are scurvy fellows who are working only 30, 20, or even only 10 hours per week, and not working very hard at that. Many of these men, moreover, are squandering their ill-gotten gains on extravagances that absorb the work of many other men. The Government has taken steps to curtail the production of automobiles, pianos, and some few things, so that the unpatriotic cannot get them, but the Government cannot begin to view the whole list of things on which money may be squandered.

Washington itself has blindly catered to this situation by weakly conceding every demand of the most impudent of labor leaders. Claude Kitchin's stupidity, or malevolence, or both, have promoted it by his unequal scheme of taxation. We have been pursuing a political and economic policy that has been courting disaster. Why has there been such depression in our financial markets? Why have commodity prices been so fearfully high? Why has money been so desperately scarce? Whither has gone too much of the gigantic sums that have been raised by bond sales and by taxation? Answer the last question, and we answer the others. Too much of the money has gone into the deliberate waste by labor. At a time when our working force is diminished by the men in the army, the men remaining in production who ought to have worked harder than ever have practically diminished themselves by working less than full time, by not working at full efficiency per hour, and by absorbing the work of other men to furnish them with luxuries. Innocently and ignorantly—we do not say intentionally—they have been acting in behalf of the Huns, and not as patriotic Americans. We are glad that Washington at last seems to be awakening to this and intends to declare the principle of "work or fight." Let those who do not want to work take up a rifle and release a fighter who will work. And from now on, let every worker go into debt to take Liberty bonds and thenceforth work hard to pay for them.

The Tin Control

THE international tin control creates what is practically a buying monopoly. Such is, of course, just as justifiable economically as is a producing and selling monopoly and is just as much subject to the law of supply and demand. The immediate question will be whether the price that will be fixed will be sufficient to bring out the production that is wanted. In this connection there are many subordinate questions.

Tin production differs from that of the other major metals in that large mining companies figure to a much less extent. Tin comes in small quantities from a great many sources, chiefly in scantily developed countries and largely from the workings of natives—Malays, Chinese and negroes. The value of silver plays a great part in their finances, a high price for tin meaning much less to them with a high price for silver than when exchange is more favorable to them. Another question is that of satiety, that is, the point where a native may earn so much money in a few days that he sees no reason for working during the remainder of the week; wherefore with increasing prices aggregate production may actually decline. We have witnessed something similiar in the recent behavior of our own workingmen.

Another interesting and important subject is the handling of the Bolivian output, which is practically all in the form of ore, to be smelted abroad. It is understood that the governments are to buy this on their own accounts and divide it among their smelters for conversion into metal on the basis of a fair profit. This plan will be hailed with joy by the Bolivian mine owners, who will attain their desideratum of a stabilized high price. It will be welcomed by the smelters, who have been very reluctant to buy ore supplies or enter into contracts on the inflated basis of late. It ought to stimulate Bolivian production, owing to both the foregoing reasons, individually and jointly, which also is something to be desired. It may some day cause the governments to hold an unsold stock of dear tin, on which they will have to pocket a loss, but nobody will think of crossing that bridge yet.

National Exposition of Chemical Industries

AT THE Fourth National Exposition of Chemical Industries, held during the week of Sept. 23, at the Grand Central Palace, New York, more than 350 exhibitors contracted for the entire exposition space on the three floors available for the purpose. This is an excellent measure of the activity and the importance of our youngest industry, for although there has been for a long time a chemical industry in the United States, it has neither attracted the attention, nor has it approached in magnitude, our other large industries. We are at the beginning of the larger development of this important industry. Though we have produced many raw products, have wasted untold quantities of valuable compounds in the smoke of our beehive coke ovens, have failed to utilize natural products that are available, the stimulus of a harsh war has brought us to a full realization of the necessity of placing our country on a self-contained basis.

Except in a few lines, such as the manufacture of common chemicals, fertilizers, explosives, rubber, photographic chemicals, borax, soda, phosphates and petroleum products, the business of the chemist has been that of an analyst and control man. The instruction in our colleges covered rather the elementary phases of chemistry than the business of manufacturing and selling chemical products. A few of the larger colleges developed courses in engineering chemistry, in anticipation of the future need that was apparent to the more far-seeing. Financiers were slow to appreciate the importance of assistance to the chemist optimistic enough to attempt to embark on a chemical manufacturing enterprise. Chemists themselves, well trained as laboratory men and thoroughly grounded along theoretical lines, lacked the experience in organization, mechanical design and business affairs to successfully undertake manufacturing. Though many ventures were failures, others were successful and progress was made.

The dependence of the chemical industry upon mechanical appliances is not realized by most engineers and business men. Nor are they familiar with the fact that our manufacturers and designers lead almost all other nations in crushing, grinding, leaching, evaporating, agitating and filtration devices. Acid-resisting materials and pipe, fittings, pumps and other apparatus finding special application in chemical manufacturing are available in great variety in our own markets.

In discussions of the war and its influence, it is not uncommon to hear expressions that this or that good will be accomplished. This is the only satisfaction that we can get out of the contemplation of the destruction and sorrow resulting from the struggle. When we look critically at the situation we see that the necessities of the moment have driven us to do in an incredibly short time what under ordinary circumstances would have required a decade or more. Things move rapidly in America, but the war has trebled and quadrupled our pace. War has brought our chemists, raw materials and mechanical industries into line. Where financial backing has been slow to come into the game, the Government has taken hold. Private enterprise has been the leader, nevertheless, and patriotism has been as much an incentive as the desire for gain, if not a greater one.

We hope that many mining engineers and metallurgists have visited the exposition, for they will have found in a compact space rare and common products manufactured from the minerals and ores that many of them produce from the mines and plants in their charge. A greater perspective and a larger appreciation of many possibilities will come from closer acquaintance with the work of our chemical manufacturers and the chemical industry.

The Fourth Liberty Loan

AS THIS paper reaches the hands of our readers, the drive for the Fourth Liberty Loan will be well under way. There is little that has not already been said, but what has been said applies now with even greater force. The mining industry has carried its share of the previous loans. It will carry its share of this loan. Give, is the order of the day. We make sacrifices in men and goods for a cause, a most worthy cause. Let every miner, worker, superintendent, engineer and manager get into the work of increasing the total of the subscriptions in his locality. Do Your Part.

Copper and Cotton

THE Rubicon has been crossed. The price for cotton is to be fixed, which means that it is to be fixed downward. The Southern senators vociferously protested against any laying of hands on their sectional commodity. They shouted that the law of supply and demand ought to prevail. As to that, many agree with them, but it was becoming too much of a scandal that cotton alone should be free while all of the other great basic commodities were regulated.

Now comes the question as to what the price for cotton shall be. We hear arguments and representations that are very reminiscent of the controversy over the copper price. There is no more use in going into studies of the cost of production in one case than there was in the other. We offer a solution of the problem that is very simple. Let the price for cotton be the same as the price for copper, 26c. per lb. at present. If the price for copper be raised or lowered, let the same happen to cotton. The normal ranges of these commodities are not dissimilar.

Personals

Have You Contributed to the Association of the 27th Engineers?

A. N. MacKay has been in New York since Sept. 16.

John L. Malm, of the Malm-Wolf Co., is in New York on professional business.

Franklin W. Smith is making an examination in the vicinity of Parral, Chihuahua, Mexico.

David A. Herron, general manager of the Tomboy Gold Mines Co., Ltd., is in Denver.

R. A. Bryce, of Toronto, Ont., is examining properties in the Gowganda, Ont., district.

F. G. Stevens, of Toronto, Ont., has been inspecting the Rex gold mine in northern Ontario.

John W. Sharpe, of Los Angeles, Calif., is making a reconnoiter of the Batesville, Ark., manganese field.

W. J. Prowell, representing a steel company of Detroit, Mich., has been in Arizona looking for manganese.

Basil Prescott will visit Santa Eulalia, Chihuahua, Mex., in October to make a geological examination.

Frank Kennedy, chief engineer for Butler Brothers, at Nashwauk, Minn., has resigned to go into business at Duluth.

Marion L. Thomas has returned to New York from Cuba, after a six weeks' investigation of manganese and iron mines.

J. W. Moffett has resigned as manager of the Beaver Consolidated Mines, Ltd., Cobalt, Ont., and is succeeded by **L. W. Ledyard**.

C. W. Whitley, general manager of the American Smelting and Refining Co. in Utah, has been on the Pacific Coast for a short vacation.

Mark Workman, president of the Dominion Steel Corporation, has gone to Sydney, N. S., and will remain at the plant for some time.

M. J. O'Brier, of Renfrew, Ont., a prominent Canadian financier and extensively interested in mining, has been elected to the Canadian Senate.

A. H. Rogers, of the firm of Rogers, Mayer & Ball, has recently returned from a six weeks' professional trip to British Columbia, Colorado and Missouri.

Bulkeley Wells, governor of the Colorado chapter of the American Mining Congress, has been elected a member of the national board of directors of the congress.

C. A. Filteau, of the National Mines, Ltd., Cobalt, Ont., has been appointed manager of the flotation plant of the Peterson Lake Silver Cobalt Mining Co., at Cobalt.

L. S. Cates, general manager of the Ray Consolidated Copper Co., is spending much of his time at Phoenix, on the draft appeal board of the northern Arizona district.

Francis A. Thomson, dean of the Idaho School of Mines at Moscow, Idaho, is examining two antimony properties on Pine Creek, in the Coeur d'Alenes, for the Government.

Prof. S. F. Kirkpatrick has resigned his position at Queen's University, Kingston, Ont., to accept a metallurgical position with the Deloro Mining and Reduction Co., of Ontario.

Capt. Stewart M. Thorne, formerly manager of the Trethewey Mine, Cobalt, Ont., who has won both the Military Cross and the Croix de Guerre, was recently wounded in France.

Frederick L. Hoffman, statistician for the Prudential Life Insurance Co., spent five days in the Black Hills of South Dakota during September, investigating mining conditions.

Francis N. Flynn, formerly general superintendent of the smelting and refining departments of the Consolidated Mining and Smelting Co. of Canada, Ltd., is in New York.

F. H. Skeel, mining engineer of Wallace, Idaho, has been ordered to report at Washington for service in the engineer corps of the Army. He expects to be commissioned soon.

J. W. Morrison, formerly manager of the Lake Shore Mines, Ltd., Kirkland Lake, Ont., has been appointed manager of the Howie-Cochenor property in the Lightning River district.

J. H. Williams, who has been employed as an engineer at the Hawkins mine at Nashwauk, is to be superintendent at the Sargent mine at Keewatin, for the Wisconsin Steel Company.

Horace F. Lunt, of Colorado Springs, Colo., has been commissioned a captain of engineers and has been ordered to the Student Engineer Officers' Training School, Camp Humphreys, Virginia.

Frank Cochrane has been appointed by the Canadian government to be acting secretary of state and minister of mines during the absence of **Martin Burrell**, who is taking an extended vacation.

James P. Porteus has again taken charge of the Bonney mine at Lordsburg, N. M., as general superintendent for the Bonney Mining Co., the lease of the [illegible] Mining Co. having expired.

A. R. Globe, formerly assistant general manager of the Hollinger Consolidated Gold Mines, Ltd., at Porcupine, Ont., is in charge of operations on an iron property near Sellwood, Ont., in the Sudbury district.

David Cole has been making a visit of inspection to a number of districts in the Southwest, having been called to Arizona to attend a meeting in Prescott of the Arizona-Binghampton Copper Co. directors.

E. R. Abadie, Jr., formerly with the Empire Mines and Investment Co., of Grass Valley, Calif., is now superintendent of the Golden Center mine of the Grass Valley Consolidated Gold Mines Co., of the same place.

N. H. Darton investigated the stratigraphy of the "Red Beds" in New Mexico during August and September. The work was for the U. S. Geological Survey, to determine the prospects for locating potash deposits.

Charles E. Addams, formerly manager of the Arizona Hercules Copper Co., is devoting himself to the management of the Arizona State Council of Defence, of which he is executive chairman, and is now studying the work of the California Council of Defence.

Norman Carmichael, general manager of Arizona Copper Company, Ltd., at Clifton, has accepted appointment as chairman of the United War Work Campaign for the state and is in Phoenix organizing his forces, which include many of the well-known mining operators of Arizona.

David W. Brunton has been placed in charge of an enlarged Washington office of the Naval Consulting Board, which will be in Room 3547 of the new Naval Building. He will handle all communications and inventions. The office of the chairman and secretary of the board will continue to be maintained in New York.

A. E. Wells, of the U. S. Bureau of Mines, has been promoted to the position of metallurgist in charge of non-ferrous metals for the Bureau. He will act as chief metallurgist during the absence from Washington of that official. **C. E. Julihn** has been appointed superintendent of the Lake Superior experiment station. **Thomas Varley** has been transferred from the Seattle station and made acting superintendent of the Salt Lake City station. **F. F. Ovitz** has been made superintendent of the Seattle station.

Obituary

William Kent, the eminent mechanical engineer, died at Gananoque, Ont., on Sept. 18, aged 67 years. He was born in Philadelphia in 1851, was graduated in 1876 from Stevens Institute of Technology, and became editor of the "American Manufacturer and Iron World," in 1877. From 1879 to 1890, Mr. Kent was employed by various companies in the capacity of mechanical engineer, and from the latter date practiced as a consulting engineer. He became associate editor of "Engineering News" in 1895, which position he held until 1903, when he became dean of the L. C. Smith College of Applied Science, of Syracuse University, where he remained for five years. He returned to editorial work in 1910, when he accepted the position of editor of "Industrial Engineering," which he filled until 1914. Mr. Kent was probably best known among engineers of all branches of the profession as the author of the "Mechanical Engineer's Pocket Book," which he brought out in 1895. Other works were the "Strength of Materials," "Strength of Wrought Iron and Chain Cables" and "Steam Boiler Economy." Mr. Kent had lectured on engineering at many colleges and technical schools and had taken out over 20 patents on various mechanical appliances. He was a member of many engineering societies and was vice-president of the American Society of Mechanical Engineers from 1888 to 1890. In former years, Mr. Kent was a valued constant contributor to the "Engineering and Mining Journal," many papers carrying his signature appearing therein 25 or 30 years ago.

Societies

American Iron and Steel Institute. The board of directors decided on Sept. 16 to omit the general meeting of the institute usually held in October.

Mining and Metallurgical Society of America. At a meeting of the council held on July 9, 1918, it was resolved that the "Gold Medal for 1919" shall be awarded for distinguished service in the metallurgy of iron and steel.

American Electrochemical Society will hold its 34th general meeting at Atlantic City, N. J., from Sept. 30 to Oct. 2. Among the papers to be presented are the following: "Hardness of Soft Iron and Copper Compared," by F. C. Kelley; "Relative Volatilities of Refractory Materials" by W. R. Mott; "The Electric Furnace After the War," by F. A. Fitzgerald; "The Future of Electric Steel," by J. A. Mathews; "Electric Pig Iron After the War," by Robert Turnbull; "The Government and the Technical Man After the War," by F. A. Lidbury; "The Power Situation After the War," by C. A. Winder; and "Research After the War," by W. D. Bancroft.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Amalgamator. James Hutchings, Chicago, Ill. (U. S. No. 1,276,656; Aug. 20, 1918.)

Blast Furnaces, Machine for Tapping. Benjamin J. Mullen, Leetonia, Ohio. (U. S. No. 1,276,251-252; Aug. 20, 1918.)

Concentration of Zinc, Lead and Other Ores, Process of. Robert G. Hall, St. Louis, Mo. (U. S. No. 1,276,058; Aug. 20, 1918.)

Concentration—Rubber Set Riffle for Tables. Joe Horn, Ray, Ariz. (U. S. No. 1,276,529; Aug. 30, 1918.)

Electrolytes, Process of Treating Impure. Frank T. Smith, Jamaica Plain, Mass. (U. S. No. 1,276,130, Aug. 20, 1918.)

Electrolytic Tank, Conductor Bar for. Julius H. Gillis, Anaconda, Mont., assignor to Anaconda Copper Mining Co., Anaconda, Mont. (U. S. No. 1,276,208; Aug. 20, 1918.)

Furnace, Apparatus for Charging Electric. Frederick T. Snyder, Oak Park, Ill. (U. S. No. 1,276,586; Aug. 20, 1918.)

Hoist. Edward Stout, Brighton, Iowa. (U. S. No. 1,276,281; Aug. 20, 1918.)

Hydrometallurgy — Extracting Soluble Metals from Ores. Charles Biesel, El Paso, Tex. (U. S. No. 1,276,162; Aug. 20, 1918.)

Mine-Car. Martin S. Runsvold, Bisbee, Ariz. (U. S. No. 1,276,148; Aug. 20, 1918.)

Mine Hoist, Recording Apparatus for. George F. Rover, Wilkes-Barre, Penn., assignor of two-thirds to Jennie H. Webb, Pittsburgh, Penn. (U. S. No. 1,275,605; Aug. 13, 1918.)

Mine Shaft, Safety Gate for. Walter Hardie Finley, Fairmont, W. Va., assignor to Fairmont Mining Machinery Co., Fairmont, W. Va. (U. S. No. 1,276,199; Aug. 20, 1918.)

Shafts, Concrete Lining for. Allen B. Dowell, St. Louis, Mo. (U. S. No. 1,275,874; Aug. 13, 1918.)

Steel, Process for Hardening. John W. Gilbert, Windsor, Vt., assignor of one-half to Daniel H. Parker, Windsor, Vt. (U. S. No. 1,275,242; Aug. 13, 1918.)

Zinc. Melting Apparatus. Takekichi Aramaki, Kiku-Gun, Fukuoka-Ken, Japan. (U. S. No. 1,275,196; Aug. 13, 1918.)

Zinc Powder, Explosive Containing. Frederick Geoffrey Lees Johnson, Chelsea, London, England, assignor to Palmer-Perchlorate Powder Co. of Canada, Ltd., Montreal, Can. (U. S. No. 1,276,537; Aug. 20, 1918.)

Editorial Correspondence

DENVER—Sept. 18

Consolidation of Clear Creek and Gilpin Counties has been proposed by prominent resident taxpayers. It is pointed out that now is an opportune time to consider the consolidation of these counties under a suitable name, with a new county seat and a single set of county officials. The two counties are among the smallest in Colorado, and considering the rapid decrease in population, the falling off of mining operations, the fact that more than 55% of the total area of the two counties is now in the forest reserve, and that an additional area is to be withdrawn forever from taxation and development by the creation of the proposed Denver National Park, the maintenance of two county governments over the remaining small area at the expense of the property holders and taxpayers is hardly justified at this time. As a result of such consolidation the amount of money now raised in the two counties by taxation could be reduced about 60%. Clear Creek County has an area of 249,600 acres, or 390 square miles, and Gilpin County contains 184,480 acres, or 288 square miles. The assessed valuation of Clear Creek in 1916 was $5,143,640, whereas that of Gilpin was $3,453,641. The amount of money raised by taxation for state, county, town, and school, purposes in 1916 was $138,782.71 for Clear Creek, and $102,416.08 for Gilpin, a total for the two counties of $241,198,79. Average levy in 1916 for Clear Creek was 26.98 mills, and for Gilpin 29.71 mills, nearly double the rate of any of the other counties in the north central part of Colorado. Politicians in the two counties, who are the greatest beneficiaries of the present arrangement, will no doubt strenuously oppose the scheme of consolidation. Efficiency and economy seem to favor the plan. With a few exceptions most of the production from the mines in Clear Creek and Gilpin counties is now made in relatively small lots, mined by lessees and sub-lessees. Scarcity and high cost of labor and the increase in the cost of mining supplies have resulted in the shutdown of all but a few of the more substantial operating companies.

Producers of Metals and Coal who have lost men essential to maximum production may secure the release of these men from Army service, according to a recently promulgated order, if the men will accept furloughs and will return to their employment. The Bureau of Mines will assist metal producers to secure results. Furloughs are granted under the following conditions: The employee who has been taken must have been employed in a position demanding technical knowledge, or have been a skilled operative in some department where it is difficult to place new and untried men; the mine or industry must have been listed as an "essential" by the Priorities Board; the employee must be willing to accept furlough and return to his employment without coercion. The man on furlough will be excused indefinitely from military service and will draw civilian pay, but will retain his uniform and must be subject to call from the War Department. If furlough is granted, the soldier retains all military rights and privileges of a soldier and also retains his established military rank. In applying for the release of an employee, the employer must address the Bureau of Mines, stating the circumstances of each man, his value and record. If satisfied that the case should receive attention, the Bureau, through its certifying officer, will at once forward the necessary blanks to be filled out by the employer or agent of the company. Affidavits and necessary evidence must be submitted to the Bureau, and that organization will make any necessary investigation, including personal investigation of the attitude of the employee. If the result is satisfactory, the certifying officer will at once request the release of the employee, and furlough will issue. Up to this time the order has been exercised only in the case of employees of shipyards, munition plants and like essential labor. Recently it was placed in active operation in the Fuel Administration, and hundreds of coal miners, superintendents and skilled men in producing mines have been returned. On Sept. 5 the order was taken up by the Bureau of Mines and is in the hands of a committee composed of H. Foster Bain, assistant director; C. W. Merrill, mining engineer, and J. E. Spurr, in charge of war-mineral investigations. Mr. Spurr is acting chairman. The handling of all problems regarding unskilled labor in metalliferous mines has been placed in the hands of the Bureau of Mines. Complaints regarding labor shortage in metalliferous mines should be addressed to this committee.

SALT LAKE CITY—Sept. 19

The Purchase of the Yampa Mine by the Utah Consolidated at Bingham has come about largely as the result of the litigation pending between the two companies, due to the filing of suit for trespass against the Yampa by the Utah Consolidated, whose territory entirely surrounds the Yampa. At the time of filing the above-mentioned suit, the Utah Consolidated instituted similar proceedings against another neighbor, the Utah-Apex. During its period of greatest productivity, the Yampa, which has been idle for some time, had an output of from 4,000,000 to 6,000,000 lb. of copper yearly. It operated its own smeltery, situated in Bingham Canyon, but never made any great profit from its ores. After a time, work at the smeltery was abandoned and the mine continued to operate and shipped to other plants. The smeltery was dismantled and sold for junk.

Experimenting With Utah Oil Shales continues in an effort to arrive at methods of profitable treatment. A number of experimental plants have been built and a large acreage of oil-shale lands has been incorporated, but so far no commercial plants have been built. The point of departure is, of course, the Scotch method of distillation, although the nature of the oil shales in this country is not sufficiently similar to permit of exact imitation. The Western shales are much more heavily saturated, and the effort here is toward the production of gasoline rather than toward that of burning oil. The operations in Scotland also are on a comparatively small scale, and the deposits not so extensive. The exploitation of the American shales will probably mean steam-shovel work and large-scale operation. For a time a small experimental plant designed by Otto Stahlman, of Salt Lake, was in operation at the University of Utah. Another method is the Crane process. At present one of the two experimental plants operating here uses the Jenson process and the other the Erickson process. The Jenson plant is a three-stage horizontal reduction plant, and has been operating for the last six months, making experiments on oil shales from Utah and surrounding states. In the field it is planned to use as many as 12 superimposed horizontal cylinders. The Erickson process also employs a multiple system of removing vapors, using vertical cylinders, and the plant built for experimentation along these lines has a capacity of 12 tons daily. A trial run of 24 hours was made recently. The ultimate object, as in the case of the plant using the Jenson process, is the building of a larger plant in the field.

PHOENIX, ARIZ.—Sept. 20

The Copper Queen Branch of the Phelps Dodge Corporation and the Calumet & Arizona Co. are offering inducements to steady miners who wish to own their own homes. They are preparing to build more than 200 homes for married men in Warren townsite. The lots are 65 ft. wide, and provision has been made for shade and shrubs and for water for irrigation.

Copper Production in Arizona is bound to suffer through the inroads of the draft upon mine and office men, although many have already gone as volunteers, mainly in the engineer regiments. At present there is sharp complaint from the mine foremen that a large number of their skilled miners have gone to war-work plants in the East, classed as laborers, drawn by the lure of a change and the prospect of wages at least as large as they have been drawing in Arizona. The complaint has been accepted as just by the Federal Labor Administration, which has ordered that strict investigation be made, to the end that no more miners be shipped to laborers' jobs outside of the state.

JOPLIN, MO.—Sept. 16

Concentrating Plants in Operation ready for operation in the Oklahoma s tion of the Joplin mining district now to 202, and 30 are under construction. addition, there are 10 plants where ha jigs are being used, some of them produ ing a carload of ore a week or more. I cently the work of building new mills h been cut down appreciably, and after th plants that were contracted for so months ago are completed, it is expect that no new mills will be built until prices improve.

BATESVILLE, ARK.—Sept. 16

Washing Plants in the Batesville Fie construction of which was begun earl in the year, are now being placed in ope tion. Until the apex of the present velopment is reached, a number of pla will be started each month, with a c responding increase in the production of field. The 200-ton plant at the Allen mi which is owned by J. C. Shepherd and sociates, was started early in Septemb It consists of a combination log washer a jig plant. The crude ore is delivered the plant from the mine, 1000 ft. up mountain, by a 12-in. flume and is wash down. During this process the clay the gangue is practically removed bef the crude ore reaches the washing pl proper. The property is incorporated the Leader Mining Co., with J. C. Sh herd, president; O. M. Bilharz, vice pre dent and E. G. Burnley, secretary a treasurer. The Waco Mining Co., oper ing across the Polk Bayou from the All has a large washing plant almost co pleted. Independence Mining Co., owni the Polk-Southard mine, near Cushm and other properties in the field, has co pleted the erection of a washing plant the Polk Southard mine and will st operations as soon as the pumping pl is installed. Two steam shovels have be working at this property, and nothing nugget ore has been produced. In mini this ore there has been taken out a la tonnage of crude wash-ore, which will treated in the new washing plant. E. McComb, president of the company, a states that he has machinery ordered a small washing plant to be installed Penters Bluff, to handle wash dirt fr several properties there. The Oklahon Kansas Mining Co., operating in the Mia district of the Oklahoma zinc field, purchased the Denison and Schlieper pr erties and contemplates the erection of number of washing plants. The Standa Manganese & Wire Co., of Chicago, is co pleting a washing plant at Lafferty Cre which will consist of two 32-ft. log washe with necessary screens and conveyor b and a 2500-ft. flume, through which crude ore will be moved from the mine the plant. In addition the company built good roads and substantial bridg Eureka Manganese Mining Co. has stalled the first modern washing plant the field and is now enlarging its capac by increasing the water supply. W. Beaty, who is in charge, states that company will install two 200-ton washi plant on the Napoleon-Hill tract, wh lies between the Eureka mine and Cu man. Machinery has been ordered. N operators are still coming into the fie Plans for new hotels at Batesville a Cushman are under way. Production d ing the first eight months of 1918 w 13,222 tons, of all grades. With the creased tonnage which will result when new washing plants begin operation, production for 1918 should show a g over last year, which was in excess 16,000 tons, of all grades.

DULUTH, MINN.—Sept. 21

Petitions Have Been Filed in the Uni States District Court by the Shena Furnace Co. charging that extravaga is rife in the village of Buhl and ask that warrants of that village be withh and by the Pitt Iron Mining Co. agai the village of Mountain Iron, preferr similar charges. Hearings for both p tions are set for Sept. 21 in Minneapo nd Judge Norris has granted temporary estraining orders against the villages. It s charged that both villages have issued arrants above the amounts permitted by w.

The Ore-Shipping Season on the Mesabi vill come to a close in another month or ix weeks. In general, mining operators re well up with their work, and at the nines which have a definite quota for shipnent during the year, the requirements vill be met. Some superintendents report hat they are already beyond their apporionment for this time of the season and thers that they will need all possible labor nd energy to complete the required denands. With still other operators, an unimited amount may be shipped. Generally he season has been favorable, despite the isual shortage of labor and the uncertainies of material. The next month or six weeks will determine what the shipments for the season will be, but in most places here is a feeling of satisfaction that the Mesabi has done its part and done it well.

HOUGHTON, MICH.—Sept. 16

The Action of Copper-Mining Companies n seeking exemption for employees is not nly justified but is positively necessary f the production of copper is to be kept to figure that will meet the requirements f the Government, domestic and Army needs, and of the Allied governments. The ompanies do not purpose asking for a blanket exemption for all of their employees. The local exemption boards and the district board will undoubtedly agree that the necessary employees of mining corporations must be kept at work and that their work is quite as essential as fighting in the trenches. The Michigan copper-mining district already has given at least 30% more than its share of soldiers, including the volunteers who went with the state organizations, one company of militia for infantry service, another company of naval militia and three companies of engineers, to say nothing of the hundreds that went individually and of whom there is no toll. The total is unusually large in proportion to the population. [illegible] on the question that further depletion of the mines would put a deficit in production for the remainder of the year, as it already has for the last few months.

SPOKANE, WASH.—Sept. 20

Satisfactory Construction Progress is being made on the power lines from Bonnington Falls, B. C., to the smeltery and other industries at Northport, Wash., and to the mines on Copper Mountain, B. C. The lines are being installed by the West Kootenay Power and Light Company, a subsidiary of the Consolidated Mining and Smelting Co. of Canada. Their cost is estimated at upward of $1,000,000. The line to Copper Mountain will carry 100,000 volts and the one to Northport, 60,000 volts.

That Lack of Transportation and nothing else is responsible for the inappreciable production of lode gold in central Idaho at a time when the metal is so sorely needed is the opinion of Francis A. Thomson, dean of the school of mines of the University of Idaho, who spent most of August making a survey of the districts of Idaho County, which he estimates have produced in the past between $[illegible] and $[illegible] in placer gold. He [illegible] only in modern times to the [illegible] of California, Fraser River, Australia and Alaska. Although mined for nearly 60 years, the district is so mountainous that the state and county have not felt justified in building into a section largely in forest reserves. Mr. Thomson urges the Government to construct a [illegible] road into the camps.

TORONTO—Sept. 21

Recently Reported Potash Discoveries in old lake bottoms north of Maple Creek, Sask., have resulted in a [illegible] of prospectors to that section. Numerous alkali sloughs in that district have been staked out, and many samples were being collected for analysis.

VICTORIA, B. C.—Sept. 16

Export of Canadian Silver Coin, silver bullion and fine silver bars is prohibited except under license issued by the Minister of Finance. The regulations provide that licenses shall be issued only where the silver is to be used for civil or military purposes of importance in connection with the war and only in cases where the exporter certifies that it has been purchased at a price which does not directly or indirectly exceed $1.01¾ per oz., 1000 fine, at the point where the silver is refined or at the point of importation in the case of imported silver.

The Mining News

ALASKA

ALASKA SHIPMENTS of domestic copper, ore and matte to the United States during August were 8404 gross tons, having a copper content of 4,245,557 lb. and valued at $1,093,306.

ARIZONA

Cochise County

LOS CONQUISTADORES (Benson)—Three shafts on the property are 115, 118 and 80 ft. deep respectively. Formation which carries the gold is quartz contained in diorite, pegmatite and schist dikes. Mine equipment consists of a complete mill building, assay office, and headframe for hoist at the 115-ft. shaft.

Mohave County

HACKBERRY CONSOLIDATED (Hackberry)—Mill to start in 60 days.

BERKELEY (Kingman)—New shaft down 40 ft. and in ore. Drifting from old shaft on 100 level in ore.

WALNUT CREEK (Kingman)—Tunnel to tap main copper vein at 750 ft. has been driven 600 ft. and has cut several stringers of rich ore.

RECORD LODE (Oatman)—Shaft down 433 ft. J. J. McCarthy is superintendent.

Pinal County

RAY CONSOLIDATED (Ray)—Copper production during August amounted to 6,625,000 pounds.

SILVER KING (Superior)—Carload of rich silver ore shipped from raise from the 400 level.

Yavapai County.

ARIZONA-BINGHAMPTON (Agua Fria)—Larger shaft to be sunk.

BELFORD (Mayer)—Taken over by Little Egypt Co. Property has 18 claims. Machinery for development has been ordered.

SHEA (Verde)—Shipments to be started soon to United Verde Extension furnaces. Ore is siliceous.

BIG DOME (Walker)—Struck heavy flow of water.

Yuma County

COBRITA VERDE (Cunningham Pass)—Work to be resumed soon as well as on a number of other shallow properties where miners cannot be secured during the hot season.

LITTLE GIANT (Cunningham Pass)—Operated by the Black Giant Co. of Mobile, Ala. Shipping a carload a week of copper and gold ore, stoped mainly on the 200 level.

ARKANSAS

Independence County

EDWARDS (Batesville) — Development work in progress and good production being maintained. Operations carried on by shafts, pits and open cuts.

GROSSMAN (Batesville)—A. Grossman, of Chandler, Okla., has purchased 200 acres of manganese land in Sullivan Creek district. Working from 20 to 30 men, and from 8 to 10 teams.

JOHN MARTIN (Batesville)—Tract consists of 160 acres of Lafferty Creek. Small force mining 10 to 20 tons a week, with pick and shovel.

STORY (Batesville)—Purchased by Chicago interests through A. J. Edwards. To start construction of $40,000 washing plant this month. Tract consists of 80 acres and is partly developed.

CALIFORNIA

Amador County

BUNKER HILL (Amador City)—Recent development in crosscut and drifts has disclosed pay ore in lower levels, and stoping was started. To resume milling soon.

ARGONAUT (Jackson) — California Mines Concentrating Co. installing cyanide plant to work tailings. Tanks are built of concrete. Storage capacity, 160 tons of solution. W. E. Darrow, manager of concentrating company, successfully cyanided Bunker Hill tailings.

CENTRAL EUREKA (Sutter Creek)—Shaft now sunk to 3555 ft. and good ore coming from 3500 level, supplying 20 stamps. Raise driven from 3500 to 3400 level to connect with raise to 3200 level providing ventilation and showing good prospects of ore. Albion S. Howe is superintendent.

LINCOLN (Sutter Creek)—Dismantling old plant for scrap. Mine formerly large producer, now owned by Eastern men associated with owners of Old Eureka. Reopening and development to be undertaken.

Butte County

CHROME DEPOSIT discovered on Mill Creek, two miles east of Pulga, by J. G. Dwyer, of Oroville, to be operated by San Francisco men, after shipment of 100 tons now ready.

Calaveras County

UTICA (Angels Camp)—Operation suspended at the Cross shaft. Gold Cliff producing regularly.

Eldorado County

PACIFIC (Placerville)—Aleander Baring recently visited mine to arrange for reopening. Old property, developed by shaft and situated in the center of town.

Lassen County

ALLEN & ECKERT (Susanville)—High-grade gold-silver ore occurring in narrow seams and accompanied by large body of low grade has been cut. New claims have been located along the formation, which is several hundred feet wide and of undetermined length.

Nevada County

ALLISON RANCH (Grass Valley)—Water at 900 level. Ore being extracted from levels above.

NORTH STAR (Grass Valley)—Installed 1225-ft. aërial cable operating a clamshell bucket to carry trailings across Wolf Creek.

QUAKER HILL GOLD (Nevada City)—Company formed to purchase and operate Sargent and Gouge-Eye hydraulic mines. To install large hydraulic plant.

CHROME MINING is active in Rough and Ready and Washington districts. Some of the ore concentrated at the Oustomah mill. Chicago Park district, two miles south of Grass Valley, also showing good chrome prospects, and some good ore has already been extracted.

Shasta County

GARDELLA DREDGE (Redding)—Recent 10-days' clean-up netted $4000. Dredge operating on old McCormick-Saeltzer ranch.

COLORADO

San Juan County

JOE & JOHN (Gladstone)—Recently purchased by G. H. Cook. Development has opened a vein of payable gold and silver ore. Trial shipments to be made to the Durango smeltery soon.

IDAHO

Shoshone County

AJAX (Burke)—Crosscut for vein east of Oom Paul fault soon to be abandoned and work transferred to drift west of fault, where considerable ore has been developed.

NABOB CONSOLIDATED (Kellogg)—Contemplates building mill upon completion of Pine Creek railroad.

THRONDSON METAL SAVING (Kellogg)—Completed 200-ton mill opposite mouth of Pine Creek. Treating accumulation of slime tailings, estimated at 150,000 tons. Mill equipment, concentrating tables and flotation; no crushing.

BEAR TOP (Murray)—Shipping lead-silver ore, hauling 12 miles to railroad. Company also controls Orofino group adjoining, which has 100-ton mill.

NORTH BUNKER HILL (Wardner)—Installing electric power to take place of gasoline. Two veins have been crosscut on 300 level. Preparing for extensive development.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Copper production in August was 10,718,520 lb. Producers were: Ahmeek, 1,636,040 lb.; Allouez, 472,550; C. & H., 5,197,541; Continental, 169,400; Isle Royale, 1,273,680; La Salle, 172,755; Osceola, 1,445,755; Superior, 144,659, and White Pine, 206,140 pounds.

CENTENNIAL (Calumet)—Old workings of No. 2 shaft caved down to first level, but no damage was done. No. 2 to be shut down temporarily.

SENECA (Calumet)—Shaft sunk 205 ft. during August. Has averaged 202½ ft. per month during sinking period.

HOUGHTON COPPER (Houghton)—Has suspended operations.

SUPERIOR (Houghton)—Drifting on 31 level is showing good copper rock.

WOLVERINE (Kearsarge) — Mill running two shifts and handling 800 tons of rock daily.

NORTH LAKE (Lake Mine)—Closed down owing to adverse conditions and breaking of hoisting rope.

COPPER RANGE (Painesdale)—Continuing diamond drilling at Challenge property. Champion, Trimountain and Baltic now producing 35% of normal output.

MICHIGAN (Rockland)—Has resumed shipments to Winona mill.

Iron District

MAITLAND MINING (Palmer)—Has begun shipments. Ore mined by steam shovel and crushed. Some hydraulic stripping has been done.

MINNESOTA

Mesabi Range

DANUBE (Bovey)—Guthrie Bros., stripping contractors, have removed one million yards of stripping and some ore tonnage will be shipped this autumn. One unit-washing and crushing plant is being built at Little Riley Lake. Mine operated by Balkan Mining Co. George Leach is superintendent.

SARGENT (Keewatin)—Stripping operations are conducted by Winston-Dear Co. Mine operated by Wisconsin Steel Co. Shaft has been sunk 150 ft., and skip pocket is to be cut soon. Mine dwellings and five mine buildings are under construction. J. H. Williams is superintendent.

MISSOURI

Joplin District

BALDWIN (Aurora)—Started operations after several months' idleness. Property includes a concentrator.

FARMINGTON (Hockerville)—Mill has resumed operations under new ownership.

LUCKY FRIDAY (Joplin)—Cut ore in new shaft on Connor land at 40 feet

NEOSHO (Neosho)—To build 150-ton mill and expects to purchase crushers, compressors and conveyors. Work to start Oct. 1

MONTANA

Cascade County

ANACONDA (Great Falls)—First furnace of ferromanganese plant blown in Sept. 17. Four more furnaces to be in operation by November 15.

Jefferson County

LEGAL TENDER (Clancy)—New company reopening 500 ft. shaft of former rich silver producer.

MT. WASHINGTON (Wickes)—Shipping one car of silver-lead ore per day.

Lewis and Clark County

LEE MOUNTAIN (Rimini)—After shipping 37 carloads of silver-lead ore, works have been closed.

Lincoln County

SNOWSTORM (Troy)—During August 5000 tons of ore handled by mill. Tunnel No. 7 has been driven 900 ft. and will have a total length of 2200 feet.

Mineral County

TARBOX (Saltese)—Winze from 800 level sunk 200 ft., from which crosscut is being driven 75 ft. to vein. Company may build mill this autumn.

Powell County

BALD BUTTE (Bald Butte)—New shaft of south vein has been sunk 200 feet.

VICTORY (Ophir)—Lessees cyaniding dump and tailings pile.

Silver Bow County

NORTH BUTTE (Butte)—Shaft on Sarsfield claim has been sunk over 900 ft., and connection with other properties will be made when 1000-ft. point is reached.

TUOLUMNE (Butte)—Net earnings for August are estimated at $16,000, as compared with $6000 during July.

NEVADA

Elko County

OLD CORNUCOPIA DISTRICT is being reopened. High-grade silver ore recently found in Peacock mine, and considerable tonnage milling-grade ore is on dumps. Cornucopia was large producer of silver in the early days, but closed down 1893, and has not been reopened, on account of distance from railroad.

Humboldt County

NEW TUNGSTEN DISCOVERIES have been made near Rebel Creek, in Santa Rosa Range near north line of county. Discovery was made by W. T. Critchfield and B. Martin, who were developing a silver property and hauling out ore to railroad with auto truck.

Nye County

MANHATTAN CONSOLIDATED (Manhattan)—Shaft sunk to 500 level, where ore of good grade opened in lateral development work.

WHITE CAPS (Manhattan)—Mill treating over 100 tons daily. Mine pumps being put in condition to handle water anticipated in shaft.

TONOPAH DIVIDEND (Tonopah) — Equipped with modern plant, including hoisting engine, electric light plant and compressor. Main shaft is two compartment and 300 ft. deep. E. P. Cullinan is manager.

SOUTH DAKOTA

Lawrence County

TITANIC (Deadwood) — Compressor, boiler and machine drills have been installed and work has started on 1200-ft. tunnel.

MOGUL (Terry)—Mogul-Ofer tunnel has been advanced over 1200 ft. and will be continued to 1600. Ores from upper levels will be sent through raise to tunnel and then to bins at portal. Aërial tram will be used to deliver at mill bins instead of railroad cars.

Pennington County

AMERICAN TIN AND TUNGSTEN (Hill City)—Cowboy shaft unwatered and breaking of ore has begun. New double-drum hoist installed at mine. Mohawk and Mills mines also being developed

BLUE LEAD (Hill City)—Boiler and compressor installed and shipping of copper ore has been resumed.

UTAH

Salt Lake County

SELLS (Alta)—New tram connecting bins near Lexington tunnel, with receiving station half mile down canyon, is ready for operation. Ore is lead-silver with a little gold.

UTAH COPPER (Bingham Canyon)—August copper production was 19,920,947 pounds.

Juab County

APEX STANDARD (Eureka)—Shaft 165 ft. deep is being cleaned out and retimbered preparatory to sinking to depth.

VICTORIA (Eureka)—Silver-copper ore of high grade being mined on 1050 level. Operated through Eagle & Blue Bell under same management.

CANADA

British Columbia

CANADA COPPER (Greenwood)—Co struction of the concentrator is going fo ward actively.

RAMBLER-CARIBOO (Three Forks)- Output next year likely to be confined t ore of milling grade, as recent operation show little clean ore. Contemplating pu chase of locomotive.

CONSOLIDATED MINING AN SMELTING (Trail)—Receipts of ore a smeltery for first eight months of 1918 t taled 223,610 tons.

GRANBY CONSOLIDATED (Vancouver —Production during August amounted t 2,820,207 lb. of copper. Of this, the Anyo plant produced 2,426,313 lb. and the Gran Forks plant 393,894 pounds.

Ontario

DOME (Porcupine)—Development wor principally on 1250 level, where a drift i being driven toward the east, and mai haulage way for ore is being cut throug rock.

NEWRAY (Porcupine)—Operations dis continued owing to labor shortage.

VIPOND (Porcupine)—Pumps have bee withdrawn, and mine will be allowed t fill with water.

PREMIER LANGMUIR (Langmui Township)—Several shipments of barit have been made, notwithstanding difficult transportation conditions. A siding to th railway is now being built.

HUDSON BAY (Cobalt)—Cut new high-grade vein parallel to the open cut.

KERR LAKE (Cobalt)—Silver production during August amounted to 250,319 ounces.

LA ROSE (Cobalt)—Has made important discoveries on the Violet claim. A new oreshoot is being opened up on No. 2 vein and a new series of veins have been found 250 ft. north of No. 2. Both of these are on the 330 level.

MINING CORPORATION (Cobalt)—Treating 300 tons of old tailings per day in the new flotation plant.

NIPISSING (Cobalt)—During August mined ore of a net value of $250,737, and shipped bullion from Nipissing and custom ore of a total net value of $484,978. Mill production was low, on account of shutdown of aërial tramway, owing to a fire.

OPHIR (Cobalt)—Shareholders have ratified agreement to option property to the Mining Corporation. Latter company has taken possession and is doing development work.

PETERSON LAKE (Cobalt)—Flotation plant has resumed operations.

PROVINCIAL (Cobalt)—To resume work upon arrival of flotation equipment.

BURNSIDE (Kirkland Lake)—To install new mill.

ELLIOTT-KIRKLAND (Kirkland Lake)—Started diamond drilling property from the 500 level. Development on the vein to date has been unsatisfactory.

KIRKLAND - PORPHYRY (Kirkland Lake)—Has taken over the Orr property.

LAKE SHORE (Kirkland Lake) — Treated 1800 tons, and produced bullion valued at $48,000, an average of $26.70 a ton, during August.

WRIGHT-HARGRAVES (Kirkland Lake)—Robert Grant is to design and supervise construction of a 150-ton mill.

HATTIE (Matheson)—Shaft sunk 25-ft. on four-foot gold-bearing vein. Arrangements being made to install mining plant.

OTISSE (Matachewan)—Additional equipment necessary for operation of the mining plant has been shipped, and sinking will start as soon as it is installed.

COTTER (Boston Creek)—Diamond drilling to be done by the Sudbury Diamond Drilling Co., which will start at once.

MILLER INDEPENDENCE (Boston Creek)—Shaft has reached depth of 200 feet.

O'DONALD CLAIMS (Boston Creek)—Has been leased by Robert W. Norrington and associates, of Detroit.

RENAUD CLAIMS (Boston Creek)—Surface work begun and good ore being taken out.

BOURKE'S (Bourke's Station)—Ore containing free gold and tellurides has been cut at depth of 95 ft. Drifting will begin at 100 level.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsan)—August cleanings amounted to $93,500.

The Market Report

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence	Sept.	Sterling Exchange	Silver: New York, Cents	Silver: London, Pence
19	4.7550	101⅛	49½	23	4.7550	101⅛	49½
20	4.7550	101⅛	49½	24	4.7550	101⅛	49½
21	4.7550	101⅛	49½	25	4.7550	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine

DAILY PRICES OF METALS IN NEW YORK

Sept.	Copper: Electrolytic	Tin: Spot.	Lead: N. Y.	Lead: St. L.	Zinc: St. L.
19	*26	†	8.05	7.75	9.05@9.15
20	*26	†	8.05	7.75	9.00@9.10
21	*26	†	8.05	7.75	9.00@9.10
23	*26	†	8.05	7.75	9.00@9.10
24	*26	†	8.05	7.75	8.95@9.05
25	*26	†	8.05	7.75	8.90@9.00

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Sept.	Copper: Standard Spot	Copper: Standard 3 M.	Copper: Electrolytic	Tin: Spot	Tin: 3 M.	Lead: Spot	Lead: 3 M.	Zinc: Spot
19	122	122	137	343½	343½	29½	28½	54
20	122	122	137	341½	341½	29½	28½	54
21	...	...	...	...	...	...	...	...
23	122	122	137	341½	341½	29½	28½	54
24	122	122	137	340	340	29½	28½	54
25	122	122	137	....	....	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at \$4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

New York—Sept. 25, 1918

Zinc was easier this week. Otherwise there is scarcely anything to report.

Copper—Europe is taking a good deal of raw copper and is asking for all the brass it can get. In this country there is scarcely any ordinary industrial business, copper manufacturing being about wholly on a war basis. Brass making consumes most of the copper. Wire drawers are fairly busy, but sheet rolling is practically negligent.

Copper miners and refiners are wondering how the draft is going to affect them. The advent of cold weather is producing better conditions in the refineries.

Copper Sheets—The base price of copper sheets remains at 35¾c. per lb. Copper wire is quoted at 29 and 30c. per lb. f.o.b. mill, carload lots.

Tin—People in the tin business know scarcely more than they did last week as to how things are going to be conducted. It appears that the Dutch and Chinese interests are not represented on the international tin executive body. There have been no further quotations of the market in Singapore. The price for tin here has not yet been fixed.

In spite of the prospective arrangements, it seems possible to buy tin for shipment from Singapore, Straits tin for prompt shipment being offered at 72½c. On the other hand, Banka cannot be bought for September shipment from Batavia at less than 89c., while \$1 is asked for shipments of Chinese tin from Hong Kong. In this market Banka is quoted at 81@83c.

Refer to our editorial pages for a further discussion of the tin situation.

Lead—The situation remains tight as ever and fully in control of the lead committee, which, under the direction of Mr. Crane, is doing excellent work. Both Mr. Crane and Mr. Mitchell are winning general commendation for their intelligence and diplomacy in handling a difficult situation. The Orient wanted to buy lead this week, but of course it could not be supplied with any.

Zinc—This market became distinctly easier on some fairly large transactions. It is significant that October-December and November-December contracts are offered at a discount of about ¼c. below what is asked for prompt.

Zinc Sheets—Unchanged at \$15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—This market was quiet, but there was a very strong undertone. Unsold stocks still exist here, but the quantity cannot now be very large. The Chinese producers are strongly averse to selling any large quantities at present prices and let out only small quantities. We quote spot at 14@14¼c.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at \$1.50@1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver — This market became stronger, and considerable quantities were reported sold at around \$129. We quote \$127.50@130. There appears to be two conflicting parties in the market, a bullish and a bearish. San Francisco reports by telegraph \$120, strong.

Silver and Platinum

Silver—The market continues stablized for silver at 49½d. in London, with the official price here, \$1.01⅛ per oz. 999. The demand for India continues; supplies for China are held back until the India situation is more satisfactory. London shipments in the last week were about 660,000 ounces.

The price for silver is rigidly controlled both here and in London. It looks as if China would give 12@15c. per oz. over the fixed prices. Recent exchange rates indicate that. However, she is not allowed to have it.

Mexican dollars at New York: Sept. 19, 78; Sept. 20, 78; Sept. 21, 78; Sept. 23, 78; Sept. 24, 78; Sept. 25, 78.

Platinum, Palladium and Iridium—Prices fixed at \$105, \$135 and \$175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 21—Blende, per ton high \$77.35: basis 60% zinc, premium, Class B, \$65@60; Prime Western, \$55@50; calamine, basis 40% zinc, \$40@35. Average selling prices: Blende, \$52.71; calamine, \$37.97; all ores of zinc, \$52.20.

Lead, high, \$105.20; basis 80% lead, \$102@100; average selling price, all grades of lead, \$100.83 per ton.

Shipments the week: Blende, 9257, calamine, 331; lead, 1828 tons. Value, all ores the week, \$684,910.

Offering of only \$55 basis, with spelter above 9c., was considered an insufficient price by many sellers, and they declined to accept. The shipment dropped 2400 tons. A large amount of the ore in bins is, however, purchased and owned by smelters, who are apparently in no hurry to move it. This creates an impression of a reserve stock in excess of its actuality. Buyers of lead are contesting sharply for the production, and reports of prices higher than the reported basis would figure are frequent.

Platteville, Wis.—Sept. 21—Blende, basis 60% zinc, highest settlement price reported, \$73.25; base price for premium grade, \$75 per ton; base price for high-lead blende \$50 per ton. Lead ore, basis 80% lead, \$97 per ton base. Shipments reported for the week were 2222 tons blende, 402 tons galena and 727 tons sulphur ore. For the year to date the totals are 94,311 tons blende, 5783 tons galena and 35,288 tons sulphur ore. During the week 2870 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Distinctly weaker. Charles Hardy reports that ample supplies are being offered almost daily, and that the quantities seem to be far in excess of what the market can absorb. He adds that the bulk of the buyers of chrome ore have contracts covering their requirements until the end of the year.

Molybdenum Ore—Improvement that we noted last continues, and business was done this week at \$1.20 to \$1.25. Considerable business in ferromolybdenum was reported, which should strengthen the ore market. Sellers of ore are now holding for higher prices.

Pyrites—All licenses outstanding or unused for any part of the 125,000 ton allocation, made some months ago, unless previously extended by the War Trade Board, are to be cancelled as of date of Oct. 1. Prices of domestic pyrites are no longer quotable, as they are determined by negotiation between buyer and seller.

Tungsten—Market remains very active. High-grade scheelite sold for \$25@25.50; high-grade wolframite \$24@24.50; low-grade ores \$19@24 per unit, according to amount and kind of impurity.

Iron Trade Review

PITTSBURGH—Sept. 24

At this writing the understanding reached between representatives of the War Industries Board and the iron and steel industry is awaiting approval by the President, and it is stated that secrecy as to details must meanwhile be observed. Gossip in the trade is that steel prices are unchanged for the fourth quarter, whereas Lake Superior iron ore is advanced 25c., which would make \$5.75 for Mesabi nonbessemer at Lake Erie dock, and that basing points are arranged for pig iron whereby some furnaces will receive higher prices, depending upon freight rates.

Views expressed as to the supply of steel, both in Washington circles and in the steel industry, are extremely confusing. On the one hand claims are put forth that the steel supply is short, with 23,000,000 net tons of finished rolled steel estimated as required for the current half year, though only 9,000,000 to 10,000,000 tons has been made in the third quarter. On the other hand, various sources of consumption are being studied with the avowed purpose of finding lines in which the supply can be reduced. The consumers whose business is thus being inquired into comprise nearly all users of the product, including makers of shell steel, ship steel, pipe, wire, tin plate and merchant bars. Rails are the one item that it is definitely sought not to decrease, but rather to increase. The Railroad Administration has been receiving about 40,000 tons of rails a week lately, but wants 60,000 tons. Large shipments are being made to the A. E. F., but more tonnage is desired in that quarter also. There is, of course, no desire to curtail in the least the production of shells or ships, but the steel supplies to these and other consuming industries are to be more closely watched.

Production of steel hinges chiefly upon the pig-iron supply, and a larger proportion of pig iron than normal is required, because the available supply of scrap is light, on account of war-time conditions. The rate of pig-iron production since Apr. 1 has been between 40,000,000 and 41,000,000 tons a year, whereas the rated capacity of furnaces in blast is nearly 3,000,000 tons more, and the restriction in output is attributed chiefly to the poor quality of coke furnished, with occasional deficiencies in quantity. The Fuel Administration has been working hard in the last few weeks to bring about an improvement in coke quality, urging miners to produce clean coal and operators to produce good coke, and an inspection system has been established, and poor coke is to be penalized in price. One coke operator has been required to refund $80,000 to customers on account of poor coke which he has shipped, and another $75,000. The War Industries Board had a conference with pig-iron producers yesterday in Washington, seeking means to increase pig-iron output. If more pig iron is made there will be more steel.

Pig Iron—Allocations of pig iron are granted sparingly, as there is not enough to meet all requirements. At the pig-iron meeting mentioned above consideration was given to the matter of finding pig iron for the 33,000,000 semi-steel shells the Ordnance Department wants foundry and machine shops to make in the next 10 months, but no information is available as to what was done. There does not seem to be any consumption of foundry iron that is unessential and could be cut off. Deliveries of pig iron to the end of this month are controlled by prices formerly fixed: Bessemer, $35.20; basic, $32; No. 2 foundry, $33; malleable, $33.50; forge, $32, all f.o.b. furnace, but some modification of the schedule is expected to be announced for fourth quarter, possibly within a day or two.

Steel—No unfinished soft steel is available in the market, all supplies having been allocated long ago. Shell-discard steel is almost out of the market, because, as a rule, mills are able to roll it for war or preference purposes, and what cannot thus be used is likely to be remelted as scrap. Maximum prices, which are not likely to be altered for fourth quarter, are: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys—Consumers of ferromanganese and spiegeleisen continue to show indifference and generally appear to be covered as far ahead as they care to be. There have been rumors of slight concessions in prices under stress of competition. The long-continued scare about shortage may possibly develop the opposite condition. Regular prices are $250, delivered, for 70% ferromanganese and $75, furnace, for 16% spiegeleisen.

Coke

Coke—As noted, efforts are being made to improve the quality of coke. The quantity is practically at record rate and apparently is sufficient to cover all furnace needs. Foundry coke is offered less freely, the Fuel Administration having required operators to ship as furnace coke some 72-hour coke they were selling to foundries which probably did not need it but were stocking up. Following the Fuel Administration's order prohibiting the screening of old dumps to secure household fuel, a tentative agreement has been reached whereby the industry will probably be allowed to proceed, under strict surveillance to see that it does not absorb coke-oven labor. The price limit on the product is reduced to $5.50, the screen size being reduced from ¾-in. to ½-in. Connellsville coke continues at $6 for furnace and $7 for foundry, per net ton at ovens. Byproduct coke is on the basis of $5.70 plus freight from nearest competitive beehive ovens to the point where the byproduct coke is made.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	[illegible] 498	43.418	49.077
Sept	68.515	100.740	.....	32.584	50.920	.....
Oct.	67.855	87.332	.....	32.361	44.324	.....
Nov.	71.604	85.891	.....	34.192	43.584	.....
Dec.	75.765	85.960	.....	36.410	43.052	.....
Year	65.661	81.417	.....	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	......	117.500	......	135.250	......
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.40	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(*a*)	207.443	318.875
April	55.910	(*a*)	220.171	329.905
May	63.173	(*a*)	245.114	364.217
June	62.053	(*a*)	242.083	331.925
July	62.570	(*a*)	242.181	360.347
August	62.681	(*a*)	243.978	380.900
September	61.542	......	244.038	......
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(*a*) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	......	8.611	......	30.500	......
October	6.710	......	6.650	......	30.500	......
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.935	8.190	8.635	54.000	54.000
September	8.136	......	7.966	......	54.000	......
October	7.983	......	7.813	......	54.000	......
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	......	42.24	......	48.5	......
October	37.25	......	33.95	......	33.95	......
November	37.25	......	33.95	......	33.95	......
December	37.25	......	33.95	......	33.95	......
Year	$43.57		$39.62		$40.83	......

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Sept. 25
Alaska Gold M.	3¼
Alaska Juneau	2
Am.Sm.&Ref.,com.	77
Am. Sm. & Ref., pf.	103⅜
Am. Sm. Sec., pf., A.	90¼
Am. Zinc	‡15
Am. Zinc, pf.	‡46½
Anaconda	68½
Batopilas Min.	‡1
Bethlehem Steel	82
Butte & Superior	26¾
Butte Cop. & Zinc	9⅞
Cerro de Pasco	[illegible]
Chile Cop.	[illegible]
Chino	40
Colo.Fuel & Iron	46½
Crucible Steel	65
Crucible Steel, pf.	‡88¼
Dome Mines	‡9⅛
Federal M. & S.	‡11¾
Federal M. & S., pf.	40½
Great Nor., ore ctf.	31½
Greene Cananea	45⅝
Gulf States Steel	79¾
Homestake	‡74
Inspiration Con.	54¼
International Nickel	30
Kennecott	33⅛
Lackawanna Steel	82¼
Mexican Petrol	106⅞
Miami Copper	27¼
Nat'l Lead, com	[illegible]
National Lead, pf.	‡101
Nev. Consol.	20⅛
Ontario Min.	7¾
Ray Con.	23¼
Republic I.&S.,com.	91¼
Republic I. & S., pf.	99⅞
Sloss-Sheffield	60
Tennessee C. & C.	17¾
U. S. Steel, com.	111¼
U. S. Steel, pf.	110⅜
Utah Copper	82
Va. Iron C. & C.	‡71

BOSTON CURB*	Sept. 2
Alaska Mines Corp.	‡.12
Boston Ely	.80
Boston & Mont.	.43
Butte & Lon'n Dev.	.15
Calaveras	1
Chief Con.	3⅜
Contact	.15
Corbin	.10
Cortez	.10
Crown Reserve	.15
Crystal Cop.	.49
Eagle & Blue Bell	2
First Nat. Cop.	1¼
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	19
Mexican Metals	.30
Mines of America	.90
Mojave Tungsten	.09
Nat. Zinc & Lead	.15
Nevada-Douglas	.40
New Baltic	1
New Cornelia	16½
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.05
Yukon Gold	.90

SAN FRAN.*	Sept. 25
Alta	.02
Andes	.03
Best & Belcher	.01
Caledonia	.03
Challenge Con.	.04
Confidence	.10
Con. Virginia	.14
Gould & Curry	.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.06
Mexican	.06
Occidental	.40
Ophir	.01
Overman	.01
Savage	‡.02
Sierra Nevada	.09
Union Con.	.25
Utah Con.	.01
Belmont	‡2.00
Jim Butler	.49
MacNamara	.23
Midway	.06
Mont.-Tonopah	.13
North Star	.03
Rescue Eula	.08
West End Con.	1.07½
Atlanta	.02
Booth	.03
Comb. Frac.	‡.02
Florence	.10
Jumbo Extension	.09
Kewanas	.02
Nevada Hills	.02
Nevada Packard	.22
Round Mountain	.15
Silver Pick	.03
White Caps	.13
Big Jim	‡.75
United Eastern	3.50

COLO. SPRINGS*	Sept. 2
Cresson Con.	4.75
Doctor Jack Pot	.03½
Elkton Con.	.04
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.64
Granite	.18
Isabella	.04
Mary McKinney	.07
Portland	.82
United Gold M.	.10
Vindicator	.36

BOSTON EXCH.*	Sept. 24
Adventure	.60
Ahmeek	75
Algomah	‡.15
Allouez	49
Ariz. Com., ctfs.	15½
Arnold	.20
Bingham Mines	9½
Bonanza	[illegible]
Butte-Balaklava	.25
Calumet & Ariz.	66½
Calumet & Hecla	445
Centennial	12
Copper Range	46
Daly West	2½
Davis-Daly	5
East Butte	9½
Franklin	4
Granby	81
Hancock	5¾
Hedley	‡12
Helvetia	.25
Indiana	.60
Isle Royale	25
Keweenaw	1
Lake	4½
La Salle	2½
Mason Valley	3½
Mass	3½
Mayflower	2½
Michigan	2½
Mohawk	55½
New Arcadian	1½
New Idria	14½
North Butte	13½
North Lake	.50
Ojibway	.75
Old Dominion	39
Osceola	50½
Quincy	55
St. Mary's M. L.	48
Santa Fe	.65
Seneca	10½
Shannon	3½
Shattuck-Ariz	14½
So. Lake	.50
So. Utah	.12
Superior	4½
Superior & Bost.	3½
Trinity	2½
Tuolumne	.93
U. S. Smelting	42
U. S. Smelt'g, pf.	43
Utah Apex	1½
Utah Con.	9½
Utah Metal	1½
Victoria	2½
Winona	1
Wolverine	23
Wyandot	.55

N. Y. CURB†	Sept. 25
Big Ledge	.87½
Butte & N. Y.	‡.75
Butte Detroit	.07
Caledonia	.48
Calumet & Jerome	[illegible]
Can. Cop. Corpn.	‡1 [illegible]
Carlisle	‡2
Cashboy	‡.04
Con. Ariz. Sm.	‡1½
Con. Coppermines	5½
Emma Con.	.01½
Goldfield Con.	‡.20
Goldfield Merger	.02
Greenmonster	‡[illegible]
Hecla Min.	4½
Howe Sound	‡4
Jerome Verde	[illegible]
Louisiana	‡[illegible]
Magma	32
Majestic	‡.15
Marsh	.03½
McKinley-Dar-Sa.	‡.44
Milford	‡.75
Mother Lode	.34
Nixon Nevada	‡.36
Ohio Cop.	[illegible]
Rawley	‡2½
Ray Hercules	4½
Richmond	‡.56
Rochester Mines	.34
St. Joseph Lead	‡.14
Standard S. L.	.25
Stewart	‡14
Success	.11½
Tonopah	2½
Tonopah Ex.	1½
Tribullion	‡.12½
Troy Arizona	.12
United Cop.	‡[illegible]
United Verde Ext.	‡37½
United Zinc	‡[illegible]
Utica Mines	‡.08

TORONTO*	Sept. 25
Adanac	.05
Bailey	.03
Beaver Con.	.28
Chambers Ferland	.09
Coniagas	2.00
Hargraves	.02
Kerr Lake	5.87½
La Rose	.50
Min. Corp. of Can.	2.25
Nipissing	9.00
Peterson Lake	.07
Temiskaming	.28
Wettlaufer-Lor.	.03
Davidson	‡.30
Dome Exten.	.13
Dome Lake	.10
Hollinger	[illegible].62
McIntyre	1.37
Newray	.10
Porcu. Crown	.14
Teck-Hughes	.20
Vipond	.10
West Dome	.08

* Bid prices. † Closing prices. ‡ Last quotations.

Engineering and Mining Journal

McGraw-Hill Co., Inc. Price, 20c. New York, October 5, 1918

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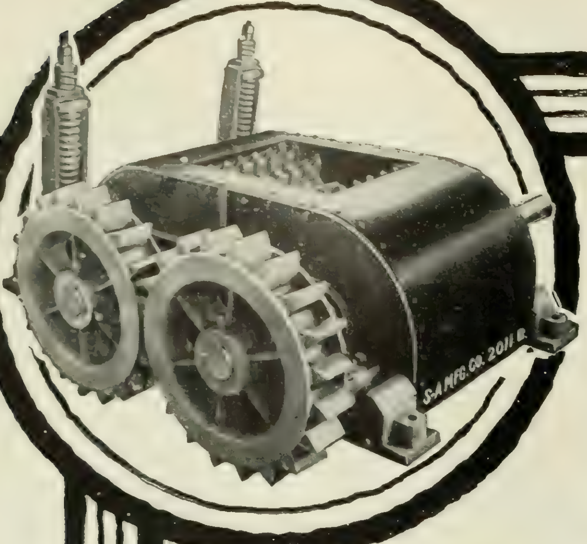

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Engineering and Mining Journal

October 5, 1918

Volume 106 *Number* 14

VICTOR SHAFT OF THE TONOPAH EXTENSION COMPANY

WEST END MILL, TONOPAH

Effect of the War Upon Tonopah Mining

BY JAY A. CARPENTER*

An interesting and comprehensive summary of the figures obtainable which refer to the increase in prices of labor and supplies, and to other expenditures connected with the mining and milling of the silver ores of Tonopah in 1913 and 1917, as compared with the appreciation in the value of the product during that period. Details of the operations of the five principal companies are given in tabulated form for these two years and the conclusion is reached that the increased costs of operation are almost wholly counterbalanced by the increased value of the product.

MINING engineers who visit the camp of Tonopah invariably ask the question, "What has been the effect of the war upon the costs of mining and realization of the profits of the operating companies?" The mine superintendent naturally dwells upon the subject that gives him the greatest concern, which is the increased cost and scarcity of labor and its decreased efficiency. The mill superintendent deplores the ever-increasing cost of supplies and the decreasing quality. The auditor complains of the doubling or trebling of the time checks coming to the office, and of the scarcity and slow delivery of supplies. The superintendent of a developing property is nearly driven to despair; whereas the stockbroker features the quotation of over $1 silver and declares that conditions at Tonopah are better than ever.

The object of this paper is to try to determine, by a study and comparison of costs between the years 1913 and 1917, whether a company producing the same tonnage of ore with the same silver content in both years would make a greater or less profit under the changed operating conditions of the present.

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*Mine foreman, Jim Butler Tonopah Mining Co., Tonopah, Nevada.

The best method of investigating this problem is to consider separately each of the three main divisions of mining costs—power, labor, and supplies; and after determining the percentage increase of each of these items in 1917 over 1913, to apply this increase to the power, labor, and supply costs of 1913, thus obtaining a fairly accurate figure for the corresponding total costs in 1917. The difference between this figure and the total cost for 1913 would be the increased cost, which should then be compared with the increased value of the ore. The increased value of the ore is determined by taking the average metal content of the ores milled in 1913 and figuring its value at the 1917 metal prices, and subtracting the 1913 value. Comparison of increased mining costs with increased value of the ore would determine whether the profit is greater or less.

The mining companies of Tonopah purchase their electric power from the Nevada California Power Co., whose hydro-electric power plants are in the Sierra Nevada Mountains, at a distance of 140 miles. The service is excellent, except for line troubles during electrical storms on the desert or severe winter storms in the mountains. The companies operated in 1917 under the same Public Service Commission power schedules as in 1913, and the cost of power therefore has not increased. With the larger producing companies the cost varies from 1.4c. to 1.2c. a kilowatt-hour.

OPERATIONS OF FIVE IMPORTANT TONOPAH

Company	Year	Mine Tonnage		Value per Ton	Extraction of Values			Mining Costs			
		Year	Day		Gross, %	Marketing, %	Net, %	Direct	Development	Indirect	Total Cost
Tonopah Belmont	1913	172,398	473	$21.09	94.45	2.50	91.95	$3.01	$1.10	$0.41	$4.52
	1917	131,100	361	16.57	94.05	2.56	91.49	3.42	1.02	.60	5.04
Tonopah Mining	1913	163,387	448	17.79	89.00	3.26	85.75	.....	.....	1.06	4.02
	1917	101,978	277	15.47	93.30	1.40	91.90	.....	.....	1.07	5.91
Tonopah Extension	1913	58,022	159	12.00	88.40	1.60	86.80	.....	.....	.38	5.78
	1917	110,188	302	12.54	90.51	1.40	89.11	.....	.....	.....	5.26
West End	1913	52,838	145	18.70	91.30	2.60	88.60	.....	.....	.64	4.11
	1917	45,910	126	15.73	93.10	1.46	91.64	3.34	1.87	.58	5.79
Jim Butler	1913	18,900	52	19.80	.....	....	90.00	.....	.....	.37	5.57
	1917	40,297	111	26.12	93.14	....	93.14	4.11	1.06	.73	5.90

Labor has received two advances of 50c. a shift since 1913, the first being in December, 1916, and the second in September, 1917. On the item of labor, the pay of the machineman in the mine or the batteryman in the mill represents closely the average daily pay to the men in the camp, as the lower pay of the common laborers is balanced by that of the more skilled men above them. In 1913 the daily wage of the machineman and batteryman was $4.50 a shift; and, in 1917, $5 for nine months, and $5.50 for three months, or an average of $5.12 a shift, which is an increase of about 14% in the cost of labor. The item of the decreased efficiency of labor cannot be expressed in percentage figures, but it can be expressed by the mine shift boss in very strong words. The reason for the change in efficiency is that in 1913 the high scale of wages in Tonopah, as compared with the copper districts, attracted a high class of labor, whereas in 1917 the best labor had gone to the copper camps.

The increased cost of supplies per ton of ore in 1917 over 1913 cannot be so accurately determined as that for power and labor. This is because of the great number of items to be considered, the wide difference in the percentage increase in the price, and the great variation in the amount used.

The best way to determine the increased cost of supplies per ton of ore is to tabulate, in percentage, the increased cost of the main supply items, and to apply that increased percentage to the amount of these supplies used in 1913 by one of the main operating companies, thus obtaining a fair figure for the corresponding cost of supplies in 1917. The preceding table gives a fair list of mine and mill supplies, with the 1913 f.o.b. Tonopah price per unit, the corresponding 1917 price, and the percentage increase.

VARIATION IN COST OF TONOPAH MINE AND MILL SUPPLIES

Item	Unit	1913 Cost	1917 Cost	Increase, %
Drill steel, ⅞ in. hex	lb.	$0.1167	$0.2567	120
Blacksmith coal	ton	19.70	35.00	78
Air hose	ft.	.30	.45	50
Mine shovels	doz.	7.50	16.50	120
Powder	lb.	.145	.2325	60
Caps	case	50.00	150.00	200
Fuse	case	27.00	40.00	48
Stulls, 6 in. to 8 in. top	ft.	.10	.10	0
Timber and plank (native)	M	19.50	32.00	64
Timber and plank (Oregon)	M	24.00	38.00	58
Lubricating oil	gal.	.25	.28	12
Mine rail, 8 lb	ton	55.00	110.00	100
Iron pipe, 2 in	ft.	.12	.25	108
Hoisting cable, 1 in. plow	ft.	.22	.35	59
Manganese steel crusher parts	lb.	.145	.203	40
Battery shoes, chrome	lb.	.06	.085	42
Battery dies, local, cast	lb.	.035	.04	14
Tube-mill liner, local, cast	lb.	.053	.06	13
Danish pebbles	ton	33.00	55.00	67
Sodium cyanide	lb.	.25	.32	28
Sheet zinc	lb.	.10	.20	100
Lead acetate	lb.	.09	.165	83
Lime	ton	17.00	19.00	12
Borax glass	lb.	.136	.16	18
Soda ash	lb.	.036	.042	17
Crude oil	gal.	.04	.07	75
Filter canvas	yd.	.56	.70	25

The percentage increase at shipping points would be greater than shown on the table of f.o.b. Tonopah prices, because freight rates did not increase from 1913 to 1917. Owing to the geographical situation of Tonopah, freight plays an important part in the cost of mine supplies. An extreme illustration of this appears in the item of crude oil, which, in 1913, cost 1c. a gallon and the freight 3c., whereas in 1917 it cost 4c. and the freight remained at 3c.; thus the price f.o.b. shipping point, increased 300%, but the local price increased only 75 per cent.

Local Foundry and Use of Artificial Pebbles Effect Savings

The excellent foundry and machine shop of the Campbell & Kelly Co. has been of great value in prompt delivery and saving of freight charges on hundreds of tons of cast iron and semi-steel. This firm, after purchasing all the scrap iron and steel at a fair price, furnishes the greater proportion of the battery dies, battery and tube-mill liners, mine cars, mill pumps and repair-part castings used by the operating companies. The Maris pebble quarry, 40 miles from Tonopah, which furnishes an artificially rounded chalcedony tube-mill pebble of good wearing quality, has also been a help to the companies. The plant is running at full capacity, and pebbles are being delivered in Tonopah at $25 a ton, whereas Danish pebbles are scarce at $55.

One of the operating companies, in 1913, subdivided its cost of mine supplies as follows: 12.4% for drill steel and repair, 14% for timber, 6% for pipe and track supplies, 50% for powder, cap and fuse, and 14.6% for other items. This is approximate, but it is a closer subdivision than most companies make. Usually the exact cost of a small item like lead acetate per ton milled is calculated, but no direct figure is obtained for an important mine item like timber. The underlying cause for this failure to record so important an expense is that the mill crew is interested in the storekeeper's work and results, whereas the mine crew considers the storekeeper a nuisance. Applying the increases of prices from the table as closely as possible on the limited subdivision cost figures given, the results are as follows:

Item	1913, %		Increase	1917, %
Drill steel and repairs	12.4	×	2.20	27.3
Timber	14.0	×	1.32	18.5
Track and pipe	6.0	×	2.00	12.0
Powder, cap and fuse	53.0	×	1.60	84.7
Other items	14.6	×	1.80	26.3
	100.0			168.8

This gives an increased cost of mine supplies of 68.8 per cent.

MINING COMPANIES IN 1913 AND 1917

Mill Tonnage					Milling Costs			Tonopah Cost per Ton	Eastern Office per Ton	Total Cost per Ton	Increase, %		Tons of Ore per Ft. of Development
Per Day	Oz. Gold	Oz. Silver	Price, Silver	Value, Ton	Direct	Indirect	Total				Total Cost	Profit	
473	0.267	26.33	$0.595	$21.09	$2.56	$0.20	$2.76	$7.37	$0.32	$7.69	36.50	55.45	6.7
400	0.162	15.88	.8413	16.60	2.87	.22	3.09	8.13	.44	8.57	51.70	39.79	9.1
448	0.23	21.84	......	17.79	2.59	.22	2.81	6.83	.59	7.42	41.70	44.05	9.1
277	0.163	14.19	.850	15.47	2.92	.33	3.25	9.16	.34	9.50	59.1	32.80	...
159	0.15	15.00	......	12.00	2.58	.40	2.98	8.76	.17	8.93	74.40	12.40	3.6
302	0.117	11.77	.86	12.54	.....	.....	3.21	8.47	.39	8.86	70.60	18.51	10.0
145	0.227	22.72	.595	18.70	2.97	.21	3.18	7.29	.15	7.44	39.80	48.80	7.7
183	0.206	19.70	.830	20.51	2.79	.21	3.00	8.79	.24	9.03	57.40	34.24	6.0
52	0.27	23.75	......	19.80	6.23	1.04	7.27	12.84	.08	12.92	65.40	24.60	...
111	0.285	25.20	.806	26.12	5.33	.71	6.04	11.94	.36	12.30	47.1	46.0	8.0

A similar method of figuring the milling supplies results as follows:

Item	1913 Cost Per Ton	%		Increase	1917, %
Zinc	$0.19	12	×	2.00	24.00
Cyanide	.70	41	×	1.28	52.50
Lime	.03	2	×	1.12	2.24
Lead acetate	.04	2	×	1.83	3.66
Fuel oil	.09	5	×	1.75	8.75
Shoes and dies	.03	2	×	1.30	2.60
Tube-mill liners	.08	5	×	1.13	5.65
Tube-mill pebbles	.11	6	×	1.67	10.00
Water	.17	10	×	1.00	10.00
Other items	.28	15	×	1.50	22.50
	$1.70	100			141.90

This gives an increased cost of mill supplies of 41.9%. In 1913 the proportion of costs of the four large companies for mining and milling was 60% for mining and 40% for milling. Mining costs were divided into, approximately, 6% for power, 64% for labor and 30% for supplies, and the subdivision of milling costs was 16% for power, 25% for labor and 59% for supplies. This is an interesting division, because it shows that the cost of power is a minor charge, whereas labor is the predominating item in mining, and that supplies are the principal factor in milling.

Item	1913, %		Increase	1917, %
Power	6.0	×	1.00	6.0
Labor	64.0	×	1.14	73.0
Supplies	30.0	×	1.69	50.7
	100.0			129.7

Taking mining costs of 1913, and applying increases for 1917, the result appears in the preceding table.

That is, the cost of mining should have increased, approximately, 30%. Taking the mill costs likewise:

Item	1913, %		Increase	1917, %
Power	16.0	×	[illegible]	[illegible]
Labor	25.0	×	1.14	[illegible]
Supplies	59.0	×	1.41	[illegible]
	100.0			127.5

Milling costs should have increased 27%. With 60% of the total costs as mining costs and 40% as milling costs, the total increase in total mining cost appears as follows:

	Cost		Increase	1917, %
Mining	60	×	1.297	77.7
Milling	40	×	1.275	51.0
	100			128.7

Thus the total cost of mining, under the assumption that the daily tonnage, metallic content of the ore, and mining conditions remained the same in 1917 as in 1913, has increased 28.7 per cent.

In Tonopah the ratio of silver to gold in the ore is nearly 100:1; thus, for 1 oz. of silver there is 0.01 oz. of gold. The average selling price of silver for the Tonopah companies for 1913 was $0.595, and, in 1917, $0.85. The corresponding 0.01 oz. of gold sold for $0.206 at both times. The value for each ounce of silver, with its corresponding gold, in 1913, was $0.801, and, in 1917, $1.056, giving an increase in value of 32%. From these data it is evident that the increased cost of power, labor, and supplies from 1913 to 1917 has about equaled the increased value of the metal content of the ore.

The method adopted in calculating the increased total cost of mining in 1917 over 1913 results in a more reliable estimate than can be obtained by the study of a table of comparative mining costs, compiled from annual reports, because the tonnages mined, the width and depth of orebodies and the grade of ore vary greatly with each company in the years to be compared. However, such a table is herewith given, not only for the sake of comparing the operating costs between the pre-war and war times, but also to serve as a comparison with silver-mining costs elsewhere; and the data should be useful to engineers acquainted with the local peculiarities of the Tonopah properties, as it affords a direct comparison of their respective costs.

Each company has its own peculiar form of report, and consequently it is a difficult task to standardize costs as shown in this table, which is based on a fair knowledge of the properties and a careful study of their annual reports. Although it may contain minor errors, it is, in the main essentials, correct.

The total tonnage milled in 1917 by the leading four companies was 13% less than in 1913. The average silver content of the ore dropped from 22.4 oz. to 14.4 oz., a decrease of 35.7%. The 35.7% decrease at a 32%

increase in value gives only 85% of the gross value per ton in 1917, as compared with 1913. If the cost of mining had actually increased 28.7%, the margin of profit would have been only 19.4% of the value of the ore, instead of 44.6%, as in 1913. However, the margin of profit in 1917 was 24.8% of the value of the ore, owing to the fact that the actual cost of mining in 1917 increased only 16.9% over the figures for 1913. This does not mean that the figure of 28.7% increase, as deducted above, is an incorrect value of the increased cost of mining, but indicates, rather, that the difference between 28.7% and 16.9% is the measure of the savings made by the companies over operating conditions in 1913.

Not all the operating savings are favorable, for in 1917 the amount of development work per ton of ore milled was considerably less. This was due, in some cases, to the fact that there was not so much virgin ground left for development, and, in others, to the scarcity of good machinemen and muckers. Where it cost one company $6.40 per ft. to drive crosscuts in 1913, it cost $8 per ft. in 1917. In this connection, it is interesting to note that the labor increased 15%, the expense for power was unchanged, and supplies 50%, giving a total increase of 25%, which closely checks the cost of the increased figures mentioned previously as showing the increased cost of mining.

EFFECT OF WAR NOT ALTOGETHER ADVERSE

Another reason for the lower actual percentage of increase of total mining costs is the fact that Tonopah companies carry large storehouse accounts. Many materials are kept on hand for months ahead of actual requirements or else purchased on contracts made during the year previous. Therefore, in 1917, a part of the supplies used was charged out at 1916 prices.

However, there is another factor that must be given its credit, and that is the better supervision over labor and supplies that is now exercised on all the properties. The practice, in these war times, of a hard day's work, and the will to save materials and supplies, extend from the superintendents to many of the workmen.

The Tonopah Extension, which is now mining on the 1580 ft. level and sinking the shaft to 1700 ft., showed, taking all things into consideration, a creditable decrease in underground mining costs in 1917 over 1913. Likewise, in milling, the West End mill came out with a slightly lower milling cost in 1917 than in 1913, with practically the same silver content of ore, and only a small increase in tonnage. The net extractions of the milling plants increased from 88.3% in 1913 to 91% in 1917, the best showing being made by the Tonopah Mining Co.'s mill, which jumped from the lowest to the highest net extraction. The Jim Butler Co. shows high milling costs, because all its ore has been shipped to a custom mill at Millers. The average total cost of mining increased from $7.70 a ton in 1913 to $9 in 1917, with the Tonopah Belmont having the lowest cost, $8.13.

ESTIMATED RESULTS FOR 1918

Although 1918 figures are not available, the increased costs are a source of worry to the operators. The item of power will remain the same as in 1917, but many commodities are still advancing in price, and, with 1917 contracts and supplies running out, the cost of supplies for the last half of 1918 will show a marked increase—and supplies are more than 40% of the total cost. The cost of labor will be 7.4% higher than in 1917, and the new draft law will make workmen scarcer than ever. The price realized for silver will probably average $0.97, which will give an increase of 11.1% to Tonopah's 100 to 1 product, as compared with 1917. Supplies would have to increase 20% in value in 1918 as compared with 1917, in addition to the 7.4% increase in labor, to balance the increased price in silver. This is hardly possible, although the 25% increase in freight rates will bring total costs close to this figure.

To sum up the conclusions as to the effects of the war upon mining in Tonopah: The increase of total mining costs up to 1917, under similar conditions as in prewar times of 1913, has about equaled the increased selling price of Tonopah's silver and gold product, and the increased costs of 1918 will again be just about balanced by the increased selling price of silver.

Gold Mining in Ontario, Canada

Considering the handicaps under which gold miners are operating, the output of 229,421 oz. for the first six months of 1918—a small increase in production as compared with the first half of 1917—is a creditable showing, says an Ontario Bureau of Mines report. In the Porcupine camp, the Dome, Porcupine Crown, Porcupine V.N.T., and Schumacher have ceased milling operations. The Crœsus, in Munro Township; the Tough-Oakes, at Kirkland Lake, and the St. Anthony, at Sturgeon Lake, are in the same category. This curtailment of output is offset by the new producers of gold—Lake Shore, at Kirkland Lake, and Davidson, at Porcupine. The 40-ton mill of the Patricia Syndicate, at Boston Creek, started operating the latter part of June. A promising vein carrying gold telluride has been discovered on the Miller Independence, at Boston Creek. Shaft sinking is proceeding and arrangements are being made to increase the milling capacity at this property. Considerable activity at Boston Creek has resulted from these developments. In the new Matachewan camp, from the claims under option to the Nipissing Mining Co., some spectacular samples of gold ore have been secured. Diamond drilling on the Otisse claims is said to be producing satisfactory results. During the period the Porcupine camp produced 207,731 oz. of gold and Kirkland Lake, 17,927. A total of 515,094 tons of ore was milled, with a recovery in gold and silver reported to be valued at $4,692,529.

Hold Your Liberty Bonds

It was a wise and patriotic old colored American who refused to sell his $100 Liberty Bond for $96, because he would not give up the United States' promise (his bond) to pay him $100 with interest for the United States' promise (currency) to pay him $96, and who refused to sell the same bond for $102 because, he said, the $102 must be counterfeit or else the would-be purchaser would not be willing to give it for only $100. It is safe to assume that there are no gold bricks or wildcat securities among that American's assets.

The Jerome District of Arizona—Part II[*]

BY J. R. FINLAY[†]

AT THE United Verde mine, the orebodies are in a large slab of greenstone schists, in horizontal cross-sections resembling a rude crescent, which pitches downward between its enclosing intrusives, in a northwesterly direction, at an angle of perhaps 50 to 60°. The diorite covers this slab of schist with a concave surface like an inverted Spanish tile, and the quartz porphyry forms a rough pitching floor. If the included schists were removed, there would be an enormous cavern going down steeply to the north.

The schists which fill the space that I have thus attempted to describe have been the channel of an intense mineralization, so that a considerable part of them has been converted into ore. This ore consists essentially of quartz, pyrite and chalcopyrite. The thing that attracts the eye is an enormous mass of iron pyrite, occupying a cross-section of nearly if not fully 10 acres, rudely circular or elliptical in outline, but irregular. The quartz and chalcopyrite are mingled with this mass in varying amounts. Near the center of the pyrite mass there is not, as I understand it, much quartz, although the amount increases toward the periphery; but this arrangement is far from regular. The chalcopyrite is the ore. The mass of the pyrite contains only one-quarter of 1% copper—being practically barren—but certain portions of it contain chalcopyrite in varying amounts, so that large lens-like masses attain a copper content ranging from 2% up to 15 or 20%. These are the orebodies. Chalcopyrite also occurs in the schists around the periphery of the pyrite masses and also makes orebodies. The ores contained in the pyrite mass are called iron ores; those consisting of chalcopyrite disseminated in the schist are called siliceous ores.

NARROW DIORITIC DIKES CUT OREBODIES

These broad features are unmistakable, and may be regarded as thoroughly established; but, as a matter of detail, the occurrence of the commercial ore, as distinguished from the mineralization as a whole, presents many eccentricities that are not wholly understood. The orebodies are cut by several narrow dioritic dikes, known as water courses. These are usually considerably bleached, even in the lowest levels, far below the influence of any alteration proceeding from the surface. This would seem to indicate that the dikes have been altered by the mineralizing agencies. On the other hand, there is no evidence that they have been replaced by the ore minerals. It seems reasonable to conclude, therefore, that they came in during the latest stages of the mineralizing process. These dikes have a strike which may be generalized as about N 70° W; and many observers have concluded that the dikes may have followed a zone of fissuring which might have existed earlier and have been followed by the mineralization. If this was the case, there is little evidence of it in the orebodies themselves, for the minerals now form a solid mass in which preëxisting structures have been obliterated as completely as in a stock of granite.

But away from the centers of intense mineralization, in the Jerome Verde and United Verde Extension mines, some fissures have been noted that bear in the same general direction as the water-course dikes and are distinctly, though not heavily, mineralized. This lends color to the idea that a zone of fissuring may have had much to do with establishing the mineralizing channels.

NEW MINERALIZED AREA DEVELOPED

The United Verde Extension mine has in recent years opened up a mineralized area about two-thirds of a mile east of the United Verde. Ignoring for the present other interesting facts about these occurrences, there is reason to believe that they are part of the same zone as the United Verde. But the structural arrangement is still indistinct, because the development is only partial and because all of it thus far is in the zone of oxidation or in that of secondary enrichment, in both of which the rocks are greatly altered by kaolinization. In the immediate neighborhood of the orebodies, therefore, it is hard to distinguish some of them. It seems, however, that some of the smaller orebodies follow the contact of a great wedge-shaped mass of diorite between the quartz porphyry and the green schists. These ores are between the diorite and the schists. But the great orebody of the Extension mine is not so easily described. It is at the point or edge of the wedge of diorite and is surrounded apparently on all sides by quartz porphyry, but is near the contact of that rock with the green schists. Moreover, it lies apparently at the intersection of two interesting mineralized faults, one of which strikes about N 65° E and the other about N 70° W.

It is evident that in the region of the big orebody the United Verde diorite is invading the contact between the quartz porphyry and the green schists, but whether the diorite follows a preëxisting fault, or whether the faults are later than the diorite, is very obscure. The mineralization is intense over an area of several acres, in the central part of which an area of an acre and a half is a solid body of chalcocite and pyrite averaging 17% copper.

It is rather early to generalize about orebodies that are so meagerly developed, but it looks as though the vast masses of pyrite, which are a sort of matrix for the orebodies of the United Verde, are comparatively small in the Extension mine. Low-grade pyritic masses have been encountered, it is true, but thus far they are relatively insignificant, and it is not improbable that they will continue so even in the zone of primary ores. If this proves to be the case, it will only mean, in my judgment, that the Extension orebodies are more distinctively copper mineralizations than those of the United Verde. In the latter mine, the copper ores seem to have been introduced after the formation of the main pyrite masses. The later copper-bearing mineralization is probably identical in both mines. There is no reason to believe that the United Verde Extension bonanza was any richer as originally deposited than some of the individual orebodies at the United Verde; but it does seem probable that, in the Extension, the proportion of copper to the total volume of iron is very much higher. So far as can be judged at present, the two deposits are about equal as copper producers. Even making all allowances for the effect of secondary enrichment, it is doubtful if the United Verde orebodies contain more copper, if as much, per vertical foot, as those of the Extension.

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[*] Conclusion of paper published Sept. 28, 1918.

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Another point of great economic importance is the fact that the two parts, or halves, of the district are separated by a great fault. On the hills above the United Verde, the flat-lying sandstones and limestones of Devonian age begin to appear at an elevation of 6050 ft. The fault has an average strike of N 37° W. East of this is a bench, on top of which the same sandstones and limestones lie almost perfectly flat, but their bottom is at an elevation of 4350 ft. The vertical displacement is, therefore 1700 ft., and in this bench lie the Extension orebodies. Other faults occur further east, dropping the Palæozoic formation to a still lower level, so that by the Verde River, at Clarkdale, only three miles away, the pre-Cambrian floor is only 2000 ft. above sea level. None of these faults except the big one at Jerome has raised the pre-Cambrian rocks to the surface. East of that fault they have remained buried since the invasion of the Palæozoic sea. It is all but certain that in the succeeding ages, including the present era, they have never emerged above the groundwater level. They are, therefore, preserved intact, having suffered neither oxidation nor erosion since the day they were buried. On the United Verde side, however, the great recent fault exposed the pre-Cambrian rocks in an escarpment 1000 ft. high above the bordering bench. This escarpment has been beveled off by recent erosion. Above the United Verde mine, 600 ft. of the orebodies has been removed by this erosion, including nearly all of the original oxidized zone. The primary sulphides in places come up to the present surface.

Now, the oxidation plainly acted more vigorously in the larger orebodies than in the smaller ones, and the copper migrated further. If there had been smaller orebodies in the vicinity of the United Verde, the enriched portions, as well as the oxidized zone, would have been swept away, leaving only the ores of the primary zone at the present eroded surface. A small vein carrying 3 or 4% copper would not be valuable. On the other side of the fault, such small veins are still intact, oxidized zone, enriched zone, and all. In the enriched zone they carry fair bodies of chalcocite, running 15 to 45% copper. Such small veins are, therefore, valuable and make a pleasing adjunct to the big ones.

GREAT AMOUNT OF LOW-GRADE ORE IN UNITED VERDE

As in other districts where rich ores occur in abundance, the operators have naturally preferred to mine those rich ores in preference to poorer ones. It is, therefore, difficult to form an idea of the average grade of all the merchantable ores. It is certain that large amounts of low-grade ore, say from ½ to 2½% copper, occur in the United Verde mine. Some of this material goes into the shipping product, inevitably, because the miners cannot always keep it out, but no effort has been made to utilize it. How much there is of it, how cheaply it can be mined, the extent to which it could be concentrated by flotation, are all unsolved problems, and any assertion about them would be pure guesswork. However, I regard it as probable that in the course of time it will be found desirable and practicable to concentrate some of the low-grade ores; and the life of the mines will be greatly prolonged by so doing.

OUTPUT FROM UNITED VERDE MINE

At present the United Verde mine is able to ship to its smeltery an assemblage of ores, practically all primary, averaging about 5% copper and yielding about 90 lb. copper, 1½ oz. silver, and 35c. gold per ton. It may be assumed that this grade was much higher in the eariler years of the mine and that it has slowly declined. It is probable, however, that by careful mining the grade may be maintained at its present level for a number of years, although it is planned to increase the output to 1,000,000 tons a year, increasing the present tonnage by about 25%. This will mean that the output of copper will rise to 90,000,000 or perhaps 100,000,000 lb. a year in the near future. The assurance that this can be done is furnished by the discovery of a large body of high-grade chalcopyrite ore in the lower levels of the mine, from 2100 to 2500 ft. below the original pre-Cambrian surface. This orebody, I understand, runs about 10% copper, and a large section of it, opened for stoping, has averaged nearly 13%. A cross-section of the orebody near its middle would apparently cover at least an acre.

On the United Verde Extension side, 202,477 dry tons of ore had been shipped up to the end of 1917, entirely from the richest part of the zone of secondary enrichment, from which the actual yield has been about 104,000,000 lb. copper, 375,000 oz. silver, and 7000 oz. gold. The grade of ore, as shipped, has averaged about 27% copper, 1¾ oz. silver, and 70c. gold per ton. It is not believed that such ores can be shipped much longer, but there is no reason to suppose that the grade will go below 10% copper for a number of years. In fact, one may be fairly certain that the first 2,000,000 tons mined will average 15% copper. If this rate is maintained, with, say, 10,000,000 tons of United Verde ore over a 10-year period beginning in 1915, the date of the opening of the Extension mine, the average grade for the district for that length of time will be not less than 6¾% copper. This is high-grade ore, considering that it is obtained without sorting of any kind; but it is no richer than the average of the Bisbee district to date. When one considers the fact that this ore is being mined at depths varying from 400 to 2500 ft. below the pre-Cambrian surface; that none of the mines is exhausted at any level; that the Extension mine has no development at all more than 800 ft. below the pre-Cambrian surface, and almost none below 600 ft.—that, in fact, the exploration of the zone east of the fault is hardly more than well started—it may reasonably be expected that these mines will make a big output and have a long life. In 1917 they produced 135,000,000 lb. of copper, and are being equipped to produce 150,000,000 to 200,000,000 lb. a year. There is no reason to suppose that such an output will put an undue strain upon the ore reserves. Thus Jerome, which for 25 years was an isolated and obscure camp, is now becoming an important producer. I shall try to give some idea of the community as an industrial and mining center.

Up to the present, from an output of something less than a billion pounds of copper, the two mines of Jerome have paid $50,114,000 in dividends. They have also built, out of earnings, two large smelteries, a considerable length of railroad, extensive tunnels and mining equipment, two or three rather important industrial towns, completed or under way, and have, no doubt, large amounts of cash in the treasury. A rough computation of the operating earnings up to the end of 1917 is not less than $80,000,000. Of this, perhaps half has been earned during the exceptional years 1916 and 1917 from an output of 225,000,000 lb. There is good reason to suppose, however, that the earnings on 700,000,000 lb. during normal peaceful times were about $42,000000, or 6c. per lb. There is also reason to believe that if the output of the last two years had been made in normal times, with a price of 15c. per lb. for copper, the operating profits would have been $20,000,000. Thus, I believe the past history of the camp indicates an average operating profit of about 6½c. per lb. and a cost of about 8 to 9 cents.

It appears that up to the end of 1915, the United Verde mine had been able to pay $36,397,000 in dividends in a period of 21 years, during which the price of copper had averaged 14.3c., the production being fairly uniform at about 35,000,000 lb. a year. Five cents has been available for dividends, leaving a net cost of 9.3c. per lb. to cover all expenditures for mining, smelting, development, construction of railroad and smeltery, general expenses, and increase of working capital. The net yield per ton has probably averaged about 100 lb. copper, 1½ oz. silver and 40c. gold. The average value of the precious metals figures down to about 1¼c. per lb. of copper, so that if the average price of that metal is 14.3c., the total value of the bullion will be 15.55c. On this basis, a liberal allowance for all expenses, both for operating and capital, on a total output of 700,000,000 lb., has been 10.05c. per lb. The cost of converting, refining and marketing the bullion may be estimated at 1.85c. per lb., leaving 8.2c. per lb. for all other expenses.

United Verde Extension Possibilities

Apply these figures to the extraordinary bonanzas opened by the United Verde Extension, in which 2,000,000 tons of ore can be counted on to run 15% copper and to yield 290 lb. copper, 1½ oz. silver and 60c. gold per ton, with operating methods equally efficient as those of the United Verde. The value of this bullion is 14.8c. per lb. Deducting 1.85c. per lb. for converting, refining, and marketing, there remains 12.95c. per lb. The mining, smelting, construction, and general expenses will be, as before, $8.20 a ton, to be divided by 290 lb. copper. This is equal to 2.83c. per lb. Deducting this, there remains 10.12c. per lb., which should be applicable to dividends. I can see no flaw in this reasoning, although the result appears extraordinary.

It is fair to believe that the total output of copper, 580,000,000 lb., according to this computation, would be extracted in 10 years, and that dividends of $60,000,000 would be paid in that time, leaving the mine intact for further development and a complete equipment. Under these circumstances, it seems to me that the investor is warranted in figuring that the $60,000,000 profits expected in 10 years is a conservative and guarded basis for valuing the property; that he might assume a 5% net return, plus return of capital, to be sufficient for a property so guarded, and that he would have important speculative probabilities in addition. Under these circumstances, it is computed that the property possesses a valuation of $45,000,000.

The "speculative probabilities" refer to the discovery of additional ores. There is likelihood of such discoveries, both laterally and in depth. Exploration in depth has gone down only one-third as far below the original surface as in the United Verde, in which mine bonanza ore occurs in the very bottom. There has been some apprehension that the great Jerome fault might interrupt these orebodies at some point below the present workings in such a way that the downward continuation of them might be found on claims owned by the United Verde. It is entirely possible that this may happen, but it is not at all certain. In the first place, nothing is known of the dip of the fault within a distance of 1500 ft. Within such distances even the largest faults frequently make considerable turns, both in strike and in dip. This particular fault at a short distance south of the Extension mine makes a turn from a course of S 37° E to due N and S, and then makes another sharp swing around to S 60° E. A turn in the dip of the fault opposite the orebodies much less than either of these would render intersection out of the question. As a matter of fact, the fault has changed its course from the points at which it was noted northwest of the mine, for otherwise it would already have intersected the orebodies. How great the swing may be is as yet uncertain.

Orebodies Have Dip Parallel to or Away From Fault

In the second place, the orebodies may have an average dip, or pitch, parallel to the fault, or away from it. There is a considerable probability that this is the case, for some orebodies at the northwest end of the Extension mine have evidently been cut by the fault. They appear on the hanging-wall side, but there is no trace or indication of them on the foot-wall side, although the rocks are well exposed by erosion and by extensive underground workings. It seems probable, therefore, that these orebodies have a dip flatter than the fault plane, that the upraised ends have been destroyed by erosion, and that the portion on the depressed side continues downward undisturbed.

In the third place, it is certain that no intersection has occurred above a point 800 ft. below the pre-Cambrian surface. If the orebodies go down vertically and the fault plane continues on its apparent dip, the orebodies cannot be completely cut off above the 1600-ft. level (2400-foot level of the mine) below the pre-Cambrian surface. This would leave the main orebody intact to an average depth of 600 ft. below the lowest explored level. This is a minimum.

If, therefore, the probabilities as they appear at present are weighed, it does not appear that the danger of the fault impairing the value of the mine is either great or imminent. At most, it will only disturb the "speculative probabilities." At a guess, one might say that it reduces them by a third in the case of the present orebodies. There are good chances of finding ore in territory to the southeast of the present mine, where the danger of displacement by faulting is nil.

Before ending the discussion of the pre-Cambrian deposits which have proved so valuable at Jerome, it will be interesting to note the extension of the same formations to the southwest. At Jerome itself there is merely a narrow point of a wedge of pre-Cambrian, raised up through a cover of Palæozoic sediments by faulting, aggregating in vertical movement 4000 ft., which has taken place along a zone a mile and a half wide. It is thus upon the escarpment of an important recent mountain uplift. The Palæozoic formations at Jerome present two peculiarities that are worth noting:

1. The series begins with the Devonian, at least that is my supposition. The lowest limestone is known to be Devonian, and between it and the pre-Cambrian complex there is only about 50 ft. of sandstone. Ransome assumes that this sandstone corresponds to the Tonto sandstone (Cambrian) of the Grand Canyon, but I take this to be merely a slip of the pen. It is hardly possible for a few feet of sandstone to carry with it any presumption of equivalence in age with some other sandstone that looks like it. Each invasion of the sea produces a basal sandstone by reassorting the weathered débris on the land surface. Such a basal sandstone merely marks the sea transgression, and the same one might, and no doubt does, mark the progress of the sea upon higher and higher levels of a continental area through a series of geologic ages. In the absence of determining fossils, the age of such a sandstone should be assumed to be that of the contiguous rock overlying, if that is determinable.

Now, throughout Arizona there are usually some Cambrian strata in the Palæozoic column, but the Ordovician and the Silurian are generally wanting. Ordinarily, there is no angular unconformity between the Cambrian and the Devonian, in spite of the huge time gap represented by the absence of the Ordovician and Silurian. To explain this, one has only to remember that in Russia, along the Gulf of Finland, Cambrian and Ordovician strata are still unconsolidated sand and clay. They have lain there through interminable ages without change, distortion, metamorphism, or even hardening, because the earth's crust in that region has remained still. It is entirely conceivable that, around Petrograd, Quaternary strata may be in contact with and in apparent conformity with the Ordovician.

INTERESTING GEOLOGIC FACTS AND DEDUCTIONS

In Arizona the absence of unconformity between the Cambrian and the Devonian must mean simply a long period of quiet, with gentle oscillations of level, and no deposition; certainly no mountain building, and no deep erosion. In Devonian times there followed a general immersion in the sea of this whole region. By this time the neighboring lands, wherever they were, must have been worn down so flat that they could furnish little or no Clastic sediment, for the Devonian rocks are almost pure limestones. From Cananea to Grand Canyon and from Tucson to Clifton, and no one knows how much further in all directions, there was a sea of clear water of moderate depth, and full of corals and coral reefs.

An interesting question which may be solved some time is whether the highlands southwest of Jerome may not have been an island in this Devonian sea. The absence of strata older than the Devonian and the strong inference that there had intervened no considerable disturbance or erosion, which was likely to have swept away such strata in pre-Devonian times, point decidedly to the conclusion that there was comparatively high land at the site of Jerome which the Cambrian sea did not reach. This naturally brings up the question whether the slope may not have continued in some direction toward a *massif* high enough to remain an island even during a large part, or all, of the succeeding submergence.

Assuming that the Devonian strata were originally level, it is possible to calculate that the pre-Cambrian surface at Jerome was originally 1000 ft. higher than the same surface at Grand Canyon, there being that amount of Cambrian strata under the Devonian at Grand Canyon and none at Jerome. The same facts appear in comparing the sections of Bisbee, Ray, Globe, and Roosevelt Dam (Ransome). As all these places lie toward the southeast, east and north, it is easy to explain the facts by a depression along an axis lying northeast of Jerome, and therefore approximately under the edge of the plateau region. If this is true, it is logical to assume that the land surface sloped upward toward the southwest. How far this slope continued, or to what height, one has no means of knowing, except that there is good reason to believe that in Devonian times the slopes were gentle, erosion was slow, and no large rivers were debouching near enough to muddy the waters.

2. The Palæozoic strata are found at the very top of the Black Hills (the mountain block on the edge of which Jerome stands), but they merely lie on the outer rim of the uplift, and do not continue toward the southwest for more than a mile or two. They appear to feather out. There is no indication of their having been broken off by further faulting.

I do not refer to this fact as evidence of the thinning out of the Palæozoic deposition in that direction. That conclusion must be based on broader facts than those I am pointing to. It appears that the edge of the Palæozoics occurs as fragments of an arc of a curve the radius of which is about 25 miles, and its center some distance southeast of the town of Prescott. The fragments of this arc are found on the crest of the Black Hills west of Camp Verde and east of Prescott, thence northwest along the crest of the Black Hills to near Jerome Junction. At Jerome Junction there is a gap, but just north of that place the edge of the Palæozoics may be covered up with recent lavas. Six miles west of Jerome Junction the Palæozoics appear again in a strong ridge running west. All along the rim of this arc the strata dip gently away from the center.

PRACTICAL IMPORTANCE OF GEOLOGIC CONSIDERATIONS

I think there is warrant for believing this structure is the remnant of a dome or arch that was formed in Tertiary times, if not earlier, and extensively eroded long before the occurrence of the big faulting at Jerome or the late Tertiary volcanic activity of the region. If the Palæozoics be projected along their dip into the Prescott region, they would be found thousands of feet above the present surface. In the area now under consideration, this means that the original pre-Cambrian land surface does not exist in the sense that it exists at Jerome—i.e., intact but buried—but that there does ist, instead, a new erosion surface scored down more less during long geologic ages extending back perhaps the Devonian, and continuing, with probable interuptions, to the present time.

I believe these observations to have practical imporance, for without them it would be difficult to underand the deposits of the Prescott region, or to have ny logical conception of the relationship between them nd those of Jerome. The present surface of the scored ome just described is strewn with much recent lava, robably of the age of the San Francisco peaks. There re also many remnants of older volcanics, or intrusives, any of which are too fresh and undisturbed to have articipated in the intense mountain-building activities f pre-Cambrian and pre-Algonkian time. There may e many igneous rocks of ages anywhere from Permian Tertiary. Some of the ore deposits which have been orked in this area, off and on, for the last 50 years, ay be derived from these comparatively recent inrusions. I suspect this to be the case with the copper ines at Copper Basin, about eight miles southwest of rescott.

THE MAYER COPPER MINES

The far more important and promising copper mines ear Mayer, 20 miles southeast of Prescott, are patently re-Cambrian and are not to be explained as emanating rom later igneous activity. The largest mine in his district, the Blue Bell, is 30 miles south and 10 miles est of the United Verde, and about 20 miles west of he nearest Palæozoic rim. The original pre-Cambrian urface in this locality has undoubtedly been scored own at least 2000 or 3000 ft., but the exact amount I ave no present means of estimating. If, therefore, hese deposits may be assumed to have had about the ame relation to the pre-Cambrian surface as those of erome (a mere assumption certainly, but let it go at hat), one must conclude that the Mayer mines repreent a deeper-seated stage of mineralization.

I must disclaim any detailed knowledge of this region. y chief interest has been to notice some of the broader onsiderations which, it seems, must be taken into ccount before it is possible to understand the rather ysterious ore deposits of this important field. I shall erely set down a few remarks for what they are worth.

In the Mayer district the rocks are known as Yavapai chists. They appear to be ancient surface volcanics or the most part, mainly greenstones of about the comosition of diorite or diabase. There are no doubt lenty of intrusives mixed in. The copper deposits all ccur in some quartz porphyry dikes which cut the reenstones and strike about N 10° to 15° E. Many of hese rocks have been subjected to an extraordinarily nergetic squeezing, which has produced in all of them schistosity that strikes N 28° E. It is so strong in laces that the quartz porphyry looks like a light colred and very fissile slate.

Though general, the schistosity varies in intensity. n most places the quartz phenocrysts in the porphyry may be plainly seen. This strong schistose structure as often imposed on the imagination of observers, many of whom have believed the Yavapai schists to be edimentary. But that is not to be considered, for esides the optical evidence that the rocks are igneous, he quartz porphyries are plainly dikes, irregular in outline and throwing out branches. The schistosity is the same in kind as that of Jerome, but greater in degree. The strike of schistosity at Mayer is N 28° E; that of Jerome N 10° to 20° W. This swing in the direction of cleavage may be of considerable geologic significance, indicating, for instance, the locus of the forces that produced the schistosity and perhaps the ore deposits.

There is one important difference between these deposits and those of Jerome—there is no United Verde diorite or anything like it. The orebodies are all within or on the contacts of the squeezed dikes of quartz porphyry. In all other respects they are similar, but smaller and not so rich. The Blue Bell mine has produced to date about 600,000 tons of ore, and has 500,000 tons more in sight above the 1200-ft. level. In 1917 this mine shipped about 120,000 tons of ore, averaging a shade over 3% copper and $1.50 per ton in gold and silver. About half this ore is concentrated; the other half is massive pyrite, much like that of the United Verde. The Blue Bell orebodies are easily mined, the cost of mining under present conditions being a little over $3 a ton, including development. On a return to pre-war conditions this cost would be reduced to about $2.25 per ton, delivered to the railroad. There is no apparent reason why such ores should not be valuable under normal prices.

OPERATIONS OF CONSOLIDATED ARIZONA SMELTING CO.

The industrial center of this district is the Consolidated Arizona Smelting Co.'s plant at Humboldt, a few miles north of the mines, which is producing about 2,000,000 lb. of copper per month. Some of this comes from the United Verde Extension and will be cut off as soon as that company's smeltery is completed. The Consolidated Arizona Co. owns the Blue Bell mines, already mentioned, and another smaller one, called the De Soto. It also smelts the ores from a third mine, the Arizona Binghamton, which is said to be developing favorably. It would seem that from these sources a continued output of 15,000,000 to 20,000,000 lb. a year may be expected.

In all this discussion of the Jerome and contiguous district, I have gone only slightly into the details of cost. The fact is, the district displays little of special interest in this respect, and the reports of the mining companies give meager details. The striking features are precisely those already dwelt on: the geology, the big faults, the rich concentrations of ore, which allow low unit costs for copper without much regard for costs per ton mined; and the corollary that successful mining is largely successful exploration. In the whole area considered there are seven or eight mines that have dealt with deposits such as those described. Of these, two are wonderful bonanzas. The others are either mediocre producers, like the Mayer mines just mentioned, or immature prospects, some of which have produced sparingly, like the Jerome Verde, Jaeger Canyon and a few others. One, the Copper Chief, southeast of Jerome, is working, for gold, the oxidized gossan of a large pyrite deposit which has proved unprofitably low in copper. In addition to these there are many prospects, some of which are mere wildcats and others genuine enterprises testing various theories as to the location of possible extensions of mineralized areas.

In all this fervor of exploration, a detached and unprejudiced observer may find one lesson worth noting, namely that exploration of new ground for possible ore deposits demands the same attention to adequate equipment and adequate finance as the mining of ores actually found. Vast sums of money have been squandered through loss of time and failure to accomplish the work planned—by trying to make two horsepower equal four horsepower. Shafts too small and too insecure, hoists that will not raise the load from the required depth, pumps that will not handle the water, result finally in no room for ventilation, injury to health of the men, and meager results; and often the whole job, instead of being a question of drilling holes and breaking rock, becomes a blind and useless struggle with bad air, broken pipes, rotten timber, heat, water and mud.

The spectacular development and success of the United Verde Extension are due almost wholly to good prospecting engineering. The project had been going on in some such fashion as that described in the preceding paragraph for I don't know how many years. It had been started with enthusiasm, but with little calculation, by a man named Fisher, on a small fraction called the Little Daisy, right on the great Jerome fault. A shaft had been sunk 800 ft. through this fault into hard quartz porphyry. All lateral workings had to go out through the fault again. A winze had been sunk, again along the fault, to the 1200-ft. level. All this work had dug up some indications of ore, but the practical result was failure and discouragement, and the enterprise was considered to be a mere wildcat.

When James S. Douglas and George E. Tener decided to undertake the prospect, they applied common sense to the situation and came to a sound conclusion. It would cost $250,000 to explore the ground, anyway, and this amount of money, spent in a safe shaft with good equipment, would accomplish the work more cheaply and quickly than it would if spent in the old shaft. They accordingly sank a new shaft 1400 ft. in a central location in solid rock. When they struck ore, they were able to ship it immediately in good volume. Their new shaft was sufficient, as things turned out, to make an output of 63,000,000 lb. of copper a year, and to make profits at times exceeding $1,000,000 a month. That part was luck, of course, under any interpretation of that rather uncertain word; but good management consists of so acting that when luck comes your way you can make the most of it. I suppose that if no ore had been found, the level-headed gentlemen who created the mine would have been pointed to as victims of overconfidence—a renewed warning against (some phase of) the danger of building a mill before you find a mine. The indictment would have been false. They took a true measure of the job as a piece of pure prospecting.

Abolishing Concentration and Amalgamation for All-Cyanidation*

Interesting data are afforded by the recent publication of the results of treatment in a milling-in-cyanide plant where amalgamation has been abolished. Previous milling operations showed that 86% of the gold could be concentrated in about 7% of the tonnage. Tests on the 93% remaining, constituting the tailing after amalgamation and concentration, showed that this could be reduced to 45c. per ton by crude cyanide methods, and apparently without further grinding expense. These results would seem to indicate the lines along which a successful scheme of treatment might be formulated.

The 45c. residue was, however, considered discouraging, and further experiments on a sand of normal fineness for leaching purposes were apparently not considered. Tests were then made to see how much gold could be dissolved by an agitation treatment, and the results indicated that all the gold was soluble provided grinding was carried far enough. "Extractions" of 99.7% were obtained in the laboratory; and as a result of these tests it was decided to grind and regrind the 7% of the concentratable material without separation from the 93% of low-grade ore, a plan which provided that every particle of worthless rock and absorbent colloid should be thoroughly steeped in as rich a solution of gold as possible.

The fact that all the gold is soluble in cyanide is reaffirmed, but actual results would seem to indicate that from 40 to 50c. per ton remains in the residue from about 400,000 tons treated by an all-sliming, milling-in-cyanide process.

If the question of the further recovery of gold from the residue is considered, it must be realized that the 7% of material which might have been concentrated for special treatment is now intimately mixed with a large tonnage of gangue, and that any additional treatment of this residue may be deemed impracticable by known methods of handling. Even if the ratio of concentration was reduced to 10:1, there would remain argument in favor of the isolation of the special product. A dump of 400,000 tons of residue carrying about 40c. per ton in gold is valueless. A dump of 40,000 tons of clean pyritic concentrate carrying about $2 per ton in gold is a valuable asset in sulphur content as well as gold.

Tests on the concentrate in question showed that 96% of the gold could be extracted by straight cyanidation, and apparently without previous roasting, or amalgamation during regrinding. Practical results on pyritic concentrate invariably show that roasting reduces the cost of subsequent grinding and lessens cyanide consumption. Sulphur is urgently needed now, but "up-to-date" methods for treatment of a simple gold ore involve not only the loss of the pyrite but a recoverable percentage of gold associated with it. By concentrating the pyrite and recovering the sulphur, the gold is actually liberated, and the highest possible percentage may then be recovered.

The foregoing example adds weight to the contention that after milling in cyanide and all-sliming the actual residue value is not by any means in inverse ratio to the solubility of the gold in cyanide solution, but rather in direct ratio to the amount of gold which is permitted to pass into solution and become intimately associated with the worthless constituents of the ore. Practical results go to prove that a comparatively high percentage of such soluble gold may be lost in the residue after what are often termed "improved" methods of ore treatment.

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*Excerpt from an article on "Milling in Cyanide Solution," by A. W. Allen, Met. and Chem. Eng., May 15, 1918.

Mining in Alaska Under War Conditions

By P. C. Stoess*

A steady drop in Alaska's mineral production is forecast if present conditions in the territory continue. Many copper properties are idle, and gold producers are in even worse straits than those in the United States. Companies producing tin and chrome ore are somewhat better off, but, nevertheless, are handicapped. Financing new propositions is difficult, and labor shortage is acute, owing to enlistments and the draft, as well as to the call of shipyards and canneries. Ship shortage and restriction of ore shipments by smelteries in the United States have further hindered mining in Alaska. Miners there have been liberal to the Red Cross and to war funds.

FOR a comprehensive consideration of mining conditions in Alaska, the territory may be divided into three great sections, namely, Southeastern Alaska, Southwestern Alaska, and the interior. The principal production of Southeastern Alaska, embodying the islands and strip of mainland from Ketchikan to Skagway and the head of Lynn Canal, is gold from quartz mines and copper ores. Efforts have recently been initiated to produce zinc ore, molybdenum, and ores of platinum and palladium on a small scale.

Southwestern Alaska comprises Prince William Sound and its tributary countries, the Cook's Inlet districts, including Willow Creek, and the Alaska Peninsula. This section produces copper ores chiefly, and some gold, and contains the Matanuska and Katalla coal fields, as well as large coal deposits in the Peninsula, that have not yet been worked. In addition to these minerals, some oil is produced at Katalla. A small amount of placer gold and deposits of oil, sulphur, pyrite, and chrome iron are also known to exist to the west.

This interior of Alaska, known locally as the "Inside," covers the great valley of the Yukon and its tributaries from the American line to the mouth, and includes the extreme northwestern coast of Alaska, Nome and the Seward Peninsula. This section produces chiefly placer gold, though placer tin is also mined there on a small scale; and, until recently, efforts were made to open deposits of tin, tungsten and antimony.

In considering the present position of Alaska it will be well to remember that during 1916, the last year for which reasonably accurate statistics of production are available, Alaska produced metal from its ore and placer mines valued at more than $52,000,000, divided as follows: Gold, $16,329,437; copper, $35,314,933; antimony, $179,635; tin, $110,333; and tungsten, $83,370. Statistics for 1917 apparently are not available in detail, but the opinion appears to be that gold production has fallen off by over $1,250,000, and that copper production dropped in value to $24,000,000. Part of this reduction in copper is probably due to the difference in price, as throughout the last quarter of 1917 the price was fixed by the Government at 23½c. During the first nine months it fluctuated widely, but averaged, as near as can be determined, 27 to 28 cents.[1]

Southeastern and Southwestern Alaska, though divided geographically and commercially by about 400 miles of open water, and though practically uninhabited territory, are more or less identical in respect to mining operations, and the commercial conditions in the communities in these two sections are sufficiently closely allied to permit of their being considered together in this connection. Formerly, in the copper-ore producing districts of Southeastern and Southwestern Alaska, there would be no difficulty in finding at least 30 to 40 or more shipping mines, prospects in course of development, and others, all being worked with more or less energy.

At the present time, throughout the entire coast districts of the two sections, including the Nizina-Copper River district, which can be considered as tributary to Prince William Sound, fewer than 16 copper properties are being worked, according to information available. Of these, two mines are operated by one company; three smaller properties by another large company; two others have been on a paying basis and operating on their present scale for several years past; three more are shipping intermittently small amounts of ore and developing slowly at the same time; and the rest are small operations where development is carried on as it is possible, in a more or less desultory manner.

There are a number of promising properties which contain orebodies of a grade good enough to ship direct, carrying from 5% to 8% copper, but which are idle for several reasons, soon to be explained. Although these properties cannot be compared with the big copper deposits of the country, in some instances their development may open up fair-sized mines. In any case, they promise an output of from 5000 to 15,000 tons, and one property should produce more than 30,000 tons, under present conditions; and the conclusion is inevitable that they should not be lying idle. In Southeastern Alaska there are also a number of properties in the same or similar condition, but requiring equipment to permit ore to be shipped. All are now idle.

Placer Gold Mining Affected as Elsewhere

In the "Inside" or placer-mining district, the majority of the large low-grade gold producers are either shut down or closing because of the same conditions that are affecting gold mines all over the country. The richer drift mines and the dredging operations, as well as a few hydraulic mines which have a margin of profit of over 100% above ordinary costs of operation, are still working, but with much reduced profits, and it is likely, unless some action is taken to help gold production, that next season will see the majority of these shut down. The few placer mines in Southwestern Alaska near the coast are affected in much the same way. The large lower-grade operations are being suspended until conditions will permit the properties to be worked at a profit. A few, possibly three or four, higher-grade hydraulic mines are being worked under the same disadvantages that are handicapping the interior properties.

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[[1]The average price of copper during the first nine months of 1917 was 28.407c., according to statistics published in the "Journal" of Jan. 19, 1918.—Editor.]

In the entire Southeastern and Southwestern Alaska districts, it may be estimated that formerly there were always at least 50 to 60 mines and prospects working or being developed and producing gold or gold concentrates from quartz. At the present time, careful inquiry shows there are not more than 17 gold-quartz operations being carried on, including paying mines, leases, properties in course of development and equipment, and small prospects being developed in a desultory way. This includes the great gold-producing district of Juneau and the two other sections, namely, Willow Creek and Prince William Sound, which have produced fairly well, considering the investment and other conditions surrounding operations.

CONDITIONS AS TO OTHER MINERALS POOR

Respecting other minerals, conditions appear a little better balanced, though they are far from satisfactory. The quartz mines north of Nome carrying tin ores, which it was hoped would be in operation by this time, are still idle, though the tin dredges are said to be working. The bulk of the antimony and part of the tungsten ore mined in 1916 came from near Fairbanks, where there are a number of what are reputed to be promising deposits which carry these metals. Up to about 18 months ago, these were all worked in a more or less desultory manner, though probably insufficiently financed. The effort, nevertheless, was being made to get results, and some ore was being shipped under difficult conditions, which, however, can be improved. The present situation in the Fairbanks district is that efforts to mine antimony and tungsten under existing conditions have practically ceased, and most of the properties are idle.

On the other hand, however, a deposit of chrome ore is being opened up in Southwestern Alaska, on the coast, of sufficient value and in a sufficiently businesslike way to promise an operation of commercial importance during the coming year. In Southeastern Alaska, a deposit of molybdenite is being developed as rapidly as possible. From 150 to 175 men are now employed on this particular work. Incidentally, in the same district, a small deposit of copper ore was found to contain commercial quantities of platinum and palladium, and work on this is being pushed with a crew of about 20 men as rapidly as conditions will permit. Some effort is also being made to work a zinc-ore deposit in Southeastern Alaska, but at present details as to its success are not available.

MONEY AND LABOR HARD TO OBTAIN

Considered as a whole, Alaskan mining operations are suffering from much the same conditions as those which affect mining work all over the United States and Canada, save that in Alaska these conditions are somewhat exaggerated. The first thing that stands out strongly appears to be the inability, as a general rule, of the mine owners, or of any one else, to obtain sufficient money to bring any given property to a point where it can be self-supporting. The few who have been looking for properties in Alaska in recent years have sought for immense deposits of ore already opened up. This, of course, can hardly be expected in a new country, such as Alaska, particularly in view of the general apathy toward the pioneer end of mining during the last eight or nine years. Consequently, little new work has been done in Alaskan mines for some time, if exception be made of a half dozen large enterprises.

The scarcity of labor has become a more serious obstacle in Alaska than elsewhere. During the period between 1914 and 1917, when the United States entered the war, a large number of Alaskans volunteered for the British service. Later, when it became inevitable that the United States would be drawn into the conflict, and immediately after it did enter and before the draft law was passed, the younger men poured out of Alaska in a constant stream, until the entire number which would be required by the draft had volunteered. Then the draft law went into effect, and a similar number again was drawn from the population.

SHIPYARDS AND CANNERIES LURE LABOR AWAY

In addition to losses from the draft and through volunteering, there is a further large percentage of the seasonal workers in Alaska who make their homes in Seattle, Tacoma, Portland and San Francisco; who ordinarily could be counted on for work in Alaska each year, but who have also either volunteered or been drafted. Furthermore, the call for skilled workmen of all kinds in the shipyards on the Pacific Coast has made additional inroads on the labor supply available for Alaska.

Again, one must consider the seasonal demands for fishing and cannery purposes, which affect the coast districts mainly. A large number of new canneries and fish salteries were established along the Southeastern and Southwestern Alaska coast in 1917 and 1918, and these have obtained a number of laborers from the mines, as the pay is better while it lasts. As an instance of this, the case of a man who with a small boat earned $9 in less than five hours catching fish for one of the canneries in Southwestern Alaska may be cited. Ordinarily, working at a mine, he would be able to earn not more than $5.50 for an eight-hour shift.

MINERS' WAGES NO BETTER THAN IN THE STATES

It is to be noted that in Alaska the miners receive no more, and in some cases a little less, than is being paid at Butte, or in the Arizona mining camps producing copper in the United States, if the reports available in technical and business journals are correct. The general effect of this labor shortage in Alaska has been to slow up everything and to raise wages from 40 to 60%. The large copper mines have been working for some time with short crews. One property is using 350 men and should have 200 more, but cannot get them. Another is working approximately 250 and could use another 100 men. One of the smaller operations, but a regular shipper, normally employs from 65 to 70 men and has a crew at present of about 40. On the other hand, however, the small copper producers, shipping intermittently and having small crews from six to 35 men, are having no serious difficulty at present, as there always seems to be a class of men available who prefer a small camp to a large one, however attractive the conditions may be at the latter.

The same labor shortage exists at the gold mines, but is more serious, as these cannot afford to pay the wages offered by the copper operators. In the entire Juneau district there are at present fewer than 750 men employed. This is not due entirely to the rate of wages paid, however, as, wherever it is possible, work is being done by contract, which enables the men to get the same pay as or possibly a little more than they could earn by the day in copper or other mines. Under normal conditions there should be at least from three to four thousand men working in Juneau. The operator of a small gold mine employing approximately 40 men stated that he not only had difficulty in getting men for his work at the higher wages, but also that the average skill of the men available was not up to the former standard, which, of course, is to be expected when all the facts are considered.

The cost of mine supplies and food has practically doubled throughout Alaska, as well as on the greater part of the Pacific Coast, this in itself forming a severe handicap, particularly to the low-grade quartz mines of Juneau and the big low-grade gravel deposits of the interior, as may be readily understood. In a general way, as near as can be determined, the increased cost of labor and supplies has raised expenses of operation all over Alaska, on an average, not less than 75% and, in many cases, more than this amount.

SHIP SHORTAGE HAS INJURED MINING

The mines which ship ore by water, in common with Alaskan communities, are suffering from the shortage of ships, which, coupled with the immense traffic which has been going on now for three months and will not be over until the end of September, owing to the need of moving the fish pack to market, is causing great inconvenience. In some cases, it will probably result in financial hardship to the mining community, as several properties find themselves with their ore bins full and are prepared to take out further bodies of ore, but have been unable to ship all summer, as vessels have not been available for this purpose.

Though there are nine boats on the run between Seattle and points in Southeastern Alaska, and five more running to Southwestern Alaska and covering most of the Southeastern run as well, and five or six freight vessels, the conditions have been more or less chaotic all summer. Juneau has at times been for 10 days at a stretch, during the summer months, without receiving mail or passengers from the South. Similarly at Valdez and other southwestern points during a period of 21 days, in July, no boat of any kind arrived from the South, the returning boats being likewise delayed. All this means that the business of shippers of copper ore and gold concentrates is being held up.

SMELTERS HAVE RESTRICTED ORE SHIPMENTS

Another thing which does not encourage mining operations in Alaska is the smeltery situation, which a year and a half ago was admittedly unsatisfactory with regard to the ore being offered. At that time, for their own protection, the smelters buying ore on the coast were obliged to put restrictions on shipments, which have not as yet been entirely removed. To add to this condition, the supply of siliceous ores from South America, used to smelt with the iron base ores of Alaska, has been cut off to a great extent, on account of the lack of tonnage. This, therefore, will enforce a reduction of shipments of the iron base ores, which have composed a large part of the Alaska shipments. On the other hand, it may later encourage the opening of siliceous base orebodies available in the territory.

A new concern, backed by people in Ohio, has moved during the last two years to reopen the old Ladysmith smeltery, on Vancouver Island, which it was thought would relieve the situation to some extent. But to date, though the smeltery has been run intermittently for short periods, its operation does not appear to hold any immediate promise of relief. As a matter of fact, should any concern open up a new mine that would produce 300 to 500 tons of copper ore per day, it is doubtful if an immediate outlet or market could be found for it on the Pacific Coast. In any event, even if the Ladysmith smeltery should be reopened, unless it is enlarged and further refining facilities on the coast are established, the capacity will always be limited by the refining capacity of the Tacoma smeltery, where practically all the copper from smelteries on the North coast is refined. Therefore, any new smelting operation producing crude copper, or making a matte, must depend on the capacity of the Tacoma smeltery refining plant, as it is impracticable under present conditions to ship elsewhere.

DEVELOPMENT OF COAL INDUSTRY LAGS

Coal mining in Alaska can hardly yet be said to have become an industry. A small amount of coal has been mined in a desultory manner on Cook's Inlet and used locally. The Federal Government has about 300 men working at three different mines in the Matanuska coal field, but is operating with a short crew all the time. This work is in charge of Sumner S. Smith, formerly Federal mine inspector for the district. Its utility will depend entirely on the completion of the Government railway to Seward,[3] which has been retarded because of the shortage of labor.

At present ships coming south from Anchorage are loaded to capacity with laborers of all classes. Three ships which left Anchorage within 48 hours of each other recently brought out 450 persons from that point A party of men in charge of an engineer has recently been sent into the Katalla coal field with a view to laying out and beginning a coal operation there. According to report, a branch line is to be built from the Copper River & Northwestern Ry. to the Katalla field as soon as possible. It is said that this operation will be substantially backed and will be pushed by private interests.

The oil fields at Katalla are doing fairly well in a small way, and are producing most of the fuel used on the fishing boats and small vessels in and around Prince William Sound.

MINING SITUATION SUMMARIZED

As to the mining situation in general in Alaska, it may be said that the tendency is to close down all independent small operations, unless they have unusually substantial backing by interests that can afford to keep them going until their objective is reached; also to concentrate the important operations in the hands of very large corporations. New developments have ceased and there are few if any new properties in the course of being opened up. This condition applies over almost all of the Northwest. Operations of the individual prospector or group in developing mines with moderate or small means are constantly becoming scarcer. This does not make the outlook hopeful for the future, as it is rarely that the big operating concern opens up a new mine in a new district unless some one else has first proved it.

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[3] The completion of the Government road from Anchorage to Seward has recently been announced by the Department of the Interior. Coal may now be shipped direct from the Matanuska field to Seward, 190 miles away.—Editor.]

The net effect on mining in Alaska in 1918 of the present labor and cost situation, together with the other items mentioned, will be to reduce the gold output considerably. Though it is early in the season to say how far this reduction will go, the general opinion seems to be that the gold output will be cut to at least 40% of last year's production and probably more, which means that for all Alaska it will not be likely to exceed $9,000,000 in 1918. Unless something is done to assist the gold miners materially, and give them the same benefits of a higher market for their product that producers of other metals obtain, the gold production for 1919 will drop still further, until it will be cut down to two or three million dollars per year. Could some form of encouragement be given to the gold miners, it is likely that Alaska can produce from 18 to 20 millions a year, provided, also, that all the skilled men are not drafted for Army work.

Copper production certainly will not increase and is likely to drop from 10 to 15% below the figures for last year. This shortage can hardly be attributed to unfavorable conditions respecting the ore deposits of the country, but must be charged to circumstances which have arisen as a result of the war and which are felt rather more in Alaska than elsewhere. The further increase in the price of copper may possibly assist the production of that metal and encourage additional work at the smaller mines carrying higher-grade ores, and so improve the situation.

ALASKA MINERS LIBERAL TO WAR FUNDS

It should be recorded here that Alaska has been practically drained of mining engineers, assayers and surveyors under 40 years of age not directly employed by the large companies, and their crews are likewise more or less affected by this exodus, as the younger men have been called into the service. But in spite of the difficult conditions under which people in Alaska are operating, there is less kicking, as a rule, against the inconvenience caused by war conditions than is heard at other points on the Pacific Coast, and Alaska is contributing not only men but money on the most liberal scale, in proportion to her population. It may not be generally known "outside," but it is a fact that, at practically all mining camps, the men are contributing a day's pay every month to the Red Cross, and are averaging over $150 apiece in Liberty Bonds, in addition to buying war savings stamps and so on, in which they are making a good showing.

It is to be hoped that the Post Office Department will be able to make arrangements in the near future which will permit the mail to go forward, under proper supervision, as it formerly went. A few weeks ago the contracts offered for carrying the mail to Alaska were all refused, and as a result the mail clerks were taken off all the boats, and mail is now being sent to Alaska by freight, which is adding just a little more to the difficulties of operations in the territory.

Crystalline Graphite Production

The shipments of domestic graphite of the grades known as No. 1 and No. 2 flake in the first half of 1918 amounted to 1683 short tons, according to figures compiled by H. G. Ferguson, of the Geological Survey, from monthly reports submitted by the producers. Of this amount 1142 tons came from Alabama and the remainder from New York and Pennsylvania, except small quantities shipped from California, Montana, and Texas. It is estimated that more than two-thirds of this graphite was used for making crucibles and that the remainder was used chiefly for making high-grade lubricants.

The actual mine production of flake graphite during the first half of the year was nearly 2000 tons. A continuation of shipment at the present rate will give a total production for the year approximately equal to that of 1917. It is believed, however, that as crucible manufacturers are now using larger quantities of domestic graphite in their mixtures—20% or more—the demand will increase during the next few months.

The following figures, compiled from the records of the Bureau of Foreign and Domestic Commerce, show the imports of crystalline graphite in 1917 and in the first six months of 1918. Graphite entered as imported from France is credited to Madagascar, and that entered as imported from Great Britain, British India, and the Dutch East Indies is credited to Ceylon: 1917—Ceylon, 24,575 short tons; Madagascar, 4393; Canada, 3476; Brazil, 18. First half of 1918—Ceylon, 6674 short tons; Madagascar, 524; Canada, 1763; and Brazil, 40. It is assumed that one-fourth of the Canadian imports and 90% of the imports from other countries represent graphite of crucible grade. The imports of crucible graphite in 1917 were therefore about 27,000 short tons, and those of the first half of 1918 about 7000 short tons.

Magnesium Production Large

Metallic magnesium, which is commonly used as a flashlight in photography, is used also in aërial bombs and rockets for lighting battlefields at night. Burning magnesium makes a dense pure-white cloud, and the metal is put into shrapnel shells so that observers and gunners may know exactly where the shells are bursting. The result is a veritable cloud by day and a pillar of fire by night on the European battlefields.

Magnesium is made by the Norton Laboratories, Inc., at Lockport, N. Y.; the American Magnesium Corporation, Niagara Falls, N. Y., and the Rumford Metal Co., Rumford, Me. Reports made by these three companies to the U. S. Geological Survey show a production of 50,384 lb. of metallic magnesium in the first quarter of 1918, and 66,554 lb. in the second quarter, making a total of 116,938 lb. in the first half of 1918. The total production in 1917 was 115,800 pounds.

Pisé de Terre Mine Buildings*

The development of new mining districts involves building operations on a commensurate scale—an expense which is often avoided on account of the uncertainty of the life of the district. The same consideration affects new settlements which have sprung into existence following the expansion of war industries in hitherto unoccupied regions. The use of adobe is perhaps fairly well known, but the system here described, in the practice of which the walls are made of rammed earth, indicates that dwellings and other buildings can be erected at a low cost which will compare favorably, in regard to both comfort and convenience, with the more expensive structures that are sometimes considered necessary.

THE cost of buildings in many mining camps is often a serious consideration to those concerned; and operators and workmen on small properties requently live for years in uncomfortable huts rather han face the expenditure involved in erecting better nd more lasting types of dwellings.

Attention has previously been directed in technical nd other publications to the method of building with ammed earth, or pisé de terre, a system in itself very ld, but adopted only in isolated instances. The great advantage of pisé de terre work is its low cost. Houses r sheds built of adobe or rammed earth have to pay ittle or no tribute to the transport trades. All materials for the walls are found on the spot and may be aken from the field in which the buildings are to stand. For this kind of wall building only unskilled labor is required—the greater part of the house can be built by hose who are going to live in it.

PISÉ DE TERRE BUILDINGS IN RHODESIA

Pisé de terre buildings have been used as habitations n Rhodesia for a number of years and have proved efficient. The following is a description of one of the methods of construction adopted:

Boxing is required for molding the walls, and this is made of four pieces of deal each 12 ft. x 9 in. by 1½ in. These are spiked together with cleats in pairs to make two boards each 18 in. wide, which form the sides of the box between which the walls are rammed. End pieces of correct width are fixed between the boards for the required thickness of walls, which should not be less than 14 in. for walls 12 ft. high. Each end piece is held in position by four small iron plugs, two on each side, passing through holes drilled near the end of the planks and entering partly into end pieces. When setting up the frame for ramming the walls, it is held in position by three clamps, placed with their legs vertically downward over the frame at equal intervals apart. The clamps are shaped like a right-angled U, made of timber or iron, and for a 14-in. wall would be 17 in. across, inside measurement, with legs about 18 in. long. If the clamps are made of timber they should be H shape, so that a cleat can be nailed across the arms projecting above the form, to give rigidity. These prevent the side boards being spread during ramming, and to hold them apart three distance pieces are required at the top.

For joining up interior walls and corners of outside walls, a right-angle frame is necessary, but this can be constructed easily. The only other items required for construction of the walls, except a few tools which are generally available, are a plumb and level, a sieve, a few nails, wooden rammers about 3 in. in diameter which can be cut from bush timber, and hoop iron or wire. In some cases it may be advisable to put in a rough stone foundation, but if the ground is firm and well drained all that is necessary is to level off the site.

DETAILS OF CONSTRUCTION

The material used for the walls in one instance is one-third sand, one-third ant heap and one-third soil, all pulverized and put through a sieve. Water is then added. The mixture must be neither too wet nor too dry—just sufficiently damp to bind; a good indication of the correct consistency being that when squeezed hard by the hand it shows a tendency to bind. Sufficient of the loose mixture is thrown into the form to fill it to a depth of about 3 in., and this is well rammed before the next layer is put in. Thorough ramming is essential. When the frame is rammed full, it is taken apart and shifted along to make another section, and so on until the first layer is complete. The first layer is, as a rule, sufficiently dry to permit the starting of the next about three hours after laying. In the second and succeeding courses, the framework is supported by three or four pieces of stout wire or nails which have been laid into the previous course about 1 to 2 in. from the top and projecting outward about 1 in. These are drawn and the holes plugged when the frame is removed. Holes are bored in the planks to allow for this projection. One end board must be left out, as the frame at that end embraces the part of the wall already laid, and it may be necessary to use an additional clamp here. Door and window frames are put in as the work proceeds, and must be well braced while ramming. In the top layer, hoop iron or fencing wire is let in for fastening down the wall plates. Arsenite of soda may be used in the first layer or two to keep out white ants. The floor can be made of timber, cement concrete, or rammed earth, and the roof thatched or covered with corrugated iron, as is most convenient.

CONCRETE FLOOR OPTIONAL

Should a cement concrete floor, which is cheaper than a wood one, be desired, there would be an extra expenditure for cement, the amount required being about two bags for each 12 sq.yd. Such a floor should be laid before the walls of the building are begun; and it is essential that the site be thoroughly well rammed and consolidated, particularly beneath where walls will come, before laying the concrete, to prevent cracks developing as a result of settlement. The concrete mat should be carried at least 6 in. beyond the outside walls of the building; and if the work is properly done, a special ant course will be unnecessary. The concrete can be left rough below the walls to give a bond, and it might be advisable to lay some pieces of hoop iron in it which would be left projecting to be bedded on to the walls. Another good type of floor is one constructed of road material, laid down and tarred in the same manner as roads are now made in many places.

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*Excerpts from the 1918 report of the Rhodesia Munitions and Resources Committee.

A number of rooms and houses have been erected on the Globe & Phœnix mine on much the same principle as pisé de terre buildings, but the system developed there is different as regards the mixture, which consists of two parts of ant heap or ordinary clay, which must not be too sandy, and three parts of ashes or clinker sieved free from fine dust. It is interesting to note that the walls are made waterproof by first smoothing them with clay plaster, and then, when entirely dry, giving one good coat of boiling hot tar. A coat of limewash is applied three days later. That this is effective is well evidenced by the fact that the buildings erected have successfully withstood an abnormally heavy rainy season.

BUILDINGS AT THE GLOBE & PHŒNIX MINE

The Globe & Phœnix system is the result of a number of experiments carried out at that mine. The mixture employed, which is said to be ant proof, contains more moisture than pisé de terre, and each course is reinforced with old wire rope or other suitable scrap. The material is left in a heap for one or two days before being used. Circular huts have been built of the same material, the forms being made of two rings of corrugated iron in three or more sections, joined up with cleats at the end laps and held in position with cross bolts and distance pieces. The inner ring is 9 in. less radius than the outer one.

A point of interest is that ceilings for rooms, of the same material, have been successful at this mine, the method being described as follows: For a 14 x 12-ft. room, place 4½ x 3-in. seasoned timber ceiling joists at 2-ft. centers, resting on wall plates at the ends, and in the center on a 6 x 4-in. beam. Frame a strong pair of rafters over the center of the ceiling, and hang up the center of the beam with a ⅝-in. kingbolt. Fix 3 x 1 in. battens flat on top of and at right angles to ceiling joists, also at 2-ft. centers; cover the whole area over these with small-mesh wire netting and, between the joists, with temporary close boarding. Then cover the whole with a layer of the mixture 4½ in. thick. Do not close in the roof until the ceiling is dry; then remove the close boarding underneath, smooth over and treat with limewash.

ADVANTAGES AND SCOPE

An advantage which a pisé de terre house would have over the ordinary type of dwelling in many climates would be in its capacity for heat conservation in winter and greater coolness in summer. In localities where the heat is excessive in summer time, the walls could be made thicker than 14 in., at a practically negligible extra cost; and a ceiling of the Globe & Phœnix type would add greatly to the comfort, although some extra expenditure would be necessary for material needed.

There would appear to be an extensive field for buildings of the pisé de terre type, and they should appeal to many who live outside town areas. Rentals are usually high, on account of the cost of building material. Cheap pisé de terre huts could be put up for temporary residence, and more permanent quarters erected when and as conditions created the opportunity

Siberian Mines

Developments in Russia, it is announced, says the *Statist*, have placed the properties of the Irtysh Kyshtim and Tanalyk companies outside the zone of Bolshevik influence. No damage has been done to the properties, order is being restored, the Bolshevik decrees of nationalization, confiscation or expropriation have become inoperative, and the directors have reason to believe that steps are being taken to remove any restrictions imposed. It is important to bear in mind that the properties in southern Siberia, especially the Irtysh Corporation's Ridder concession, are relatively not far from the Chinese frontier, as distances are measured in that part of the world. Railway disorganization, inability to obtain supplies, and financing difficulties were first responsible for discontinuance of operations, and no doubt it will be some time before matters in this connection are sufficiently improved to permit resumption of work. However, the importance of metal production to the Allies operating from the East, and the relative proximity of the properties to the Trans-Siberian line to Vladivostok, are factors which point to an easier settlement of difficulties than thought possible only a short time ago. In this connection also the appointment of Sir Charles Eliot as British High Commissioner in Siberia, with diplomatic rank, may also have influence, in view of his knowledge of Eastern languages and his close acquaintance with the customs of Asiatic races.

Hongkong Tin Active

Business in tin for the first five months of 1918 was very brisk, according to Consul A. E. Carleton at Hongkong. So far as Hongkong prices are concerned, 1918 may be considered a record, and there is no special reason to believe that the present prices will change materially for the remainder of the year. On Jan. 1, the local stocks were about 1500 tons, and the total quantity imported into the colony from Yunnan for six months is estimated at about 6000 tons. America and Europe have taken about 6500 tons, the greater portion being for the United States, and China coast ports and Japan about 850 tons.

The price per picul in the middle of May reached $182 Mexican, and when the year began the price was about $103 per picul. At the end of June the price in Hongkong stood at about $134. The stock of tin in Hongkong was low in June, and as a result little business was done. The following declared exports of this consulate general show shipments to the United States for the six-month periods of 1916, 1917, and 1918 as follows: 1916, 5,282,828 lb., valued at $1,122,242 1917, 9,112,931 lb., valued at $3,035,986; and 1918 14,981,907 lb., valued at $9,628,228.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Chrome Ore in Cuba

All the deposits of chrome ore in Cuba that have thus far attracted attention are within 25 miles, and most of them within 10 miles, of the north coast, according to a U. S. Geological Survey bulletin. There are about 12 groups of deposits, which display considerable diversity in quality, size, and accessibility. One of the most westerly deposits is in the eastern part of the Province of Havana, and two are in the Province of Matanzas. The next group toward the east is in the Province of Camaguey, a few miles northeast of the city of Camaguey. Other groups of deposits are in the Province of Oriente, one near Holguin and another south of Nipe Bay, and there are three groups in the mountains near the coast between Punta Gorda and Baracoa.

All the deposits examined are in serpentinized basic rocks. Fibrous spots resembling asbestos commonly occur in the serpentine near the orebodies. The deposits are lenticular and in the form of tabular masses ranging in thickness from 1 ft. to more than 50 ft. and reaching a maximum length of more than 200 ft., but they may include small masses of serpentinized peridotite. Thin veinlike streaks of ore have also been noted. The orebodies appear to be characteristic magmatic segregation deposits, and resemble many of those found in masses of serpentine in California and Oregon.

The ore is generally fine grained to medium coarse grained, and varies from spotted material consisting of black grains of chromite, ranging in diameter from a thirtieth to a quarter of an inch, embedded in white or light-green serpentine, to solid black material containing little or no visible serpentine. Fine seams of a green crystalline mineral, uvarovite, a calcium-chromium garnet, are occasionally found in the ore.

Most of the masses of ore are highly inclined, and certain of them that are exposed in ravines on steep hillsides in mountainous or hilly regions dip at about the same angle as the hillsides. The deposits west of Nipe Bay are in areas of moderate relief; those near Camaguey are in an area of low relief. The deposits in the eastern part of Oriente Province, which are the largest, are situated in a mountainous country and are difficult of access.

The reserves of marketable chrome ore in Cuba range from 92,500 long tons to 170,000 long tons, but only about 2000 tons of ore can probably be shipped in 1918 unless greater efforts to exploit it are made. The largest known deposits of chrome ore in Cuba—those of the Caledonia, Cayoguan group, and Potosi claims—are near the northeast coast of Oriente, in a region difficult of access. They may yield 72,500 to possibly 130,000 tons of ore, most of which can be brought to present commercial grade by simple concentration. With suitable transportation facilities and mining equipment, and with sufficient labor, most of this ore could be mined and shipped within two years after these conditions had been established. At the time of the examination only one deposit was ready for production, and on a small scale, but it seemed that the rate of production could be greatly increased by the employment of more miners and pack animals. It would require some time to put the other deposits in this region in condition for production.

The next largest known group of deposits is near Camaguey. They are easy of access, but are of lower grade than those in Oriente Province. They appear to contain 20,000 to 40,000 tons of ore, most of which can be gathered by hand from the surface. Near Matanzas, Cardenas, and Holguin there are small stocks of ore that are ready for shipment, perhaps 1000 tons in all. The ore near Holguin is of medium grade, but that near Matanzas and Cardenas is generally of lower grade. The expense of hauling the ore is reported to be almost prohibitive.

United Eastern Mining Co.

The first annual report of the United Eastern Mining Co., of Arizona, covering the operations for the year ended Dec. 31, 1917, contains information with regard to the results for the new mill and cyanide plant which was put into commission on Jan. 4 of that year.

The ore is high grade and the gold free milling. A negligible amount of refractory mineral is present, and amalgamation is not practiced. Milling in cyanide and all sliming is the system of treatment in use, and the rich gold solution is decanted from the ground ore, after agitation, by the continuous countercurrent process.

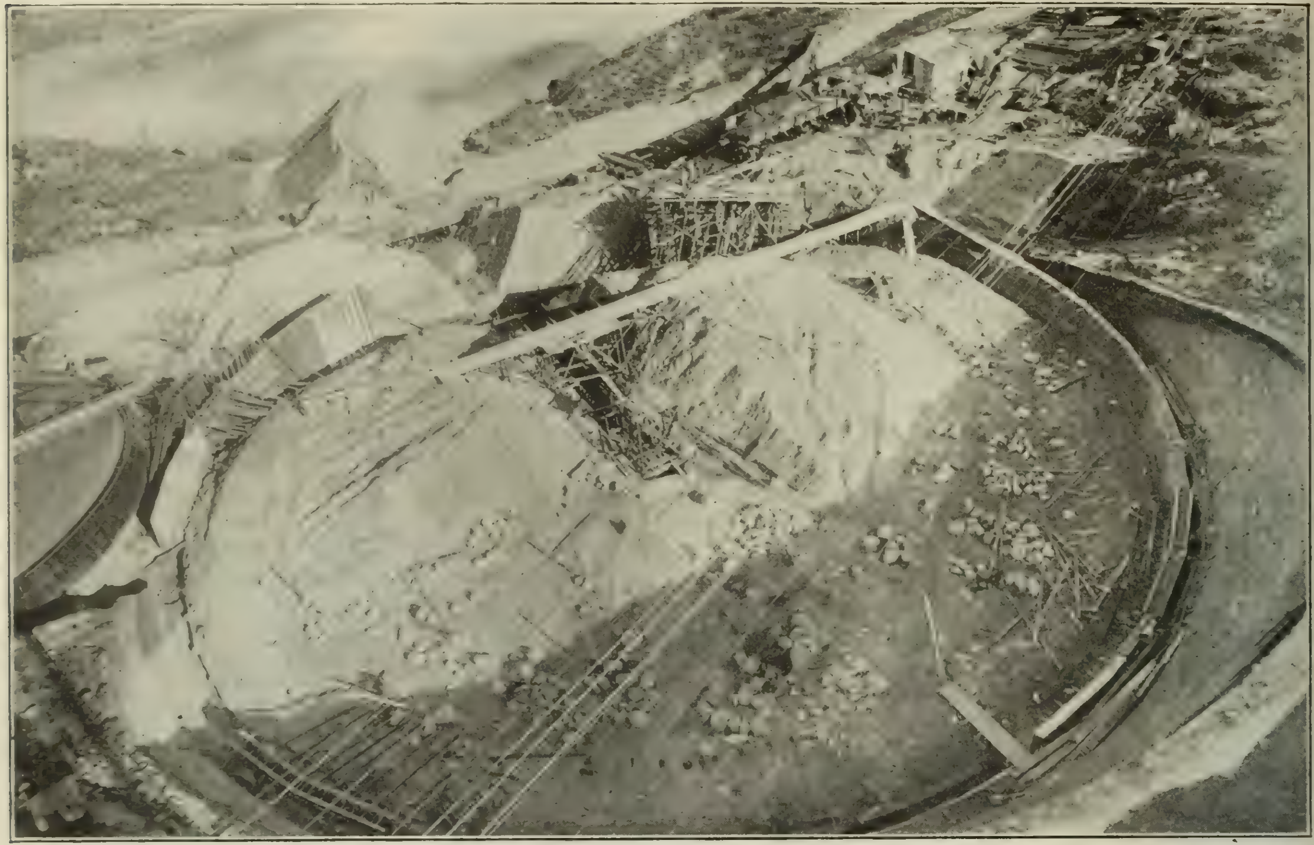
During the year the rated capacity of 200 tons per day was increased to 270. Additions to the plant included one 40 x 12-ft. Dorr thickener, to reduce dissolved losses; one 30 x 8-ft. thickener of the same type, for the purpose of removing slime from the solution going to the clarifiers, and three 24-ft. diameter Dorr agitators. Theoretical calculations of performance failed to materialize, and, although the mill was designed with the expectation that 75% of the gold would be dissolved before the pulp reached the agitators, the actual amount was nearer 25%. The additional equipment effected an increase of 0.5% in the total extraction, and permitted the amount of ore handled to be raised by 30 tons, and two Dorr classifiers were installed to replace Callow screens and a bucket elevator.

The plant treated 84,548 tons during the year, carrying gold and silver of an aggregate value of $22.42 per ton. The percentage of extraction for the year, based on assay results, was 96.41, with an average loss in residue of 80.6c. per ton. "Values recovered" are given as $21.617 per ton, but the phrase is misleading, as the figure includes $15,000 for "absorption in mill" and $553.17 for "slag on hand." Neither of these two items can be logically included under "recovery."

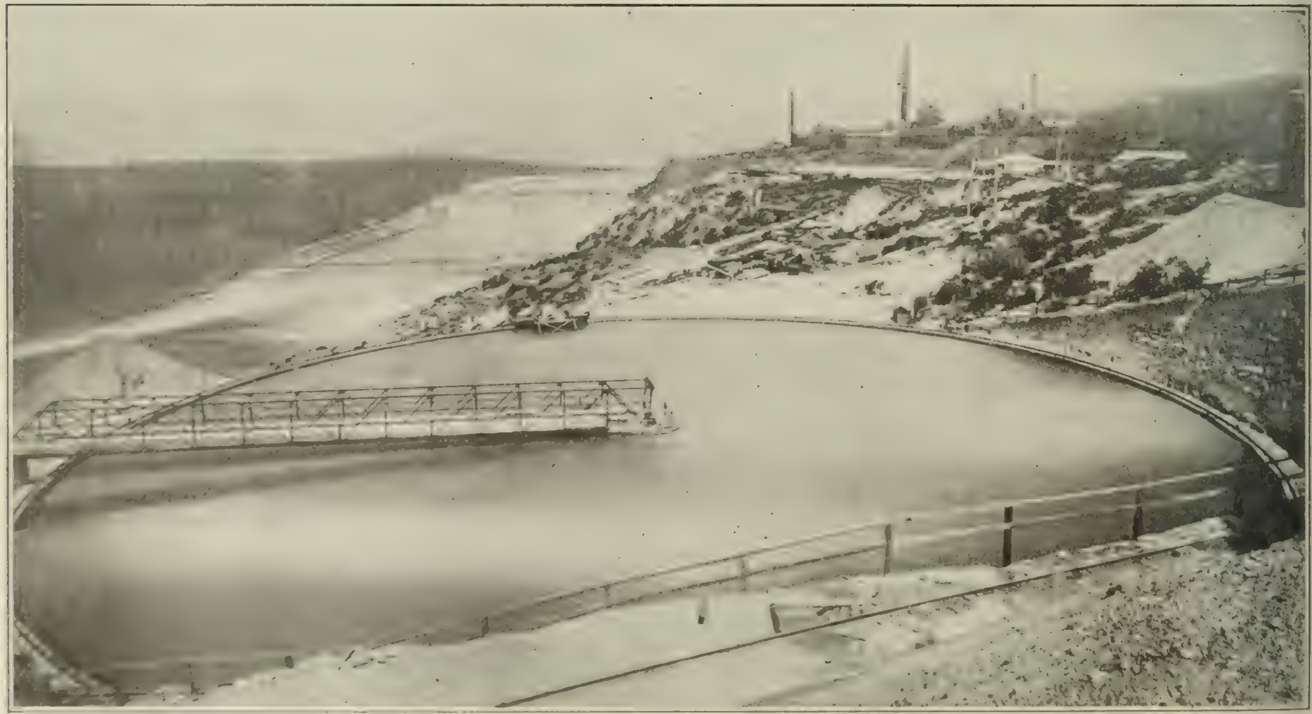
Operating costs, exclusive of depreciation and similar charges but including net administrative expense, amounted to $7.283 per ton, of which $4.181 is charged against mining and $2.159 against milling, and the ore reserves, as at Dec. 31, 1917, were estimated at 255,688 tons, with a gross value of $5,830,971.

The general superintendent, J. A. Burgess, in concluding his report, acknowledges the coöperation and efforts of the staff, and mentions W. O. North, formerly mill superintendent and now assistant general superintendent; Wallace Keith, secretary and purchasing agent; J. W. Bradley, chief clerk; B. D. Boalen, mine foreman; Earl M. Bagley, mill foreman; L. E. Ward, master mechanic; B. C. Staiger, mining engineer; and D. G. Davies, geologist, in the order named.

Thickeners in Western Practice



BUILDING WALLS OF 200-FT. DORR THICKENER OF INSPIRATION CONSOLIDATED COPPER CO., DEC. 31, 1916



THICKENER OF INSPIRATION CONSOLIDATED COPPER CO. IN OPERATION MAY 31, 1917, MIAMI, ARIZONA

HICKENER DEWATERING FLOTATION CONCENTRATES, BURRO MOUNTAIN COPPER CO., TYRONE, NEW MEXICO

THREE 100-FT. AND THREE 60-FT. DORR THICKENERS DEWATERING TAILINGS, INSPIRATION CONSOLIDATED

Sheet Zinc for Roofing

By W. H. SEAMON

Republication of an article originally printed in the "Engineering and Mining Journal" of Oct. 24, 1896. In the footnote of the original article Mr. Seamon says: "The information in this article has been derived mainly through the kindness of Mr. A. M. Layat, who has furnished the writer with all the European printed matter relating to the zinc industry. So thoroughly has this information been absorbed, that the writer is unable to properly accredit his several authorities, but has frankly disclaimed originality." For the purpose of the present publication a few immaterial paragraphs have been excised. The explanatory illustrations have been redrawn.

IN THE United States tin plate is the favorite metal roofing; the uses of sheet zinc for roofing are almost unknown; and yet in England, the home of the tin-plate industry, and in all parts of Europe, zinc is now the most favored material. It was first employed for roofing in 1811, when the Abbé Dony, the founder of the Belgian zinc industry, in his efforts to create a market for the consumption of his small output of spelter, roofed a house with sheet zinc. During the same year portions of the roof of the church of St. Barthelemy, at Liège, were covered with the metal, and both of these roofs exist today in good condition, although the first has always been subjected to the deleterious influences of the sulphurous fumes proceeding from the smelting furnaces of the Vieille Montagne Zinc Co. In 1820 the Théâtre de la Monnaie, at Brussels, was roofed with zinc, and up to the time of its destruction by fire in 1855, it is authoritatively stated that no repairs had been required. Mosselman, the successor to Dony, and the founder of the Vieille Montagne Zinc Co., continued the experiments of his predecessor with marked success, and without any special effort on the part of the company many buildings in Belgium, France and Germany were roofed with the metal, and during the year 1836 it is said that more than 12,000 tons of sheet zinc were used in France for roofing purposes, while the consumption in England amounted to only between 2000 and 3000 tons.[1]

In 1867 the smelting companies of Europe had careful examinations made of the then existing roofs, from which observations carefully prepared instructions for zinc workers were formulated and workmen were trained to handle the metal properly. Since then the increase in consumption has been rapid, until today more than 100,000 tons of sheet zinc are annually used for roofing purposes in Europe, and it is now recognized there as a durable and desirable roofing material, taking the place of lead and copper because of its greater economy. Its comparatively low cost has secured its application on structures of all kinds, palaces, municipal and state buildings, cathedrals, chapels, churches, schools, universities, hospitals, hotels, depots, theaters, warehouses, manufactories, stores and private dwellings. The German Imperial Palace, the Universit of Bonn, the Berlin Academy of Fine Arts, the Cath dral of St. Marys at Düsseldorf, the Hotel de Ville ar Cathedral de Ste. Clotilde in Paris, the Haymark Theater, Canterbury Cathedral and the governme dockyards in England, are a few of the large stru tures covered with it in Europe; while, until very r cently, a courthouse in Indiana and a high-school buil ing in Missouri were the only instances of its emplo ment in this country.

The family residence of Hon. L. Bradford Princ formerly Governor of New Mexico, at Flushing, L. was about the year 1839 roofed with zinc, formed strips about 2 ft. in width and 10 ft. in length, unit laterally, as shown in Fig. 1. It gave perfect satisfacti until about 1885, when some small holes were found the sheets, and it was replaced by tin plate, whi proved very unsatisfactory from the beginning.

In Europe, the business of zinc roofing is conduct by the various zinc manufacturers, and partly by ro ing companies. The sheets are usually corrugated a stamped at the rolling mills, which are ready to execu special orders, though some of the roofers cut a stamp their own sheets. The usual lengths of the shee are 7 ft. or 8 ft., but even 10 ft. may be had by sp cial order, and they are from 2 ft. 8 in. to 3 ft. width. For roofing purposes the following thickness are recommended by the Vieille Montagne Zinc Co.:

Gage	Thickness, In.	Thickness, Mm.	Weight per Square Foot, Lb.	Weight per Square Foot, Oz.	36 in. × 72 in. Weight of Sheets, Lb.	36 in. × 72 in. Weight of Sheets, Oz.	36 in. × 84 in. Weight of Sheets, Lb.	36 in. × 84 in. Weight of Sheets, Oz.	36 in. × 96 Weight o Sheets, Lb.	36 in. × 96 Weight o Sheets, Oz
13	0.029	0.740	1	...	19	½	22	3½	25	6
14	0.032	0.820	1	2½	21	1½	24	9½	28	2
15	0.038	0.950	1	5½	24	7½	28	8½	32	10
16	0.043	1.080	1	8½	27	13½	32	7½	37	2
17	0.048	1.210	1	11½	31	2	36	5½	41	8
18	0.053	1.340	1	14½	34	8	40	4½	46	

The various clips and fastenings may be had dir from the zinc rollers; the only labor required to be do by the roofer is that of bending the lateral edges the sheets, and the actual operations of laying them.

The tools required are those commonly employed tin and copper smiths. It is better to use wood mall rather than metal hammers, since they thin the met less at the points of impact. The shanks, anvils, et are of the various forms required for shaping and a familiar to all metal workers, as are the patterns cutting metals. As a general rule solder should not used in working zinc, since the metal is always wea ened somewhat, perhaps no more than any other met at the soldered junction, but there is no special di culty in the operation of soldering, except that a lit more care must be taken in wiping and smoothing joints than with some other metals. The best solder composed of two parts of pure tin to one of lead, any of the common varieties may be used, and the s dering flux, known as "killed spirits," made by sa rating commercial muriatic acid with strips of co mon zinc, is applied in the usual way, with a brush, a stick of wood roughened at one end.

The nails used are made of zinc, but since they ca not be driven into hard wood, those made of galvani or plain iron are sometimes employed.

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[1] "Journal of Gas and Sanitary Engineering," 1893, p. 419.

heet zinc owes its value for roofing purposes to its ability, lightness and economy as compared with anized iron, tin plate, slates and tiles, lead and per, usually employed in this country. The latter metals, generally regarded as the best, owing to r great cost are seldom adopted, and, in fact, zinc is urable and costs much less.

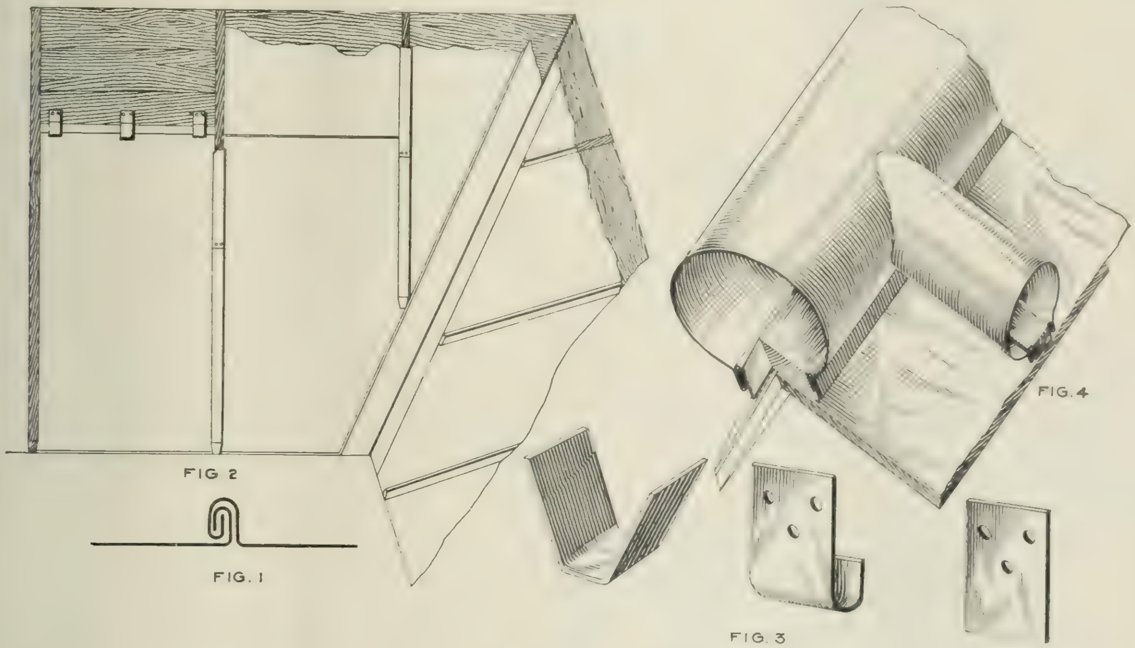
good tin roof, properly laid, and painted thoroughly t least once in every three years, will last from 20 30 years (Trautwine). A well-laid slate roof will uire occasional repairs in consequence of the loosg and cracking of the slates by frost and hail and throwing of stones. On steep slopes the slates en more quickly, owing to their great weight contly bearing on the nails, which gradually rust and sen themselves. The life of a slate roof varies from to 50 years. Galvanized iron is a very popular matel for sheds, warehouses and factories, but it is not g-lived; the unequal expansion of zinc and iron gradlly causes the zinc to scale off and expose the iron, d thus creates an electrical couple which results in e more rapid corrosion of the iron and destruction the roof. This is delayed somewhat by frequent and orough painting after the iron is exposed. With e greatest care 15 years is a long life for a roof of lvanized iron.

The superiority of sheet zinc over galvanized iron s shown in the case of the Northwestern Ry. station Birmingham, England, which was roofed in 1853 with lvanized iron, and was carefully painted on both sides ery three years and repairs made whenever required. t at the end of 13 years it was found to be rotten, cessitating its removal in 1867, when it was replaced th a zinc roof, which exists today in perfect order d has given but little trouble or expense for repairs.

The enamel-like coating of the hydrous carbonate rmed on zinc roofs is practically insoluble to atmoseric waters and thoroughly coats every particle of e metal, absolutely preventing contact of the metal with the oxidizing atmospheric agents. A zinc roof of proper gage weighs from 125 to 180 lb. per 100 sq. ft.; lead about 800 lb.; copper the same; tiles, 1500 lb., and slate from 700 to 900 lb. The roof timbers when zinc is used need not, therefore, be so heavy or costly as for the other materials.

The different systems of zinc roofing are classified by the Vieille Montagne Zinc Co., according to the methods of laying and differences in the shape and the sizes of the sheets, as follows:

1. *Ordinary Roll Cap.*—This is recommended for slopes of not less than 20° and not more than 36°, and is always laid upon sheathing, usually with No. 13 zinc, in sheets from 6 to 8 ft. long (Fig. 2); the lateral edges of each sheet being turned up for 1 in., and held down to the sheathing and up to the battens by means of clips (No. 2, Fig. 3). One end of each sheet is folded under for 1 in. to 1½ in., while there is a corresponding upfold at the other end, and the upper edges of each sheet are held in position on the sheathing by a clip (No. 3, Fig. 3), which is soldered to the bottom of the sheet, and by two clips (No. 1, Fig. 3), which are nailed to the sheathing and engage with the folded edge of the sheet, so as to allow for a slight expansion. The form given to the roll cap which covers the battens, fitting over the upturned edges of the adjacent sheets, may be as shown in Fig. 3, which is a common form, or as in Fig. 4, which is much used in certain parts of Germany.

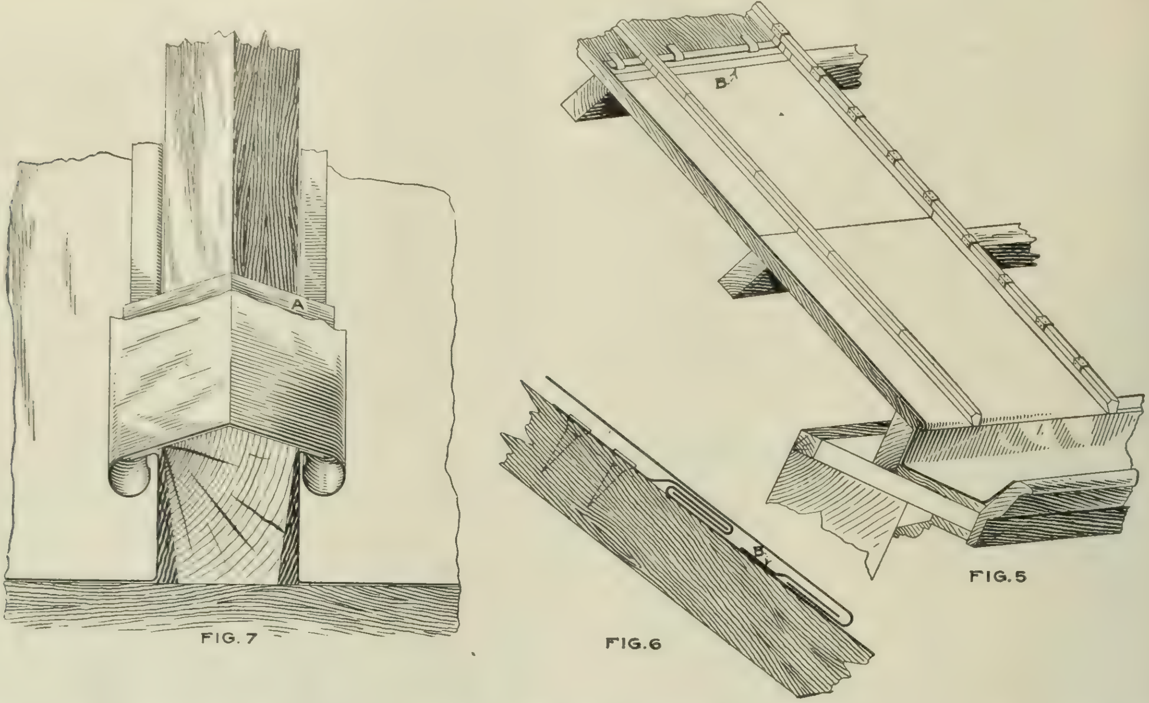


FIGS. 1 TO 4. ROLL CAP AND CLIPS

2. *Patent Roll Cap.*—The essential difference between this and the preceding lies in the manner of uniting the ends of the several sheets. A double fold (Figs. 5 and 6), prevents infiltrations by capillary action when laid on slopes as low as 4°. The form given to the battens and the manner of holding down the caps (Fig. 7), while essential to the claims of the patent, are not really necessary.

3. *Corrugated Sheets.*—The advantages of the corrugations lie in their ability to take up the lateral ex-

pansion and contraction in the sheets. No battens are employed, and the sheets may, or may not, be laid on sheathing, and on roofs framed of timber or iron. When used on sheathing, No. 13 zinc is sufficiently heavy; but when no sheathing is employed a heavier gage up to 18 should be used (Fig. 8). Another style of corrugation, called the patent corrugated (Fig. 9), is claimed to possess all the advantages of the corrugations, and the same weight of zinc will cover a larger area, the width being 3 in. greater. When ordinary corrugated is laid on iron framing, 6 or 12 clips, No. 26, are employed; if laid on wood framing 6 to 12 of No. 27, and as many of No. 29, are used. The clips are attached to the sheets by soldering, but for the "patent corrugated," 8 iron clips, No. 41, are used for wood framing, and an equal number of No. 39 for iron framing (Fig. 10). When these are laid on sheathing, which seldom occurs, clips made of zinc similar to those employed upon the flat sheets are used.



FIGS. 5 AND 6, DOUBLE FOLD. FIG. 7, FORM GIVEN TO BATTENS AND METHOD OF HOLDING DOWN CAPS

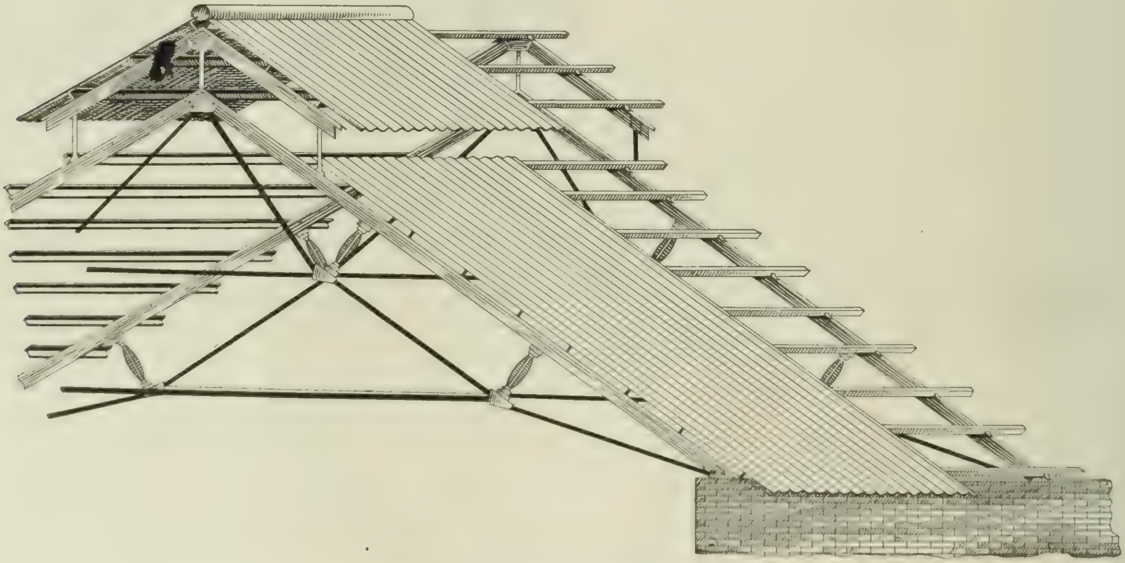


FIG. 8. CORRUGATED ROOFING

The patent double-ribbed system is only another form of corrugation much used for dwellings, on which it may be applied with or without sheathing. It is held in position with nails and clips, as illustrated in Fig. 11.

4. *Tiles.*—These are laid on sheathing and are well adapted for roofs on all slopes above 10°. The sizes as well as the shapes of the tiles are varied, and frequently are stamped with figures intended for ornamentation (Figs. 12, 13 and 14) and are very easily laid, and give, perhaps, the best results obtainable by the employment of zinc.

The first care of the zinc worker is to observe the carpenter work and have any defects corrected which would interfere with the proper laying of the roof. The sheathing, when employed, should fit snugly along the lines of union, and the upper surface should be made smooth. Particular care should be taken to remove all projecting sharp edges which might cut through the zinc. All nail heads must be countersunk. If no sheathing is employed and the sheets are laid on strips, these should be placed at regular intervals, parallel to the ridge pole. Defects in the carpenter's work having been corrected, the next step is the laying of the gutters and the valleys.

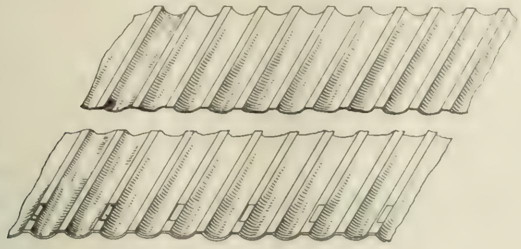


FIG. 9

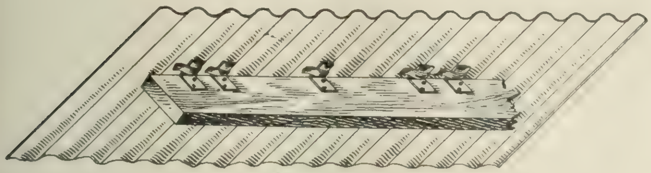


FIG. 10

FIG. 9. PATENT CORRUGATED ROOFING
FIG. 10. METHOD OF ATTACHING CORRUGATED SHEETING TO PURLINS

Formation of Gutters.—The roof projections and the arrangements for the cornice control the construction of the gutters.

Eaves Projecting Over the Cornice.—This is the simplest mode of construction. The gutter is formed, in the shop, of proper shape and dimensions in sections, each about 7 ft. in length, attached to each other by double laps and carefully soldered. Shoulders at least 2 in. long are provided at the openings for the downfalls. The gutter is supported on brackets, attached to the walls at intervals of 6 ft., and straps should pass over it at each bracket to hold it in position. The gutter should not be firmly attached to more than one bracket, usually the central one, in order to allow it to expand and contract. The downfalls may be connected with the shoulders by angle joints, which are not soldered at either connection, or the shoulders may extend vertically into an enlargement of the upper part of the downfall, as shown in Fig. 11. If the first method is followed the gutter can freely expand and contract without endangering any of the fastenings of the downfalls.

Downfalls are made in lengths of 6 ft.; their vertical edges only are soldered. Strips of zinc are soldered to the upper ends of each section, and these nailed to the wall. No. 18 zinc should always be used for downfalls and gutters, since they are subject to greater corrosion and have no additional supports.

Trough of a Wooden Cornice Forming the Gutter.—Fig. 16 shows the arrangement when the roof slopes into the trough, forming its inner wall. The gutter sheet must extend up the slope so that the lapped edge *A* will be at least 1 in. higher than the upper edge of the cornice mold, to prevent the water, when the gutter is full, from getting between the sheathing and the zinc. The lap should amount to at least 1 in. The clips *B* are 4 in. wide and 4 in. long and are disposed at intervals of about 20 in. between centers. This plan must always be followed when the roof is to be covered with tiles. The outer edge of the gutter may be held down after several methods. In all instances, strips of heavy zinc, No. 18, are attached to the upper edge of the cornice mold by nails of zinc or iron; these strips are 10 in. long, and should be placed at intervals of 20 in. between centers. Their width varies with the plan of attachment of the gutter sheet. Fig. 17 shows a common method, in which the strips extend over the edge of the cornice for about ½ in., then downward for nearly the same distance, and are finally attached to the outer face of the cornice mold by nails. The outer edge of the gutter sheet is rolled over the strips in such a way as to allow a play, for expansion and contraction, of about 1/16 inch.

Fig. 18 shows the disposition when the upper edge of the eave is below the upper edge of the cornice mold, the roof slope not forming part of the trough. The gutter sheet must extend up the roof slope until the lapped edge *A* is above the outer upper edge of the cornice mold. The figure also shows another plan for holding down the outer edge of the gutter sheet, in which the clips *C* extend for 1 in. beyond the edge of the cornice mold, over which the gutter sheet is rolled. This plan is common, but it is not so good as the former.

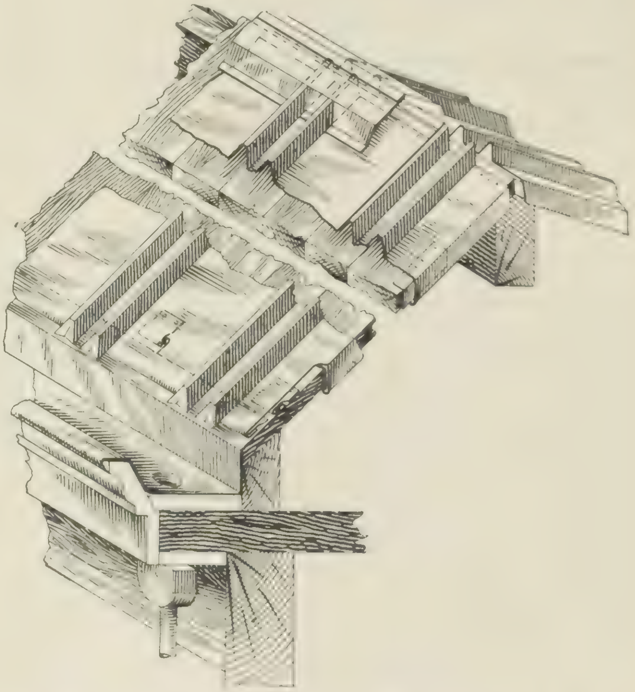


FIG. 11. PATENT DOUBLE-RIBBED SYSTEM OF CORRUGATED ROOFING

Figs. 19 and 23 show the arrangements when the eave is above the upper edge of the cornice. The inner edge of the gutter sheet is bent over, forming a projection of about ¾ in., sloping downward, over which the roof sheets are bent. The inner edge is held to the roof by clips *C*.

This arrangement allows wind to get beneath the roof sheets and blow them loose. When the sheathing extends about 1 in. beyond the inner vertical wall of the gutter, a firm attachment may be secured. The roof sheets are bent over the sheathing so as to engage with the gutter sheet and the lower face of the sheathing; a few nails may then be driven on the lower face of the sheathing to hold the sheets in place.

Figs. 20 and 21 show another and more secure form of holding down the outer edges of the gutter sheets. The clips *C* are bent down at right angles, leaving space for the gutter sheet to pass between them and the cornice mold. A small play is left for expansion and contraction.

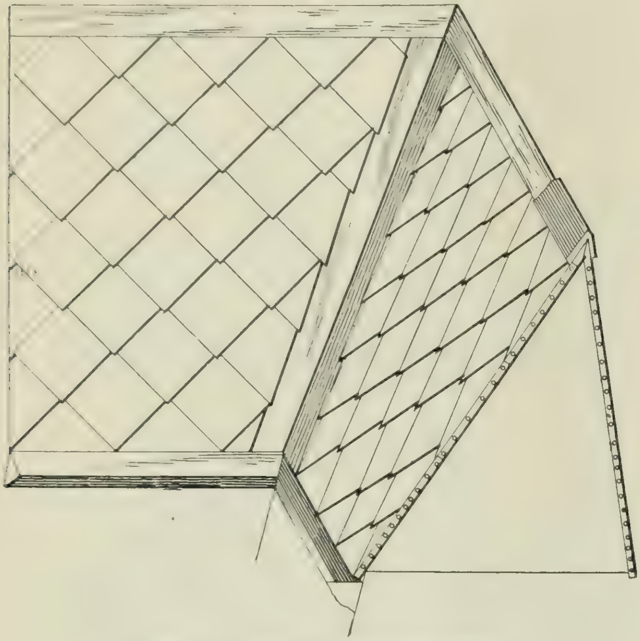


FIG. 12. METAL TILE ROOFING

Fig. 22 shows the disposition when no sheathing is employed. The gutter sheets are connected with each other by lap joints, well soldered. The ends are closed by a piece of zinc. The gutters should not be firmly fastened to the cornice trough, thus allowing some play for expansion. If there are reasons for fastening the gutter to the trough, expansion joints must be employed. Fig. 23 shows the arrangement when there is no objection to placing downfalls wherever they may be required; this divides the gutter into sections with one downfall for each section. A space of about 3 in. is left between the ends of the two gutter sheets. To the end of each sheet, vertical strips *C* are soldered, or the ends of the gutter sheets may be bent upward, but this is not recommended. The vertical sections rise to a point a trifle higher than the outer edge of the cornice, when their upper edges are bent over, as shown in the figure, and over these a clip *B* is fitted.

It is frequently impossible to have so many downfalls as this method requires; it then becomes necessary to employ the method shown in Figs. 24 and 25. A space of about 4 in. is left between the gutter sheets; strips *A* and *B* are soldered to the upper and lower sides of the adjacent ends, so as to form a groove, into which is inserted a sheet of caoutchouc, *C*, which is riveted in place, and which expands and contracts inversely with the gutter sheets. To protect the caoutchouc from the heat of the sun, a cover sheet, *D*, is provided, which is a strip of zinc, *D*, placed over the joint and held in place by clips *E*, which are soldered to the ends of the gutter sheets. This cover strip may be easily removed, allowing examination of the caoutchouc and its replacement when worn out. This plan is not equal to the former and is also more costly.

In all cases the sheets are soldered at the shop and carried to the building in suitable lengths for handling. It is important that the shoulder leading to the downfall should not tightly fit in the opening in the cornice, but should allow room for the expansion of the gutter.

Whenever possible the eaves should be above the upper edge of the cornice, projecting for 1 in. over the inner wall of the cornice. If this be done the roof sheets may be easily and firmly attached.

Construction of Valleys.—In the formation of valleys, the width of the sheet required will depend upon the amount of roof area drained by the valley. Several sheets may be soldered together, always with lap joints, so as to make sections from 12 to 15 ft. in length. If the slope of the valley be greater than 6 in. to the foot, the several sections may be united by single joints, as in Fig. 27. If the slope be less than 6 in. to the foot, the sections must be united by double lap joints, as shown in Fig. 28. The upper end of the valley sheet may be nailed to the sheathing, to hold it in place, while the lower end should likewise be as firmly attached as the construction will admit. The sides of the valley sheets are held in position by clips, placed at intervals of 20 in. between centers. The roof sheets may be attached by a single lap joint, as shown in Fig. 27, or by a double lap joint, as shown in Fig. 29. A common method of forming the double lap joints is shown in Fig. 29, and another method is illustrated by Fig. 26. In the latter no solder is required. The reason for using double joints in valleys and on roof slopes is that no water can then infiltrate by capillary attraction.

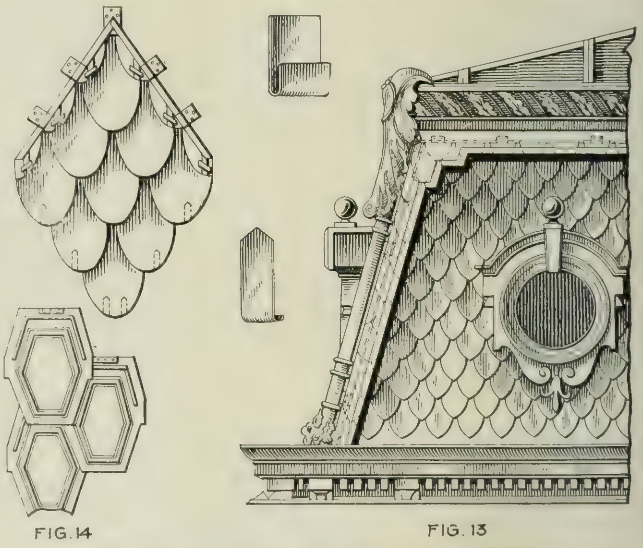


FIG. 14 FIG. 13

FIGS. 13, 14, 15. METAL TILE ROOFING

When no sheathing is employed in the formation of the roof, care is taken to break joints only at the rafters. When iron trusses are used, a sheet of iron is laid in the valley and riveted to the iron work; over this is laid the zinc for the valley, its lateral edges being folded over the edges of the iron sheet.

'lashings.—The flashings about chimneys and open-
ıs in the roof should not be formed until the roof
roaches them, thus enabling the roofer to connect,
he best advantage, the flashings with the roof.

n forming the flashings about a chimney, the mortar
removed from the first course above the roof on
lower side of the chimney, from a depth of 1 in. to
n. Into this groove a sheet of zinc of sufficient width
length is fitted; wooden plugs are driven to hold it
porarily in position. The sheet is extended down
face of the chimney, and it is made to conform to
angle of intersection of the chimney with the roof,
beating down with wooden blocks. If sheet zinc is
d for covering the roof, the roofer will endeavor
ave the last full sheet terminate within 2 ft. of the
mney, and not nearer than 6 in. The lower edge of
sheet *A* is made to engage with the roof sheets, with
p joint like that used for connecting the roof sheets.
a distance of 1½ in. from the corners of the chimney
sheet *A* is cut vertically to the roof. A piece is also
out of the corners, so as to allow the edge *B* of sheet
o be folded over, for the purpose of forming a lap
nt with the following pieces of zinc. The free ver-
al portions of *A* are bent around the corners of the
imney, as shown in Fig. 31.

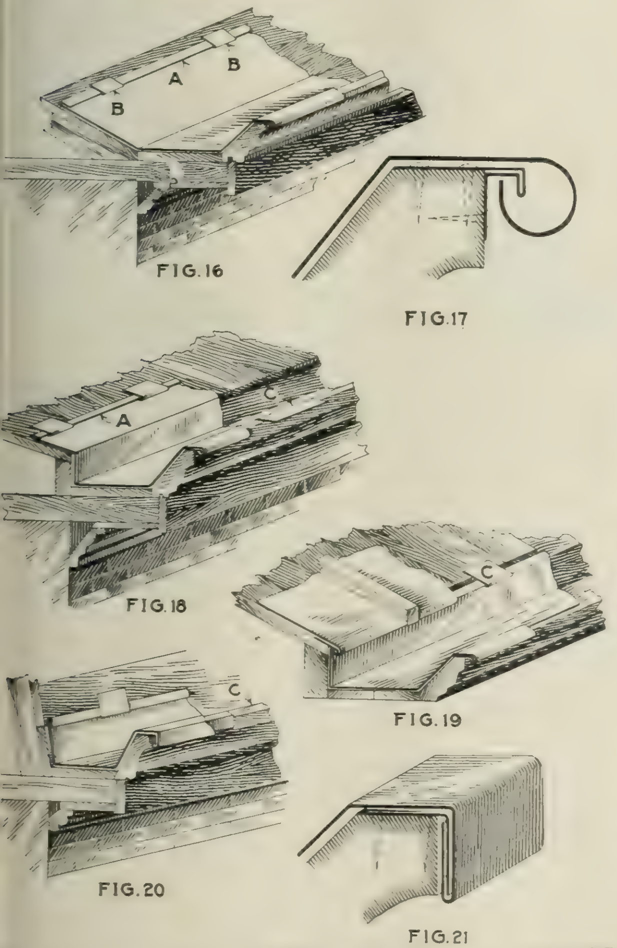


FIG.16 FIG.17 FIG.18 FIG.19 FIG.20 FIG.21

GS. 16 TO 21. ROOF TROUGHS, GUTTER AND CORNICE DETAILS

On the sides of the chimney, sheets *C* are taken of
oper length and width; the edges *D* are bent down for
in., forming an engagement for the step flashings;
e edges *E* are lapped under and engaged with the sheet
On the upper corners of the chimney, the sheet *C*
is bent around to the upper face for a distance of 1 in. to 1½ in., as the sheet *A* is bent around the lower corners. The edges *F* are bent over to form engagements with the succeeding sheet *H*. Step-flashings *G* are cut of proper shape and size, fitted into the grooves formed by removing the mortar from between courses of brick and engaged with the edge *D* of the sheet *C*. The mortar is next removed from between the second and third, or third and fourth, courses of brick on the upper side of the chimney, into which the edge of a sheet *H* is fitted of proper dimensions. This sheet is made to conform to the roof slope, and at a distance of 1 or 2 in. from the vertical corners of the chimney it is cut so that it may extend around the corners for a short distance; it is also connected by a lap joint with the edge *F* of the sheet *C*. The sheet *H* is connected with the other sheets of the roof by the usual methods. The joints in the mortar are filled in with good cement.

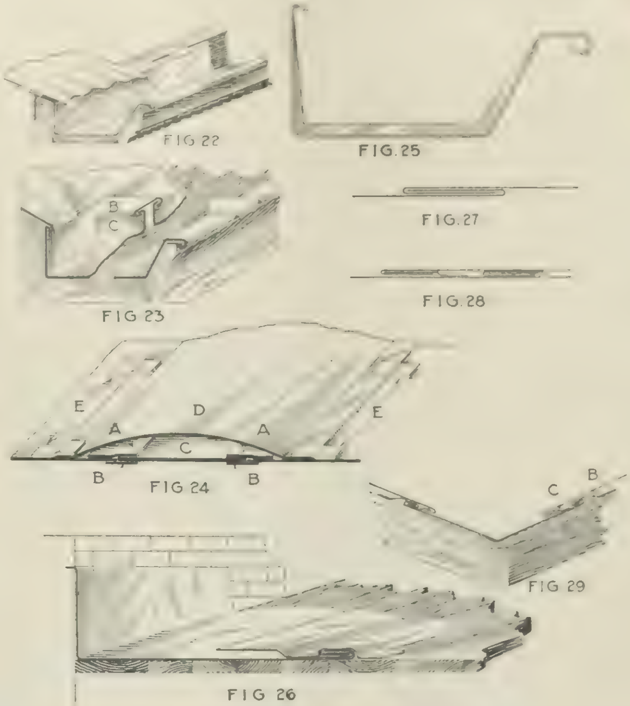


FIG 22 FIG.25 FIG 23 FIG.27 FIG 28 FIG 24 FIG 29 FIG 26

FIGS. 22 TO 29. ROOF DETAILS

When either of the "roll-cap" systems is employed, the battens must be stopped at a distance of 6 in. to 12 in. from the chimney. The exposed ends of the caps must be covered with zinc and soldered. It may be necessary to use a little solder about the angles of the chimney, but the workman should not be allowed to slur his work with the intention of using solder to cover up his deficiencies.

When corrugated sheets are employed, the general rules given above are applied, combined with those given later for laying corrugated sheets. More solder is required if the connections are to be water-tight. The same applies to the patent ribbed sheets.

If a scuttle or skylight interrupts the continuity of the roof, the sheets are nailed to the inner edges of the woodwork around the opening, bent over the upper faces, down the sides, and then out on the sheathing, where they are connected with the roof sheets by the methods just described.

In the case of a tile roof, the openings, be they made by a chimney, scuttle or skylight, are surrounded with a sheet of zinc, made up of four sections united by solder; their outer edges, which should be within 6 in. of the opening, are turned over for 1 in., forming an engagement for the clips *C* which hold it to the sheathing. Immediately within these edges a 1-in. strip *B* of heavy zinc is soldered, extending all around the opening, on which the tiles are engaged; this is shown in Fig. 32. Particular attention is called to the manner of cutting and placing the tiles, for which the true method is shown in Fig. 32.

The gutters and the valleys having been laid, work on the roof is begun. If either of the cap systems are employed, battens must be used, laid at right angles to the ridge. If the roof is to be terminated by a ridge cap, this cap must be put in place. Similar arrangements must be employed for the hips, which are always finished after the plan adopted for the ridge. The placing of the battens depends on the width of the sheets. Usually the battens are made of well-seasoned pine 1½ in. thick, of the same width at the top, and 1 in. wide at the base. In Fig. 33 the batten is shown with a flat surface, and in Fig. 7 with a bevelled top surface. The top may also be rounded.

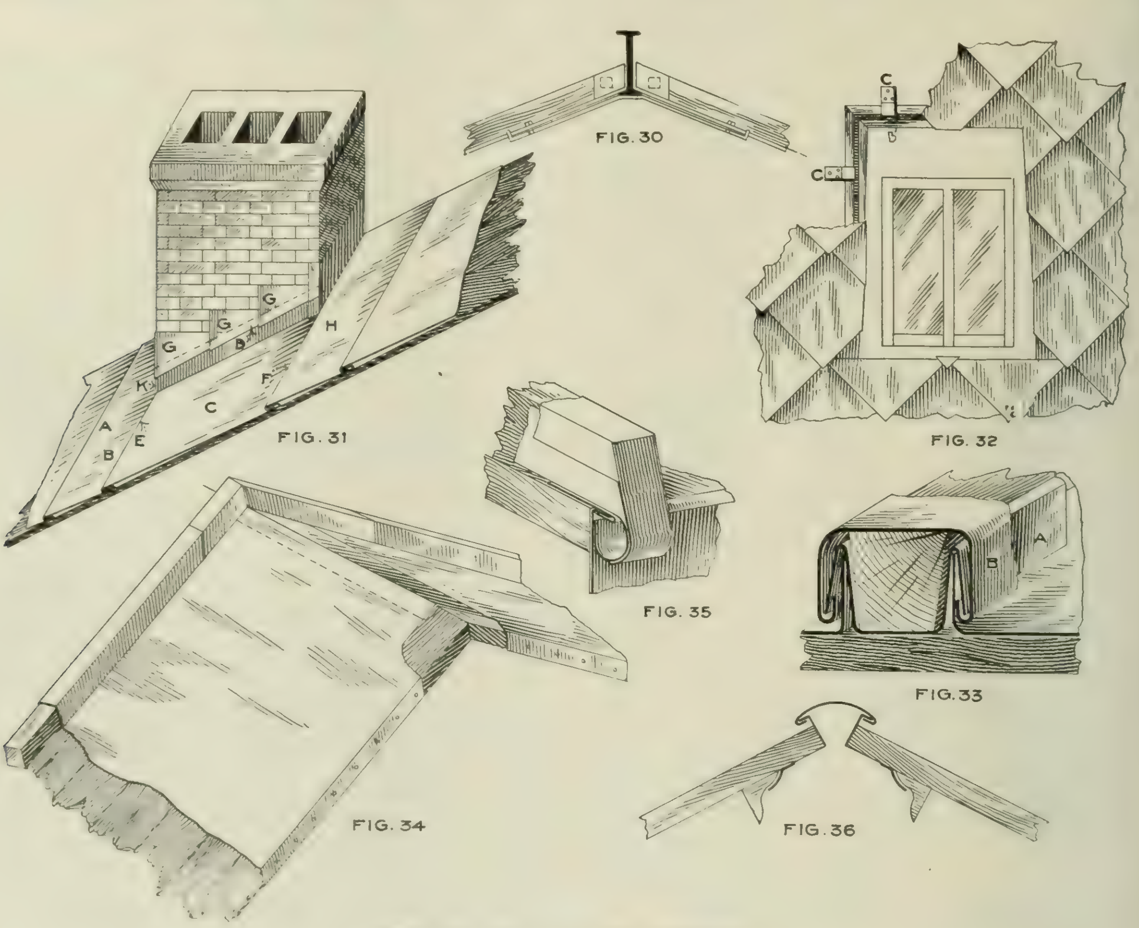


FIG. 30

FIG. 31

FIG. 32

FIG. 33

FIG. 34

FIG. 35

FIG. 36

FIGS. 30 TO 36. ROOF DETAILS

The roofer must carefully study the best arrangement for the battens, and see that they are uniformly and properly laid, for they control all future operations in the several cap systems. If no ridge pole is used, the battens must exactly meet each other at the ridges of the several slopes, and be neatly joined. If a ridge piece is used, the battens are joined to it. It is important th no battens should be allowed to extend into the gutte or valleys.

In all cases the roofer begins laying the sheet at t lower end and outside edge of any slope. The arrang ments made for the gutter control the methods of fa tening the lower edges of the roof, and they have alrea been fully described. The outer edges of the sheets a engaged with clips, Fig. 11, made of No. 18 zinc the manner shown. These clips are 12 in. in length wi 1 in. projection, and width additional to allow for th firm attachment to the sheathing by nails. The oth edge of the sheet is bent up for a height of 1 in., pull up to the batten, and held securely in position by cli No. 2, as shown in Fig. 3, of which there are three the side of each sheet. These clips are best made No. 16 zinc, and must be slipped under the battens proper intervals, when the carpenter is laying the ba tens. They are 3 in. wide and long enough to pa under the batten, up their sides to the height of 1½ i when they are bent downward for a distance of abo ½ in., in all, usually, about 4½ in. long. To the botto of each sheet, at its upper end, there is soldered near t center a clip, No. 3, Fig. 3, made of No. 16 zinc 3 i wide and 5 in. long; one end is nailed to the sheathi and serves to hold the sheet at its original height the slope. Two clips, No. 1, Fig. 3, are also used hold down the upper edge, folding over the lap in t sheet, their free ends being nailed with three nails the sheathing. These clips are made of No. 16 zinc a are 5 in. long and 3 in. wide. In a similar way the ne sheet is placed in position, and the process repeated until the ridge is reached.

If a ridge piece is used, clips like No. 2, only longer, on account of the greater width of the ridge battens, must be placed before the battens are nailed to the sheathing. The ends of the sheets run up to the ridge piece and may be nailed to it, or held down with the clips. If no ridge piece is employed, the sheets extend over on each slope for a distance of 2 in., and are united by careful soldering. This disposition is shown in Fig. 34. It will be observed that the top and bottom sheets are always firmly fastened, while at the intervening joints there is always play enough for the changes due to contraction and expansion. The hips are finished precisely in the same way as the ridges, and the connections with valleys are made as with gutter sheets.

After the roof sheets are laid, the caps or rolls must be laid. These are strips of zinc, of sufficient width, intended to cover the battens, and close up the intervals between the sheets, so as to prevent the infiltration of water. The form of the cap may be varied. Fig. 33 shows one common form, and Fig. 4 shows one used in Germany. These strips are formed in lengths of 6 ft. They are laid, beginning at the bottom of the slopes, by engaging their inner upturned edges with the clips that hold down the sides of the sheets. The succeeding strip overlaps the preceding for a distance of 2 in. or 3 in. They may be united by lap joints, or, better, a nail may be driven into the upper end of each strip, which is covered by the lower end of the sheet following.

Fig. 7 shows another form of engagement, which properly belongs to the "patent roll cap" system. The clips *A*, made of No. 18 zinc, are 6 in. long, and about 3 in. wide; instead of being slipped under the battens, they are nailed to their upper faces, at intervals of about 20 in. between centers. It will be observed that with this system the edges of the sheets must be turned up against the sides of the battens till they reach the clips, and then bent downward, as shown in the figure. The cap engages with the edges of the sheets, as shown; consequently it must be made of No. 18 zinc to give the necessary strength to hold the sheets together. These caps fit over each other and are connected with double joints, as shown in Fig. 6.

If no ridge piece is employed, the caps run up to the ridge and are there soldered together, or a saddle, with 6-in. legs, is fitted over the caps.

If a ridge piece is employed, it must be covered with a cap, formed after the same pattern as the caps covering the battens, although it may frequently be enlarged into some striking effect of an ornamental character. Fig. 4 shows a form in which the ridge cap is given a circular cross section, about 6 in. or more in diameter. The caps covering the battens are always extended up to the ridge pole. The ridge piece is made in sections of about 6 ft., united by lap joints with each other, while the lateral edges are held down by clips, similar to those used in holding down the lateral edges of the batten caps. At the points where the latter intersect the ridge piece, openings are cut, and over them is soldered a piece of zinc, conforming to the form of the batten caps and extending beyond the ridge piece for about 6 in. The hips are finished off after the method for completing the ridge piece. The ends of the ridge pieces are closed by soldering on some ornamental finial, or by simply fitting a piece of zinc to the opening and soldering it to the ridge piece.

The preceding description applies principally to the ordinary roll cap. The "patent roll cap" is laid in a similar way, except in the manner of joining the sheets. With the ordinary roll cap, when laid on slopes of low pitch, water may infiltrate, by capillary attraction, through the joints. To avoid this a double lap is formed, as shown in Fig. 6. In Fig. 26, another method of forming a double joint, without the employment of solder, is shown. It is not, however, generally employed, although there can be no doubt of its superiority. Any form of cap or ridge piece may be employed for this style. It is well to increase the height of the battens when this system is used on long slopes of low pitch, to diminish the danger of water rising above the level of the edges of the sheets. With this system roofs of 4° slope may be covered. The lower ends of the batten caps are covered with pieces of zinc united with solder. In Fig. 35 is shown a popular method.

Corrugated Sheets.—Several styles of corrugations are shown in Figs. 8 and 9. The sheets are laid on sheathing, but generally their use is limited to covering sheds, warehouses, etc., in the construction of which no sheathing is employed.

Fig. 10 shows the method of fastening when used on wooden purlins. The lateral edges of the sheets overlap for one corrugation; along the outer edges, on the lower surfaces of the sheets, clips, No. 27, made of heavy zinc or iron, are soldered; through these, clips, No. 29, also of zinc or iron, are slipped and nailed to the upper slopes of the purlins. There should be three purlins to each sheet, and as each sheet is held by two clips to each purlin, no other fastenings are required. It would seem to be an improvement to nail the upper edge of each sheet directly to the purlins.

Figs. 8 and 36 show the method of attachment when iron purlins are employed. Four iron clips are soldered to the bottoms of each sheet, which engage with the purlins as shown. These methods of fastening are said to be satisfactory, even in localities where high winds are common. The sheets may be easily removed without injury and carried to other buildings. Fig. 36 shows the manner of forming the ridge, as well as the engagement of the retaining clips with the purlins. A strip of heavy zinc is soldered at intervals of 10 in. to the ends of the sheets. Over the strip is turned, in sections of 6 ft., a ridge piece of heavy zinc. The several sections overlap for several inches, forming a sufficient protection.

Tiles.—These may be square, hexagonal or diamond shaped and stamped with ribs, scales or any other ornamental figures. When used on dwelling houses they are made usually 10½ in., 13½ in. and 17 in. square and of No. 13 zinc; when used on large roofs they are made 23½ in. and 29 in. square, and are then made of No. 15 zinc. Tiles may be laid on any roof having a slope of at least 45°. They are particularly valuable when used on Mansard roofs. Fig. 13 shows some of the possibilities for ornamentation. Tiles are very easily laid by any metal worker, and are always laid on sheathing, which need not be perfectly smoothed.

The attention of the roofer must first be directed to the work in the gutters, valleys, flashings about chimneys, and other openings. If the gutter sheet extends up on the roof slope, care must be taken to have the lapped edge made precisely parallel to the ridge pole, the upper edge of the strip being lapped over to form engagements for the tiles, and held down by clips. Its width need not be over 3 in., but it must sometimes be made wider at points, when the eaves are not parallel to the ridge. The cornice generally conceals such irregularities as would be very marked near the ridge, if not corrected. If the eaves are above the gutter and are parallel to the ridge, the strip of sheet zinc may be dispensed with, and the lower edges of the tiles bent over the sheathing and nailed to it. The first tiles laid must be half tiles.

They are held in position by turning under their lower edges and engaging them with a strip or by using clips. These clips are firmly nailed to the sheathing. Lines are now drawn on the roof to serve as guides to the roofer. The succeeding tiles are engaged, by means of their under-folded lower edges, with the upper-folded edges of the previous sheets; the clips are attached and nailed. The roofer stops his work at some convenient point within about 12 in. of the ridge, so that he may finish with half tiles. The ridge piece is formed of sheet zinc, the under turned edges engaging with the upper turned edges of the tiles.

Of the various forms of corrugated zinc, only one, technically known as the "doubled-ribbed" system, is laid upon sheathing. By reference to Fig. 11 it will be seen that this system is characterized by a system of double ribs, the ribs being about 1 in. in height and 1 in. apart. The distance between the pairs is about 6 in. The sheets are usually made about 3 ft. square, so that the ribs on each side will come within about 1 in. of the edges. Sheathing need not necessarily be employed, the sheets being laid upon strips, which must be placed at the junctions of the sheets. The position of the strips is regulated by the length of the sheets and the overlap that is to be given, which varies from 2 in. on steep slopes to 6 in. on moderate slopes. The corrugations take up all of the lateral expansion and contraction.

The method of laying this roof is shown in Fig. 11. At the eaves the sheets may be bent over the sheathing and fastened at the lower face of it, or the plan shown in the figure may be followed. Either plan gives satisfactory results. The sheets resting along the end cornices are turned over and nailed, or engaged with clips, as shown. The upper ends of each sheet are firmly nailed to the sheathing, and the following sheet covers the nail heads. The lower end of the following sheet has soldered, on two of the lower faces of the ribs, spurs of stiff zinc about 3 in. long, which slip under the ribs of the preceding sheet, holding it down.

The sides of the sheets engage with each other by side clips, alternately soldered to the upper and lower faces of the outside ribs. These clips are always attached at the factories where this form of roofing is prepared. Where the roofer is called upon to finish his work against brick partition walls, the details are in general similar to those followed in the formation of flashings.

When the sheet systems are employed, the sheets next to the partition wall are bent up for a height of 2 in. to 3 in. against the wall, and are held down to the sheathing by clips, which are made long enough to catch the upturned edges. After the roof is completed, step-flashings are constructed of sheets of zinc 3 ft. in length. They overlap at their joints for 3 in., and their free edges are made to extend over the roof sheets for a distance of 2 in. and are held down by soldering at the end corners and in the center, making a water-tight joint. Fig. 26 illustrates another method of forming the flashings without the use of solder. Where brick walls abut at the upper or lower end, the methods used are similar to the flashing already described.

Gutter sheets must always be soldered at their intersections, and expansion joints must be made at intervals of 25 ft., after either of the methods shown in Figs. 23 and 24, according to the nature of the arrangements of the downfalls. These directions will apply to all forms of sheets used. If the roof is covered with tiles, sheet zinc must be used to make the flashings, their lower edges terminating in a double joint to which the tiles are attached, as described under tile roofs.

Through the kindness of the Vieille Montagne Zinc Co., we are able to give the average surfaces which an experienced zinc worker with a helper can easily lay in one day of 10 hours:

	Sq.Ft.
Ordinary roll cap system:	
Sheets 1.81 m. in length	170
Sheets 1 m. in length	190
Patent roll cap system:	
Sheets 0.81 m. in length	170
Sheets 1 m. in length	190
Corrugated	210
Patent corrugated	190
Zinc tiles:	
Diamond shaped	110
Square shaped—11x11 in.	130
Square shaped—13¾x13¾ in.	150
Square shaped—17x17 in.	180
Square shaped—23½x23½ in.	190
Double ribbed system	190
Fish scales	100
Flat roof—sheets divided from each other by sunken gutters	170
Wall facing, imitationof bricks	140
Wall facing, imitation of stones	170

The above represents average work on medium-sized surfaces, with the average number of chimneys and other interruptions of the roof's continuity. On large roofs, the average can be easily increased to nearly double the above; while on roofs with more than the average number of interruptions the above average will be decreased.

The table on page 629 shows the amonnts of material required, and the cost of materials and laying in Europe and New York. The prices given for Europe are the regular list contract prices of the roofing companies for which contracts can be made today, when spelter is selling in London for $3.63 and sheet zinc for $4.03 per hundred pounds. The New York prices are based upon the selling prices for Nov. 1, 1895, when spelter sold in that city for $3.90 per hundred and sheet zinc for $5.75; spelter now sells for about $3. In estimating the cost of laying zinc roofing in New York, the European prices for the same work have been taken and increased 50% to allow for the difference of the prices of labor in the two countries. It will be observed that the rollers of sheet zinc market their product in this country at an advance of $1.85 per hundred pounds, while the European rollers are willing to accept an advance of but 40c. per hundred. In comparing the cost of zinc roofing with other materials it is believed that fairness to the metal demands an estimate based upon prices near what they should be; we have therefore added a final column for an estimate, based upon an advance of 50% only in labor and rolling, including profits, which we believe can be accomplished in this country.

Examination of the following tables shows that the cost of a zinc roof in Europe is about the cost of a tin-plate roof in the United States. The real economy of the zinc roof cannot, however, be clearly seen without comparing the various materials with reference to cost of repairs and durability, as well as first cost. The following table contains estimates, which have been carefully prepared after due consultation with parties familiar with the subject, and while we do not claim that they are absolutely accurate for all parts of the United States, they are nearly so:

	Zinc	Tin	Slate	Gal. Iron	Tiles	Lead	Copper
Cost per square, including cost of laying............	$11.75	$8.85	$10.50	$5.75	$12 50	$21 00	$30.00
Repairs in 30 years.	1.15	11.25	3.50	11.50	2.50	...	...
Interest, 6%, on cost, 30 years.....	21.15	16.75	19.90	11.35	22.50	37.80	54.00
Interest, 6%, repairs, 15 years....	1.00	10.12	3.15	10.35	2 25	...	
Total..........	$35.05	$46.87	$37.05	$38.95	$39.75	$58.80	$84.00

In the item for repairs for the tin roof we have assumed it would last for 30 years, provided it was painted every two years at a cost of 75c. a square. In some localities it need be painted only every three years. We have not, however, allowed for the soldering of the tin roof, usually necessary, from time to time; this constitutes all of the repairs on zinc roofs. The differences are more marked than the figures indicate, for, at the expiration of 30 years, the tin roof, as well as that made of galvanized iron, must be renewed; the slate roof may or may not be good for another 30 years, but the zinc roof will be good for 50 more at least. Slate and tile roofs require heavier framings, and this is not included in the estimates.

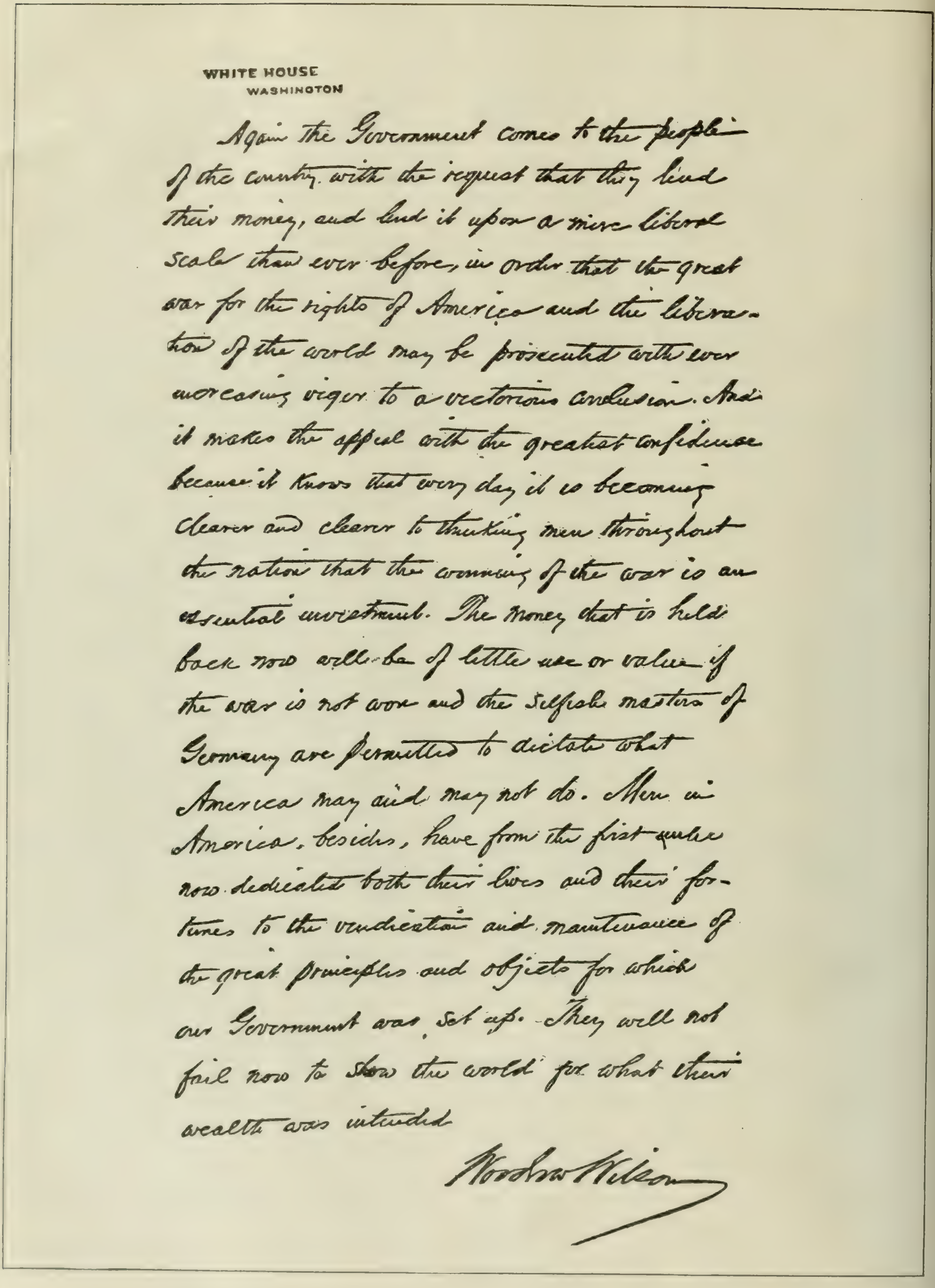
Zinc, when used for roofing, is exposed only to the chemical effects of the ordinary atmospheric constituents. Zinc decomposes pure water with the formation of zinc hydrate and the evolution of hydrogen gas. The reaction is not, however, continuous, as the zinc speedily becomes coated with a protecting envelope of insoluble hydrate, destroying the contact of the metal and water, when further action must cease. Unlike some of the other useful metals, the oxygen of the hydrate does not transfer itself, or penetrate to the underlying metal, so that, with the exception of the alteration of this thin pellicle, zinc may be preserved indefinitely in pure water. If chips of zinc are placed in contact with copper turnings in water, the zinc is rapidly attacked, hydrogen being evolved. If the water contains impurities, such as saline substances, the zinc is more rapidly attacked, since the hydrate is soluble in such, or acid solutions.

Moist air, deprived of carbonic acid, attacks zinc, but very slightly unless some less oxidizable metal is placed in contact with it, whereby a galvanic couple, with the zinc as the negative pole, is formed. Moist air containing carbonic acid forms a grayish coating of the hydrous carbonate of zinc, which adheres with great tenacity to the metal and becomes harder than the metal itself. It cannot be removed without employing a steel scraper, or moderately strong acid solvents. This coating forms a natural paint or varnish for the zinc, completely protects the underlying metal from further oxidation and constitutes one of the most valuable features of zinc roofs, since no artificial paint is required. If it were not for the small amounts of acid present in atmospheric waters and the abrasion due to their fall and flow over the sheets, the roof would be everlasting. The wearing away due to these causes is slight, as shown by experience and careful observations and experiments. Pettenkoffer examined a roof at Munich, and found that during 27 years' exposure, 8.38 g. of zinc had been oxidized on each square foot (Bavarian) of surface, of which about one-half had been carried away. The zinc had been penetrated for a distance of 0.0005 of a meter. From this observation, we find that a roof made of No. 13 zinc would require 400 years for complete oxidation, and that one made of No. 18 zinc would require 723 years.

The chief solvents existing in the atmospheric waters are carbonic and sulphurous acids. To determine their effects, we exposed, for 100 days, 10 pieces of sheet zinc, each 1 ft. square, to the action of 5 l. of water, containing 0.5 g. of sulphurous acid and an equal quantity of carbonic acid to the liter. Previous to immersion the plates were coated with the hydrous carbonate by exposing them for some time to the action of the atmosphere. Nearly every day the vessel containing the plates was gently shaken, care being taken to prevent them from rubbing against each other. At the expiration of the period, the amount of zinc dissolved was accurately determined, after the usual methods, and was found to equal 0.2266 g., corresponding to a removal in one year of 0.00000244 m., from which we estimate that No. 13 zinc would require 303 years, and No. 18 zinc 548 years for complete solution in atmospheric waters, containing such large amounts of acids. It is, perhaps, needless to say there are no records of atmospheric waters containing so high a proportion as that named above.

COST OF ZINC ROOFING

Style of Roofing	Size of Sheets	Number of Clips per Sheet	Gage of Zinc	Weight per 100 Sq.Ft. Including Clips, Lb.	Cost of Materials in Europe	Contract Prices for Materials and Laying in Europe	Present Cost of Materials in New York	Estimated Cost of Laying in New York, Including Cost of Materials	Estimate of Total Cost of Materials and Laying in New York by Development of Industry
Ordinary roll cap................	36 in. × 96 in.	No. 1, 2 No. 2, 6 No. 3, 1	No. 13	133	$5.36	$8.37	$7.65	$12.15	$10.48
			No. 14	115.5	6.26	9.26	8.37	12.87	11.05
Patent roll cap..................	36 in. × 96 in.	No. 1, 2 No. 13, 5 No. 3, 1	No. 13	138	5.56	8.57	7.93	12.43	10.71
			No. 14	151	6.08	9.08	8.68	13.18	11 29
Patent double ribbed............	39⅜ in. × 51½ in.	7	No. 13	140.5	5.66	9.30	8.11	13.57	10.82
			No. 14	155.5	6.27	9.91	8.86	14.32	11.50
	Distance between each pair of ribs, 13 in. Number of sheets per square, 7.44								
Tiles, square....................	13⅜ in. × 13⅜ in.	No. 10, 1	No. 13	185.5	8.28	10.45	10.66	14.06	12.21
	23¼ in. × 23¼ in.	No. 11, 2	No. 13	150	6.65	9.50	8.62	12.89	11.39
Tiles, hexagonal.................	10⅛ in. × 16 in.		No. 13	188	8.33	10.65	10.81	14.29	12.19
Tiles, fish-scale.................	24⅝ in. ×	No. 30, 6 No. 4, 4	No. 13	151	8.14	12.20	12.22	18.39	15.61
Ordinary corrugated...........	29½ in. × 83½ in.	Iron framing No. 26, 6	No. 15	171	7.23	9.84	10.34	14.25	11.02
		Wood framing No. 27, 6 No. 29, 6	No. 15	175	7.40	10.10	10.58	16.13	13.00



WHITE HOUSE
WASHINGTON

Again the Government comes to the people of the country with the request that they lend their money, and lend it upon a more liberal scale than ever before, in order that the great war for the rights of America and the liberation of the world may be prosecuted with ever increasing vigor to a victorious conclusion. And it makes the appeal with the greatest confidence because it knows that every day it is becoming clearer and clearer to thinking men throughout the nation that the winning of the war is an essential investment. The money that is held back now will be of little use or value if the war is not won and the selfish masters of Germany are permitted to dictate what America may and may not do. Men in America, besides, have from the first until now dedicated both their lives and their fortunes to the vindication and maintenance of the great principles and objects for which our Government was set up. They will not fail now to show the world for what their wealth was intended

Woodrow Wilson

National Exposition of Chemical Industries

TO AN ENGINEER, a compact technical exhibit has a distinct value in broadening his outlook and giving him an accurate conception of the relation is own work to that of the industry as a whole. It n the nature of a coördinating and balancing force h is perhaps not appreciated to the degree that it uld be. In both a technical and popular sense, the ional Exposition of Chemical Resources, held in New k, at the Grand Central Palace, in the week begin- g Sept. 23, was a marked success.

he dominant feature of the exposition was the atten- n paid to those notable expansions in industrial and nical effort which have directly resulted from the im- se of the war; and the significant bull's-eye mark, nicating that the material or apparatus in question had n produced since the war began, was seen on all sides. better advertisement was necessary as an illustration the enormous strides made in the chemical and allied ustries in the United States.

ll three floors were completely filled with exhibits, ich showed a praiseworthy achievement on the part the managers and promoters of the exposition in at- cting and securing the coöperation of so large a nber of exhibitors. The varied character of the prod- s shown was a notable feature, and the general angement was admirable.

The progress made in the dyeing industry is perhaps indirect interest to the mining fraternity, but the iting engineer could hardly have left the building thout the conviction that it was in this industry that most notable advances had been made; that intricate oblems had been attacked with an ingenuity and per- erance that was in itself an inspiration. The exhibits m manufacturers of ceramics, laboratory glassware, rcelain and refractory materials were representative an industry that is rapidly making the United States, these respects, independent of all other countries.

Acid-resisting materials such as chemical stoneware, riron, SidiO, Bario, hard lead, hard rubber and wood re exhibited in their different manufactured forms. excellent insight into this important branch was tainable.

In mining and metallurgical equipment, operating dels of ball mills, flotation machines, classifiers and ckeners, pressure and vacuum filters, driers, electro- tic separators, and concentrators were interesting tures about which crowds of spectators gathered.

An educational exhibit of the variety of uses to which c might be put was made by the New Jersey Zinc Co. is, as well as the exhibit of the Anaconda Copper ning Co. illustrated the progress which the larger ning companies are making in the utilization of by- ducts and the broadening of their market.

The exhibit of the E. I. du Pont de Nemours Co. was most varied, ranging from artificial leather for auto- biles to toilet articles. It is illuminating to find a npany such as this, whose best-known products go to mine and the battlefield, engaged in miscellaneous emical manufacturing. The Hercules Powder Co. also owed its versatility by exhibiting an array of prod- ts, the names of which, with the exception of potash, foreign to mining and metallurgical textbooks.

Electric furnaces, powdered-coal burning equipment, byproduct coke ovens and a straw gas generator indicated the varied lines of progress that the necessity for economical utilization of fuel is forcing upon our attention.

Not alone were the exhibits of interest, but the many valuable papers that were read and the illustrated descriptions presented helped round out the visitor's acquaintance with advances in chemical technology.

The session on Friday afternoon was a symposium on the metal industries. H. C. Parmelee, managing editor of *Chemical and Metallurgical Engineering*, was chairman of the meeting. Mr. Parmelee, in commenting upon the United States from the standpoint of metal production, said:

> The national advantage of holding premier rank among the world's metal-producing countries has been accentuated by the war. Among precious metals, 60% of the world's production of gold is controlled by Great Britain, mainly in South Africa and Australia. This, together with the further fact that less than 1% of the world's gold comes from European countries, has undoubtedly had a great economic effect in the conduct of the world's business during the war.
>
> The United States holds second rank in the production of gold, but first in silver, producing about 30% of the world's total. Under normal conditions Mexico would be a close second, with Canada, Australia, and Germany following. Russia is unquestionably the leader in platinum, and Colombia next.
>
> In pig iron and steel, the United States easily holds first rank, with an average production in recent years of about 40% of the total. Germany follows, with about 25%. The United Kingdom is third, and France and Russia divide fourth place.

The paper by Alcan Hirsch, of the Hirsch Laboratories, on "Ferrocerium Pyrophoric Alloys," was particularly interesting in that it described how the demands of the war had caused the development of a new industry in the United States. Mr. Hirsch described the preparation of the electrolyte and the electrolyzing of the molten cerium salts, as well as the manufacture of the well-known cerium-iron alloys.

Theodore Swann, of the Southern Manganese Corporation, presented an important paper on the ferromanganese industry and its development within the United States. He stated that in 1914 the United States produced less than 1% of its ferromanganese requirement, but that over 90% would be produced from domestic supplies in 1918; that though the average recovery of manganese from its ores was 73%, there were possibilities of increasing this recovery by careful investigation of the process of reduction. The importance of the electric furnace as a method of manufacturing ferromanganese was indicated. Professor Joseph W. Richards, of Lehigh University, gave an excellent summary of data concerning the ferroalloys, commenting on the ferroalloys of silicon, tungsten, uranium, vanadium, molybdenum and titanium.

An unusual and especially valuable feature of the exposition was the daily journal published by *Chemical and Metallurgical Engineering.* The more important papers were given in full, as well as summaries of progress made in different lines of chemical industry. Illustrations of the exhibits, a directory of exhibitors, and editorial comment made the publication a useful record of events to the visitors and a valuable reference for the engineer who might desire to review at leisure the somewhat crowded happenings of the week.

Events and Economics of the War

The end of the war was brought visibly nearer, when Bulgaria dropped out of the struggle on Sept. 30, after her plea for an armistice had been accepted by the Allies; her lines had been shattered during the week and her territory invaded. Operations by the Allies against other belligerents in the Balkans continue. The Austrians are withdrawing in Albania and the Germans in Rumania, it is reported. The British advance continues in Palestine, 50,000 Turks and 325 guns having thus far been taken by General Allenby. On the Western front, the greatest battle of the war is raging from the sea to the Meuse, and the Hindenburg line is rapidly crumbling under the Allied pressure; simultaneous attacks by the Americans east of Argonne forest and by the French to the west overcame the enemy's main defenses, and, continuing, threaten his communications; the French dominate the Chemin des Dames ridge, the British have entered Cambrai, which is in flames, and the Belgians have advanced to within two miles of Roulers. Brazil has closed its legation in Vienna.

The Fourth Liberty Loan campaign was officially opened on the evening of Sept. 27 by President Wilson, who, in a speech in New York, declared there will be no bargaining with Germany. Drawing of numbers for the draft of men registered on Sept. 12 began in Washington on Sept. 30. The President addressed the Senate on Sept. 30 and urged it to adopt the Woman Suffrage resolution; the suffrage resolution was defeated in the Senate. The regulations for licensing platinum were issued on Sept. 30 by the War Industries Board and became effective the following day.

Fuel Requirements of the United States

According to the U. S. Fuel Administration, the present annual fuel requirements of the United States are about as follows:

The railroads of the country must have 166,000,000 tons; 125,000,000 tons will be required for domestic lighting, heating and cooking; 57,000,000 tons went into coke last year, and a considerably greater amount will be required for this purpose this year; 14,000,000 or 15,000,000 tons will be required to coal ships; public utilities will consume 35,000,000 tons; 13,000,000 tons will be used by the coal mines themselves to develop power, and 5,000,000 tons was estimated to be the amount needed for producing ice during last summer.

Some industrial needs are: Steel and rolling mills, 24,000,000 tons; brick, tile and clay products, 11,000,000; cement manufactories, 8,000,000; paper mills, 7,500,000; foundries and machine shops, 7,500,000; cotton mills (with Southern mills using wood wherever practicable), 5,000,000; meat packing and canning, 4,000,000; chemical factories, 3,250,000; glass makers, 3,000,000, and woolen mills, flour mills and lumber mills, 2,000,000 tons each.

Iron and Steel Prices Continued

The President has approved the agreement th was made by the price-fixing committee of the W Industries Board with the representatives of the ir ore, pig-iron and steel interests in regard to the co tinuance until Dec. 31 of the prices on iron ore and pi iron and iron and steel products. Maximum prices no prevailing on these commodities are to be continued effect for the rest of the year 1918, with the followir exceptions, as given in the official announcement:

1. Lake Superior Iron Ore—Base prices of Lake Superior ir ore delivered to lower lake ports are increased 25c. per gross t on and after Oct. 1, 1918, subject to the following conditio These increased prices are based on the rail freight rates no in effect and on the present lake rates, and in the event of a increase or decrease in either rail or lake rates said prices sh be increased or decreased accordingly on all deliveries made du ing the continuance of such increased or decreased freight rate

2. Pig Iron—The base price on basic iron is increased to $ f.o.b. furnace. The base price on No. 2 foundry iron is i creased to $34 f.o.b. furnace. The price of standard bessem iron is fixed at $35.20 f.o.b. furnace. The above prices are su ject to the following changes from previous practice as regar delivery: (a) Pig iron produced in the Virginia, Tennessee, a Birmingham districts and the scattered districts south of t Ohio and Potomac rivers, including furnaces at St. Louis, M but not including furnaces bordering on the Ohio River, sh be sold on an f.o.b. Birmingham, Ala., basis. (b) Pig iron pr duced in the Eastern district, that is, from all blast furnac situated east of the Allegheny Mountains and north of the Potom River, shall be sold on an f.o.b. Pittsburgh basis. (c) Pig ir from all other producing districts or furnaces shall be sold f.o. furnace, as heretofore.

No new contracts calling for delivery of any of the abo commodities or articles on or before Jan. 1, 1919, are to speci a price unless coupled with a clause making the price subje to revision by any authorized U. S. Government agency, so th all deliveries after that date shall not exceed the maximu price then in force, although ordered or contracted for in t meantime.

All manufacturers and producers are expected observe the maximum prices thus fixed.

Sweden Seeks Oil From Shales

The production of oil from oil shales or slates is r ceiving careful attention in Sweden, as in the Unite States. Shortage of oils of all kinds, for which w conditions are responsible, has been one of the greate difficulties encountered in the former country. A résum of the situation there, in this regard, has recently a peared in *Commerce Reports*, being reprinted from Copenhagen newspaper. According to this, an alu shale is found in Sweden, especially in western Gotlan that is comparatively rich in oil and gives 5 to 6% crude oil by distillation. The Scotch oil shales are sa to yield about 8% by weight, but the Swedish formati can be more easily mined, it is claimed.

To produce an amount of crude oil equivalent to t 14,000 tons normally imported each year in the pr war period by Sweden would require about 280,000 to of the Swedish shale, it is reported. The country al imports normally about 128,000 tons of refined oil, equi alent to an additional 3,700,000 tons of shale. The tot mports are therefore equivalent to a total yearly production of 4,000,0000 tons of shale. The crude oil produced from this shale is said to yield about 70% of istilled oil much like petroleum in composition. The ndustry has been brought from the experimental to he practical stage and a company has been formed o develop and promote it.

Eight-Hour Day for U. S. Steel

The United States Steel Corporation has adopted the ight-hour basic day. This change in its policy became perative on Oct. 1, and affects the greater part of the 75,000 men engaged at the corporation's mills, mines, urnaces and transportation organizations. The eight-hour day will now be the basis for calculating wages nd working periods for these employees, and it is expected that increases in wages in some departments will result. Announcement of the new order was made n Sept. 24 by Judge Elbert H. Gary, chairman of the oard. The open-shop plan heretofore in force throughout the works will be continued.

United States Leads in Ferroalloys

"France before the war led in the production of ferroalloys, particularly as made by the electric process," says *Iron Age* editorially in its last issue. "Paul Girod was a pioneer in this field. His products were introduced n all steel-making centers of the world. Germany occupied a less prominent position, but her work in this line was growing in importance, particularly as regards control of the tungsten resources of Great Britain and as a seller of ferrotungsten to other countries. Great Britain had not yet awakened to the possibilities of ferroalloys, and the United States was not very far ahead of her.

"A striking transformation has taken place in the last four years. Today without doubt the United States leads the world in the production of all kinds of ferroalloys. More ferromanganese is produced here than in any other country, and it is not improbable that we may partly displace Great Britain as an exporter to Canada. These exports recently have grown larger with each month. In electrically made ferromanganese, rapid strides are being made here. And in ferrosilicon, both high and low grades, decided progress has been made recently in the electric grades.

"In other ferroalloys, particularly those of tungsten, chromium and molybdenum, as well as of vanadium and uranium, development has been noteworthy in this country as the war has progressed."

Henry R. Merton & Company

Henry R. Merton & Co. have been refused a license under the Non-Ferrous Metal Industry Act. This announcement was made by the president of the Board of Trade in the House of Commons on Aug. 6. It is assumed that unless some unexpected development occurs, the company will have to cease trading in the metals comprised within the terms of the act. Sir Albert Stanley, president of the Board of Trade, stated that formerly the Metallgesellschaft of Frankfurt held a large number of shares in Henry R. Merton & Co., but it holds none now. The Australian branch of the firm of Merton has been closed down. The present directors of the company are Messrs. S. Baer, H. Gardner, W. Gardner, O. Lang, E. R. Merton, and M. Wilson, all of whom are British subjects, but German subjects have an indirect financial interest in the company, says the *Ironmonger*, for Merton & Co. own 11,875 shares in a Swiss company which is believed to be under German control.

With the consent of the British government, Merton & Co. have recovered the whole of their shares held by enemies in return for the surrender of their own holdings in the Metallgesellschaft, but it now appears that although it has purged itself of its direct enemy associations, the company still falls under the first schedule of the Non-Ferrous Metal Industry Act. That schedule, under six headings, recites conditions, any one of which, if found applicable, precludes the grant of a license, unless the Board of Trade deems it expedient to grant one. Apparently, at present the board does not do so, and as Merton & Co. admittedly come within the conditions laid down in the first schedule, they have no right of appeal under Clause 5 of the act to a divisional court of the high courts. Such an appeal can be lodged only when there is a difference of opinion between the applicant and the Board of Trade as to the first schedule applying to the circumstances of his particular case.

Denmark To Receive Metal Supplies

Copper, iron, steel and other commodities to the extent of 352,895 metric tons annually will be exported to Denmark, according to Danish-American commercial and shipping agreements, that were successfully concluded and signed on Sept. 18 by the War Trade Board and a special Danish mission, after prolonged negotiations in Washington. The quantities of mineral, metal and related commodities included in the agreement are given as follows in metric tons:

Kerosene, gasoline, lubricating oils and greases, crude petroleum and dark refuses, 80,000, including not over 7000 tons of lubricating oils; copper and manufactures of copper, including brass, 3500; brass wire, 34; brass wire screens for paper making, 20; brass screws, 36; iron and steel products, 150,000; manganese dioxide, 600; nickel and manufactures, 14; antimony, 25; aluminum and manufactures, 132; lead and manufactures, 3000; tin and tin plate, quantity to be later agreed upon; zinc sheets, 300; zinc and manufactures, 2700; silver and manufactures, 14; sulphur, 270; zinc, lead and other paints, 2500; graphite, 100; asbestos (not crocidelite), 275; asphalt (not petroleum residue), 3250; talc, 150.

In addition to the above, sundry chemicals are included in the agreement, and various instruments for technical and scientific purposes, as well as machinery and parts, if approved. No articles so imported into Denmark are to be directly or indirectly reëxported to the Central Powers, under the terms of the agreement, nor to any neutral country where such exportation will release any commodity whatever for export to Germany or her allies.

Iron Mines in Tasmania may be purchased by the Australian Government to retain some control over the iron industries. Premier Watt announced on Aug. 29 that an option was being acquired to purchase the Blythe River iron mines for $550,000, with this end in view.

Remember the Comfort Fund of the 27th Engineers.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

War-Minerals Bill Ready for Signing

Owing to the active part taken by the President in urging the passage of the War-Minerals Bill, it is regarded as probable that he will sign the bill without delay. No intimation has come from the White House as to whom is being considered for administering the act. The prevailing opinion is that the powers will be divided between the War Industries Board and the Bureau of Mines. It is regarded as logical that matters of allocation and price-fixing would go to the War Industries Board, although the opinion has been expressed that a separate administrator will be named.

The House made little objection to the radical changes made in its bill by the Senate. In fact, Representative Stafford, of Wisconsin, declared that "the Senate bill is far superior and much more conservative than is the House bill." He said the House bill was "vicious in providing a guaranteed price on certain metals, regardless of the cost of production."

Such criticism as was expressed concerning the action of the conferees in departing so widely from the expressed opinion of the House was aimed at the increase in the appropriation from $10,000,000 to $50,000,000. Representative Mondell, of Wyoming, said "We can only approve the measure in the hope that conservatism will govern and control in the execution of this law. No doubt it can be made useful and helpful to the end that we shall secure the benefits of increased production of these minerals without entailing great losses on the Treasury or improperly interfering with orderly development with private capital."

In the course of the debate on the conference report, the following colloquy in regard to copper took place:

Mr. Slayden: Copper is one of the things that the Government does require in time of war, and Germany would give her very soul for plenty of it right now. It is true the Government does not propose to take over the copper mines. But the Government has done this thing, which I think is entirely unfair: It has compelled the copper producers to sell their product under the market value.

Mr. Foster: I think the copper producers of the country have not lost any money, I will say to the gentleman from Texas, on the price that the Government has fixed for copper.

Mr. Slayden: That is not the question. I think the gentleman will admit that the producer of any useful commodity, produced in an honorable way, is entitled to the market value.

Mr. Foster: He is entitled to reasonable compensation.

Mr. Slayden: He is entitled to the market value, in my judgment. That is the way I view cotton, and my friend from Arkansas, Mr. Wingo, and my friend from Tennessee, Mr. Garrett, no doubt, agree with me in that particular.

Mr. Foster: That is a question that we cannot settle here.

Mr. Slayden: For some time copper has been quoted in London at £122 per ton, which figures out to be 30c. lb., as I make it, while producers in this country were compelled to sell their copper at 23½c. a pound.

Mr. Wingo: I beg the gentleman's pardon. The producers of copper have been given a price which they themselves know is highly remunerative. I have been protesting against allowing them more than they were entitled to if the English price was made the basis.

Mr. Slayden: It was not fixed by themselves. They protested against the price. The English price, less freight, would be more profitable to the producers.

Mr. Foster: They may not be getting all they want, but they are getting all they ought to have.

Mr. Slayden: I do not think they are getting all they ought to have. I think they should get the market value.

Judging from the mail being received at the Bureau of Mines, a general impression seems to prevail in the mining districts that substantial aid is to be extended to those who desire to undertake the recovery of any of the war minerals. Prospectors have written the Bureau asking for everything from a donkey to a frying pan. Officials of the Bureau point out that the purpose of the bill is not to help mining but to secure supplies for the war. If mining or metallurgical enterprises need any form of subsidy or help, it is pointed out, separate legislation must be obtained.

Lead Rationing Working Well

The War Industries Board reports that the process of rationing lead is going along satisfactorily. The supply on hand at consumers' plants is sufficient for immediate needs. Government contracts are well taken care of. The situation has become no worse, and, if anything, it is a little better.

An additional demand on lead is being made by the use of foil in replacing tin tobacco containers. To conserve tin, a paper container is being used, which, however, requires the wrapping of the tobacco in lead foil. Even before this new demand, 4½% of the entire lead production of the country was going into foil.

Zinc Substituted for Other Metals

Makers of less essential products who use aluminum are being asked by Pope Yeatman to substitute ribbon zinc or other metals for aluminum wherever possible. The Eastman Kodak Co. has been particularly active in reducing the amount of aluminum used. Its use is also being restricted in cooking utensils, fireless cookers, toys, novelties, ornaments and in vacuum cleaners.

Considerable success is reported in the substitution of zinc for other metals. It now is being used in quantity for coffin linings, for boxes to be used as containers and in the manufacture of cans. The zinc rolling mills, Mr. Yeatman states, are showing the most commendable enterprise in their work in this direction.

Accident Problems Studied

Among the subjects considered at the fifth annual meeting of the International Association of Industrial Accident Boards and Commissions, which was held in Madison, Wis., Sept. 24 to 27, were the need for uniform reports of exposure to accidents; the use of standard accident and compensation tables; surgical treatment to prevent and to minimize permanent disabilities; compensation in cases of preëxisting disease aggravated by accident; crippled workers, and conservation and reclamation in the industrial army.

Regulations Issued for Licensing Platinum

MORE than 150,000 licenses must soon be issued under the regulations for handling platinum, which were published on Oct. 1. C. H. Conner, chief of the platinum section of the War Industries Board, made public with the regulations an explanatory statement, which, incidentally, is the first to be issued by the platinum section. Mr. Conner's statement is as follows:

The act of July 1, 1918, (Public No. 181), limiting the sale, possession and use of platinum, iridium and palladium and compounds thereof, provides that these metals are made subject to certain terms, conditions and limitations of the Explosives Regulations Act of Oct. 6, 1917.

Under Sec. 21 of the Explosives Act, the platinum section of the War Industries Board, Washington, D. C., has been created the ncy to which all matters coming under this act pertaining to platinum, iridium and palladium and compounds thereof must be erred for license, details of which are set forth in a special ular.

The rules and regulations pertaining to this act have been pared with much care and labor by a committee consisting representatives of the Bureau of Mines, the U. S. Geological rvey, the Bureau of Standards and the War Industries Board.

n conformity with the authority delegated to the platinum tion of the War Industries Board to administer the act, this portunity is taken to outline, in a general way, the purposes be accomplished and the policy to be pursued.

The two main purposes to be served by the enforcement of is act are:

First, the securing of a complete survey of the supplies of the platinum, iridium and palladium of the country through inventories of these metals, to be furnished at the time applications for licenses are submitted.

Second, to assist the Government in developing an adequate supply of these metals necessary for war purposes and other essential uses.

It will be the policy of the War Industries Board to disturb as tle as possible, consistent with the administration of the act d the objects to be accomplished, the trades, industries, in- itutions and persons affected by the regulations.

Few people realize the importance of platinum in the war ogram. Platinum is one of the agencies employed, in very rge quantities, in the production of sulphuric and nitric acid, ecessary ingredients of explosives. It is also used in the manu- cture of scientific and surgical instruments, such as cautery tips, ypodermic needles, etc.; electrical measuring instruments; X-ray ubes; fuses for firing the charges in guns of large caliber; con- acts for telephone, telegraph and wireless systems; thermo- ouples for the regulation of furnaces in the heat treating of hells, guns, etc., and winding electric furnaces. Iridio-platinum ontact points are absolutely essential for magnetos operating eroplane engines; also for the successful operation of trucks, ractors and tanks on the battlefield. Chemical laboratories are ependent on platinum in making analyses and in furthering scien- fic development. The dental industry, which vitally affects the ublic health, requires a large amount of platinum and palladium.

The requirements, therefore, for platinum for war and essential urposes are large, and the supply is limited. The shortage is ot at present critical, but may become so in the near future. he facts are, there is sufficient platinum on hand to carry the overnment for a limited time, but there is no reserve stock. It is mportant—indeed a matter of vital necessity—that a reserve e built up for the future.

Russia has been the principal source of supply in the past. he chaotic conditions there have practically cut off that source. therefore becomes necessary to develop an internal source of upply. Large quantities of platinum have been brought into the ountry in the past, and have found their way into trades, in- ustries, chemical laboratories, etc. It is from these sources that he Government must largely depend for its requirements in the uture.

In the administration of this act, the patriotic coöperation and ssistance of all persons affected thereby is earnestly requested.

The Explosives Act was amended on July 1 by the ad- ition of the following provisions:

Provided, That any license issued under the act of Oct. 6, 1917, ay be canceled by the director of the Bureau of Mines if the erson to whom such license was issued shall, after notice and n opportunity to be heard, be found to have violated any of the rovisions of the act.

Provided further, That platinum, iridium, and palladium and compounds thereof are hereby made subject to the terms, conditions and limitations of said act of Oct. 6, 1917, and the director of the Bureau of Mines is hereby authorized, under rules and regulations approved by the Secretary of the Interior, to limit the sale, possession, and the use of said material.

The regulations which will govern the handling of platinum were prepared by a committee consisting of Hennen Jennings, Bureau of Mines, chairman; C. L. Parsons, Bureau of Mines; C. H. Conner, War Industries Board; J. M. Hill, U. S. Geological Survey; and W. F. Hillebrand, Bureau of Standards. The regulations follow:

The following regulations are hereby promulgated under the provisions of the act of Oct. 6, 1917 (40 Stat., 385), as amended by the act of July 1, 1918 (Public, No. 181), authorizing the director of the Bureau of Mines, under rules and regulations approved by the Secretary of the Interior, to limit, during the period of the war, the sale, possession, and use of platinum, iridium, and palladium, and compounds thereof:

Sec. 1. The War Industries Board is hereby designated under Sec. 21 of the act of Oct. 6, 1917, and the President's proclamation of Oct. 26, 1917, as the agent of the director of the Bureau of Mines in the execution of the regulations as hereinafter indicated.

Sec. 2. From and after the date of these regulations, under the penalties prescribed by Sec. 19 of the act of Oct. 6, 1917[1], no person[2] shall:

Par. a. Use any platinum or platinum scrap, iridium or iridium scrap, palladium or palladium scrap, and/or compounds thereof, in the manufacture, alteration, or repair of any ornament or article of jewelry.

Par. b. Manufacture for use in dentistry any metal, metal parts, or alloys containing more than 20% by weight of platinum or 40% by weight of platinum, iridium, and/or palladium combined, or manufacture supplies therefrom.

Sec. 3. From and after the date of these regulations, under the penalties prescribed by Sec. 19 of the act of Oct. 6, 1917, no person shall without a license—

Par. a. Purchase, sell, barter, or deal in unmanufactured platinum, iridium, or palladium, or compounds thereof (including crude, scrap, filings, polishings, or sweeps), except that sales may be made without a license to an authorized agent of the United States or to a licensee authorized to purchase the same; or possess for more than 90 days after the date of these regulations one ounce troy, or more, of such unmanufactured platinum, iridium, palladium, or compounds thereof.

Par. b. Possess, use, sell, purchase or barter, for purposes connected with his business, platinum, iridium, palladium, or compounds thereof (except that sales may be made without license to an authorized agent of the United States, or to a licensee authorized to purchase the same), if such person be engaged in—

No. 1. Producing platinum, iridium, or palladium, or compounds thereof, by mining.

No. 2. Producing sulphuric acid, nitric acid, or other chemical products where platinum, iridium, palladium, or compounds thereof are used in such production.

No. 3. Importing or exporting platinum, iridium, or palladium, or compounds thereof.

No. 4. Producing platinum, iridium, or palladium, or compounds thereof, either as a primary product or as a byproduct of smelting or refining.

No. 5. Manufacturing electrical appliances and/or parts thereof containing platinum, iridium, or palladium, or compounds.

No. 6. Manufacturing surgical appliances and X-ray apparatus containing platinum, iridium, or palladium, or compounds thereof.

No. 7. Manufacturing chemical apparatus and reagents of all kinds containing platinum, iridium, or palladium, or compounds.

No. 8. Conducting or operating chemical laboratories in which platinum, iridium, or palladium, or compounds thereof, are used.

No. 9. Manufacturing scientific instruments containing platinum, iridium, or palladium, or compounds thereof.

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[1] Sec. 19 of the act of Oct. 6, 1917, is as follows:

"That any person violating any of the provisions of this act, or any rules or regulations made thereunder, shall be guilty of misdemeanor, and shall be punished by a fine of not more than $5000, or by imprisonment not more than one year, or by both such fine and imprisonment."

[2] The word "person," for the purposes of these regulations, shall be construed in accordance with the definition contained in Sec. 1 of the act of Oct. 6, 1917, which is as follows:

"That the word 'person' when used herein shall include states, territories, the District of Columbia, Alaska, and other dependencies of the United States, and municipal subdivisions thereof, individual citizens, firms, associations, societies, and corporations of the United States and of other countries at peace with the United States."

No. 10. Manufacturing and/or distributing dental supplies containing platinum, iridium, or palladium, or compounds thereof.

No. 11.. Manufacturing and/or dealing in jewelry containing platinum, iridium, or palladium or compounds thereof.

No. 12. Manufacturing or producing any article or product not mentioned above where such business requires more than one ounce troy per month of platinum, iridium, or palladium or compounds thereof.

Sec. 4. Applications for licenses shall be made under oath to any licensing agent duly authorized under the act of Oct. 6, 1917, as provided in the regulations issued under this act.

Sec. 5. Every applicant for a license will be required to submit with his application a sworn inventory of all platinum, iridium, or palladium or compounds thereof in his possession or control; and every licensee will be required to submit at such times as may be designated by the War Industries Board a sworn inventory of his holdings of platinum, iridium, or palladium or compounds thereof in whatever form they may be.

The director of the Bureau of Mines, at the request of the War Industries Board, may at any time require from any user or possessor a detailed sworn inventory of any and all materials held by him containing platinum, iridium, palladium or compounds thereof, and such inventory must be furnished promptly upon receipt of such requirement.

Sec. 6. All licenses shall be issued in the name of the director of the Bureau of Mines and countersigned and delivered by the War Industries Board, and shall be and remain subject to the following conditions:

Par. a. Each license shall contain such appropriate conditions as the Bureau of Mines, through the War Industries Board, may impose.

Par. b. The Bureau of Mines, through the War Industries Board, may change the conditions of the license from time to time, as it may deem necessary.

Par. c. Records shall be kept by each licensee of all his sales, purchases and other transfers of platinum, iridium, or palladium or compounds thereof, and of articles containing platinum, iridium, or palladium or compounds thereof, with the names and addresses of the purchasers, sellers, and/or transferees, and the quantities involved, which records shall be open at all reasonable times to the duly authorized representative of the director of the Bureau of Mines.

Par. d. Any and all platinum, iridium, or palladium or compounds thereof, acquired under the authority of such license, shall be used strictly for the purposes and in the manner stated in such license.

Par. e. Upon request of the War Industries Board, the licensee shall report the prices at which sales of his products containing platinum, iridium, or palladium or compounds thereof are being made, and the right to prohibit further sale of such articles at prices deemed exorbitant by it is reserved to the War Industries Board.

Sec. 7. Any licenses issued hereunder may be revoked for violation of any of these regulations, or for violation of any of the conditions contained in such license, or if such revocation is deemed necessary or advisable for purposes of the national security and common defence.

Sec. 8. The War Industries Board will, upon request, furnish a list of Government agents or licensees authorized to purchase platinum, iridium, or palladium or compounds thereof. Neither the United States nor its representatives will assume any responsibility, financial or otherwise, where sales are made to licensees.

Sec. 9. The prices at which platinum, iridium, or palladium will be purchased by a duly authorized agent of the United States or by such licensee as may be authorized to purchase or sell platinum, iridium, or palladium or compounds thereof, will be such prices as may be determined by the proper Governmental agency authorized to determine such prices.

Sec. 10. Whenever such Government agents and such licensees as may be authorized to purchase platinum, iridium, or palladium or compounds thereof, shall refuse to purchase the same from any person who is compelled by these regulations to sell the same, or is forbidden by these regulations to possess or use the same, then such person shall promptly notify the platinum section, War Industries Board, Washington, D. C.

Sec. 11. These regulations shall not operate to relieve any person upon whom an order requisitioning platinum, iridium, or palladium or compounds thereof may have been or may hereafter be served, from any obligation imposed upon him by such order.

Sec. 12. These regulations are supplemental and amendatory to the regulations heretofore issued under the Explosives Act of Oct. 6, 1917.

The regulations are issued over the signature of Van. H. Manning, Director of the U. S. Bureau of Mines, and Franklin K. Lane, Secretary of the Interior. They were approved Aug. 17, 1918.

September Mining Dividends

The total amount disbursed as mining dividends i September, 1918, as was to be expected, showed marked decrease from the payments in the correspond ing month last year. However, only two or three com panies found it necessary to pay less this quarter tha they did in the preceding one, and the decreases wer not great. The porphyry companies were among thos which did not cut, from which it would appear that th increase in the price of copper has helped to counte balance the prevailing high costs and other disturbin conditions.

United States Mining and Metallurgical Companies	Situation	Per Share	Tot
Ahmeek, c	Mich.	$2.00	$400,0
Allouez, c	Mich.	1.50	150,0
Am. Sm. and Ref., con.	U. S.-Mex.	1.50	914,97
Am. Sm. and Ref., pfd	U. S.-Mex.	1.75	875,0
Argonaut, g	Calif.	05	10,0
Caledonia, l.s	Ida.	.03	78,1
Calumet & Arizona, c	Ariz.	2.00	1,284,9
Calumet & Hecla, c	Mich.	15.00	1,500,0
Chino, c	N. M.	1.00	869,9
Cons. Ariz. Sm., c	Ariz.	.05	83,1
Copper Range, c	Mich.	1 50	591,5
Cresson Cons., g	Colo.	.10	122,0
Eagle & Blue Bell, l.s	Utah	10	(a) 89,31
Eastern Talc	Vt.	15	10,43
Electric Point, c	Wash.	.03	23,81
Federal Min. & Sm., pfd	U. S.	1.75	209,75
Golden Cycle, g	Colo.	.03	45,0
Hecla, l.s	Ida.	.15	150,0
Homestake, g	S. D.	.50	125,58
Internat. Nickel	U. S.-Can.	1.00	1,673,3
Iron Cap, c	Ariz.	.25	36,2
Isle Royale, c	Mich.	.50	75,0
Kennecott, c	....	1.00	2,787,02
Magma, c	Ariz.	.50	120,0
Nevada Con., c	Nev.	.75	1,499,5
Old Dominion, c	Ariz.	1.00	297,07
Oroville Dredg	Calif.	.12	82,38
Osceola, c	Mich.	2.00	192,30
Phelps Dodge	U. S.	(b) 8.00	3,600,00
Quincy, c	Mich.	2.00	220,00
Ray Con., c	Ariz.	.75	1,182,38
St. Joseph Lead	Mo.	.50	704,73
Tintic Standard, l. c	Utah	08	93,4
Tonopah Ex., g. s	Nev.	.05	64,14
United Eastern, g	Ariz.	.05	68,15
Utah Con., c	Utah	.25	75,00
Utah Copper	Utah	2.00	3,248,98
Canadian Companies	**Situation**	**Per Share**	**Tot**
Hedley, g	B. C.	$0.15	$36,0
Kerr Lake, s	Ont.	.25	150,00
Min. Corpn. of Can., s	Ont.	.18¾	311,26
Holding Companies	**Situation**	**Per Share**	**Tot**
General Dev	U. S.	.75	90,00
Yukon Alaska Trust	......	1 00	203,43

(*a*) Payable in Liberty Bonds and War Savings Stamps.
(*b*) Payable $6 in cash, $2 in 4¼% Liberty Bonds.

The table shows that 36 United States mining an metallurgical companies in September, 1918, paid $23, 553,456, compared with $34,463,831 paid by 43 com panies in the corresponding month last year. Canadia companies paid $497,260, against $760,604 last year and holding companies, $293,433, a decrease of $150, 000 from last year.

Yukon Gold Co. discontinued its regular payment this quarter, the reason being the reduced income du to abnormally high cost of everything entering into gol mining.

The Phelps Dodge Corporation paid $8 this quarter compared with $6 in June, 1918, but designated $ as a payment from reserve for depletion, and distribute it in the form of 4¼% Liberty Bonds.

The Utah Consolidated reduced its quarterly payment from 50c. to 25c., and the General Development Co. from $1 to 75c. per share.

The totals for the first nine months of the year ar as follows: United States mining and metallurgica companies, $129,528,608; holding companies, $1,728,438; Canadian, Mexican, Central and South American companies, $13,242,350.

Comfort Fund Gets Windfall

Vth the coming of autumn the leaves are falling, nd ne drifted into the office the other day all the way ro the Mount Elliott mine in Queensland, Australia. vs a gum tree leaf[1] in the shape of a check for £20, in was accompanied by a message saying:

> a little gum leaf toward the Comfort Fund for those great f America and from away back my greetings to them.

e are told that there are numerous eucalyptus trees alifornia, no doubt brought from Australia, and aps they have also followed the flotation oil to other ties. "Gum leaves" like the above are eagerly welnd for the Comfort Fund and will be an evergreen h that friends have not forgotten the 27th Engineers.

HOW THE COMFORT FUND STANDS

usly acknowledged	$14,436.50
ster Bain	10.00
Bailey	10.00
es Le Vasseur (second contribution)	10.00
im Wraith	25.00
. Wheeler	10.00
la Mine Operators' Association	100.00
R. Wallace	50.00
Bowen	5.00
Brown and M. W. Hayward	16.00
Cap Copper Co.	50.00
. Smith	10.00
Geary	5.00
Wolf	10.00
. Siebold	10.00
Kee	10.00
. Grether	5.00
on J. Thomas	10.00
Eurich	10.00
ty Bell Gold Mining Co.	200.00
e Witt Smith	15.00
iated Miners of the University of Idaho	10.00
Idria Quicksilver Mining Co.	100.00
Burrall	25.00
gston Wernecke	5.00
. Mathewson	50.00
est to June 26	82.61
. Hixon	10.00
Canby	10.00
. Guggenheim	10.00
ard Tavis	5.00
n Guggenheim	100.00
Kelley	10.00
rnon Del Mar	4.00
er S. Smith	5.00
H. Coghill	10.00
oln Crocker	10.00
. Dewey	10.00
outh Consolidated Gold Mines, Ltd.	100.00
ed Eastern Mining Co.	50.00
A. Wilson	20.00
r Lachmund (fifth contribution)	10.00
Rowland Cox	10.00
. Huntoon	5.00
ka Mining and Engineering Society	50.00
R. Benedict	3.00
redge Walker	25.00
Mella	25.00
ard McCarthy	100.00
. Houser	10.00
lon Mining Co.	50.00
am H. Kinnon	30.00
. O'Brien	10.00
er W. Strauss	10.00
ana Society of Engineers	50.00
R. Atkeson	2.50
les Le Vasseur (third contribution)	5.00
k Carroll	10 00
. Hastings, Jr.	5.00
. Woodbridge	5.00
ey B. Small	10.00
. Porter	10.00
. Taggart	10.00
. Farish	25.00
. Sherry	10.00
. Hamilton	50.00
ge O. Argall	10.00
. R.	15.00
r Lachmund (sixth contribution)	10.00
. Arnold	10 00
. Wolf	5.00
loyees of Utah Leasing Co., Newhouse, Utah	20.50
loyees of Braden Copper Co.	112.50
les A. Mitke (second contribution)	10.00
. Colvocoresses	25.00
les Le Vasseur (monthly)	5.00
. Wethey	25.00
ord Eaton	25.00
. Hunner	5.00
. Thomson	25.00
bers of the A.I.M.E. meeting in Colorado Springs, pt. 4, 1918	215.00
Miles	25.00
. Wilmarth	25.00
Frederick [illegible]	[illegible]
Balance of [illegible] Joplin contribution [illegible] through [illegible]	[illegible]
H. V. [illegible]	[illegible]
American Zinc [illegible]	[illegible]
Thomas H. [illegible]	[illegible]
W. F. [illegible]	[illegible]
Earl B. [illegible]	[illegible]
Hyrum D. [illegible]	[illegible]
C. F. [illegible]	[illegible]
W. P. [illegible]	[illegible]
Edwin F. [illegible]	[illegible]
"Gum Tree" [illegible]-pound check	[illegible]
Alex G. [illegible]	[illegible]
Total	[illegible]

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

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[1] We admit that the gum tree is an evergreen and that it is g in Australia now. Anyhow we received the "leaf."—EDITOR]

Captain Irving's Death

We have received the following letter from Fred Searls to John Gray, describing the great work that Captain Irving had been doing and how he died. His multitude of friends will be glad to read this letter, speaking right from the heart, which we are authorized to publish.

France, July 28th, 1918.

Dear John:

This is the first opportunity I have had of writing you concerning Captain Irving's death. Poor old John; he literally worked himself to death. Died of pneumonia at midnight July 20th. The real story is this: He came down from the 11th to the Army Engineers' School last December and entered on the matter of developing and teaching dug-out construction to the A. E. F. It was a bit of far cry from his own work to come down to practical details of mine work. But he applied the same ability and tireless energy to it that he showed in other things, and he got ahead with it in a way that was remarkable. I can't tell you how much credit he deserves for it or how much use the work has been and will be to the army. I came down here at his request to help, and in the matter of previous experience and knowledge of such things I probably had quite an edge on him. But in accomplishment and learning the game, he passed me like an express train. He was the foremost authority over here on these things, and he leaves a lot of firm friends in the army game.

I was almost glad that we lost the Star decision, because I told him about it the last time I saw him conscious, and it cheered him up so much.

He was just getting out these new E. F. N. and was working all hours at G. H. Q. He came down here on the 9th, ill, and went to the hospital on the 11th, with this three-day fever that has been hitting us all. We thought nothing of it, and by the 15th he was much improved. The next day he suffered a relapse and developed pneumonia. We got expert doctors in consultation, and I can say truthfully that everything possible was done. He didn't have any resistance; was worn out, and he just got worse and worse until he died.

He was buried with full military honors in Cemetery 13, A. E. F., Grave 58.

I lost the best friend I've had in the army. In addition, he was my captain, and I had come to regard him in this respect in rather a different way from the old Butte days. He was a fine man, John, and it was good to serve under him.

I wrote to Kemp and to Irving's uncle in New York. Would you send a synopsis of this letter to Will Clark and to Winchell? I think they would be interested in knowing that John was accomplishing something worth while over here, and the details of his death.

As for me—I'm doing what I can; part of the time at the front and part at this school. Have seen some fighting and know what the game is. It's a tough one, and while I'm wishing I were in the infantry, I think I'll get plenty of chance before it's through. Our men are remarkable—with scant training and no experience they go in and clean everything up. It makes a man proud to be in this man's army. They're afraid of nothing and like the going. Heard a sergeant praising the Italians naively the other day: "Yes—they're all right; follow us anywhere." And the Yanks aren't following anybody, not even the veteran French heroes. Only Fritzie.

Guess that's enough optimism—looks like a long hard game to me.

Yours,
SEARLS

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Editorials

Trade Unions for Professional Engineers

"LABOR, from the aristocratic munition worker to the lowly scavenger, has shown us the power of organization, and now it is the turn of the higher grades to embrace trade unionism almost as a measure of self-preservation. Realizing that the government will recognize only those who are efficiently organized, the professional engineer seems to have had it driven home to him that if he is to be listened to, like the workmen whom he controls, he must combine. Therefore, we may shortly expect to find that the great bulk of those engaged in every branch of electricity supply, from the chief engineer downward to the workmen, will be organized in a trade union. So far as this particular branch of industry is concerned, dissatisfaction has been growing, because, while municipalities and the Committee on Production have constantly, under threats of strikes, granted increased wages to their workmen, they have as consistently ignored the professional men in their employ. Even chief engineers and their staffs, it is argued, feel the increased cost of living, and the way in which their claims have been neglected has been largely responsible for a step which cannot fail to have a material influence on the industries of the country. The decision has been come to with considerable reluctance, but conditions have made it essential that there should be this extension of trade unionism, which may be expected to spread to all forms of public utility and similar undertakings. Are we in for strikes of the chief engineers and their staffs, and will London come out in sympathy with other towns, or *vice versa?* Some interesting possibilities are foreshadowed, and the workman may yet find himself unable to work because his chief has 'come out.' "

We quote the above from our esteemed British contemporary, the *Ironmonger.* We do not take it seriously, but as a humorous idea that is incisive there is much in it. We use the designation "engineers" in a different sense from what they do in Great Britain. Adhering to our own vernacular, suppose the engineers of the country should unionize themselves and go out on strike for shorter hours, higher wages, time and a half for overtime and double time for Sundays and holidays. Everybody knows that they have meritorious claims for generous consideration on all of those grounds. How long would our railways, factories and mines run without them? Russia may give an answer, though not owing to the intelligentsia going out on strike, but rather to the mistaken idea of the proletariat that knowledge and experience are unnecessary. Flooded mines, frozen furnaces, and wrecked railways soon furnished object lessons to the contrary.

American engineers will never unionize themselves and strike; for ideas of patriotism, industry and efficiency that have been bred into them forbid. Waste of material and waste of time are equally abhorrent to the men of this profession. Their minds are imbued w
the governing idea of accomplishment. They have
thought that conflicts with the wish to do a full da
work and do the most in that day that can possibly
done. Their greatest achievements are when they red
cost of production. Then they feel that they have d
something whereof they can be proud; and so they c
for they have contributed to the material benefit of
of their fellow men. The engineer loves his work a
gets his greatest pleasure in doing it. His remunerat
is to him a subordinate consideration. Both capitali
and labor unions take advantage of him, when th
ought to cherish him and be very kind to him. But
are glad that engineers are just as they are, and
country has reason to be glad about having them in
emergencies of the last 18 months.

Is Cotton Still Immune?

THE irate senators from the South gave Mr. Bar
an uncomfortable quarter of an hour—or hour a
a quarter—when the news circulated that he was goi
to cause a price to be fixed for cotton and they rush
to his office and told him to keep his hands off. But u
reference to the President, the latter supported
Baruch to the extent of causing two commissions to
appointed to look into the matter. Nothing less co
have been done, in view of the circumstances.

Since then the affair seems to have been dropp
There have been intimations from the price-fixing co
mission, through the press, that perhaps it will not
necessary to fix any price for cotton. This will be g
news, if true, to the Southern senators and their c
stituents, but it will not be so popular in the West, wh
copper and lead are produced.

The Comparative Friability of Ores

IN A PAPER recently submitted to the Americ
Institute of Mining Engineers, the author, Lut
W. Lennox, dealt with a factor in ore-dressing ope
tions from an apparently new aspect. The inves
gations described were the result of an attempt
determine the relative resistance of different ores
uniform crushing and grinding strains. The appara
used was a small model tube mill carrying an e
load of small steel balls. The ores to be tested w
coarsely crushed and graded to provide uniform samp
of which definite amounts were introduced into
mill, together with a definite amount of water. T
machine was then revolved at a fixed rate for a p
determined time, and the amount of material abra
or broken to a certain dimension taken as represent
the comparative friability of the ore, or, convers
the resistance to crushing strains and grinding actio
The Rittinger system of computing results on the ba
of surface exposed was adopted in subsequent cal

ations, and curves were plotted to show apparent work one, which would be inversely proportional to the esistance of the particular ore, other conditions being qual. Figures are given to show the comparative esistability of a number of ores from well-known mines n the United States and Alaska, as determined by this nethod, and the results are undoubtedly of interest and alue. The author of the paper describes refinements f calculation intended to make the results as correct s possible, particularly with reference to work done n minus 200-mesh material. It is not claimed that he method is complete or absolutely accurate, but Mr. ennox avers, with justification, that the results should ive an indication of the relative resistance of the ores o crushing and grinding strains.

For a number of years experiments have been carried out in different parts of the world for the purpose f perfecting a method of computing the relative nechanical efficiency of crushing and grinding machines f various types on the same ore, by means of an estimate of work done, as calculated with the help of either f the well-known laws of Kick or Rittinger, and a knowledge of the power expended. By maintaining uniform conditions with regard to the machine and the power needed, and by varying the character of material used in the experiments, it is possible to estimate the comparative friability of the ores with no greater error than that introduced by the difficulty of calculating the exact dimensions of the particles produced.

The method proposed by Mr. Lennox for estimating the comparative values of certain physical characteristics of ores is not entirely new, although it may appear novel to the mining fraternity. In our issue of June 6 there was published an article entitled "Artificial Pebbles for Tube Milling," in which an account was given of the Deval abrasion machine, used for the purpose of determining what civil engineers term the French coefficient of wear, as applied to the requirements for road-building rock. Comparative resistance is calculated in an almost identical way to the method described above, except that the tube mills used are set with inclined axes so as to give maximum bruising effect, and no steel balls are used. The conclusions are, moreover, based on a less accurate determination of the sizes of the products.

The question of the relative friability of ores and also the pebbles required to crush them is receiving an increasing amount of attention. The experimental work done by the Office of Public Roads and Rural Engineering has resulted in a great deal of information of value to other industries; and Mr. Lennox's paper, which was recently discussed at the Colorado meeting of the Institute, will facilitate the solution of many a grinding problem. His method suggests a simple system of determining facts which will materially influence the design of crushing plants, and will aid in the work of forecasting, with greater accuracy than is possible at present, the equipment necessary. Another important field for the method will be found in connection with comparisons of the efficiencies of various crushing machines operating on different ores in different localities. The data which will be available will aid in explaining the phenomenal duties achieved in some instances and the somewhat inexplicably low ones in others.

Sheet Zinc for Roofing

WE ARE republishing, this week, at the request of some of our readers, an article on the use of sheet zinc for roofing purposes, by W. H. Seamon, that appeared originally in the *Journal* of Oct. 24, 1896, continuing as a series through several subsequent issues. The article is just as interesting and valuable now as it was 22 years ago. It was introduced by the following editorial:

> On another page we give the first part of a paper on the applications of zinc to roofing and other purposes, which ought to interest many readers. It is well understood that at the present time the productive capacity of our zinc mines and smelting works is in excess of the demand for spelter, while exports of any considerable quantity to Europe are possible only at the risk of a disastrous break in prices. How this condition has come about it is useless to inquire; it exists, and the only remedy for miners and smelters is to find new uses for the metal. The employment of sheet zinc for roofs is quite common abroad, though almost unknown here. Its adoption for that purpose, for which it is very well suited, would create a new and important market for the metal, which would be of great advantage to the trade. The article referred to is a thoroughly practical one, and gives very fully the best methods of handling and applying zinc for the purpose, besides setting forth the advantages obtained by its use.
>
> It is in such directions as this that future gains for the zinc trade are to be found. The establishment of a new source of demand is of far more permanent importance than any temporary increase in price through a trust or combination; and is, moreover, a legitimate gain, which will be felt not only now but for a long time to come.

Except for the reference to exports of spelter to Europe, the above editorial reads as well, is just as pertinent, and gives as good advice as if it had been written last night, instead of 22 years ago. The economic policy of the *Journal* with respect to legitimate trade developments was just the same then as it is now.

Tonopah Mining Costs

IN THIS issue we present an excellent summary of comparative costs of silver mining in Nevada by Jay A. Carpenter. Mining costs in Nevada are peculiarly illuminating in that they represent conditions unlike those pertaining to other Western states, with the possible exception of Arizona. Practically all supplies must be brought in from considerable distances and at comparatively high freight rates. Machinery and labor are also brought from distant centers. Water must be developed at high cost. Living conditions are not particularly attractive. The mines are deep, and a large proportion of development work is necessary. Orebodies are often of limited extent. Ore treatment requires excessively fine grinding. Only in the power cost does the Tonopah district appear to have any advantage, and this is due to fortuitous circumstances.

The result of Mr. Carpenter's comparison shows that the increased price of silver has not brought increased profits, but has merely maintained equilibrium. In this the Tonopah operators are fortunate. We doubt whether the situation is as good as Mr. Carpenter's conclusion would lead us to believe. In our last issue, we published a letter by George E. Collins that throws an additional light upon the subject of mining costs at precious-metal mines under present conditions. Mr. Collins shows how the practice of exacting economy in all directions has made it possible for some gold mines to continue in operation and even to maintain a sembalance of profit. Without doubt the excellent showing of the Tonopah district is due in a large measure to the practice of similar economies. Credit must be given to foremen, superintendents and managers for their skill and devotion to duty in this as well as in other districts.

Miners Leaving Alaska

ACCORDING to a dispatch from Dawson, Y. T., dated Sept. 26, a sudden exodus of miners and their families from the Yukon and Alaska has begun. The increased cost of labor and of all mining supplies and goods is responsible for the numerous departures from the district. Every boat arriving at Dawson during the last few weeks from Ruby, Fairbanks, Iditarod and other Alaskan camps comes with the accommodations taken by people leaving the country for the Pacific Coast, where there is hope of obtaining work in war industries at high wages until after the war.

This dispatch serves to emphasize the statements of P. C. Stoess, whose article on "Mining in Alaska Under War Conditions" appears on another page of this issue. Mr. Stoess has just returned from that territory and has painted a rather gloomy picture of the difficulties which must be met by all mining companies there, with few exceptions.

If labor be allowed to eat up all profits, which are limited by fixed prices; and if labor does not save and goes untaxed anyhow, who is going to pay the stupendous levies that Mr. Kitchin and his colleagues are framing? The professional and salaried classes who are dependent upon fixed incomes, and the old people whose sole income is derived from bonds, into which they put the savings of their youth, have some grave things to think about. Certainly they have no powerful friends who are looking out for them.

BY THE WAY

As a part of a safety program of a Minnesota mining company, it has been the custom for each mine to hold a monthly meeting, at which safety measures, including a discussion of the accidents which had happened during the month previous, were studied by those present. The personnel of the committee was changed from month to month and so chosen that all departments of the mine organization were represented. The company operated several mines in the district, so that a comparison as to what had been done along lines of accident prevention at each was available, and a certain rivalry existed among the different mines.

During a recent month the Saginaw mine operated for the entire period without an accident, and, as an average of 200 men was employed, the record was regarded as remarkable. The chairman of the safety meeting, which was held at the Siam mine the month following the establishment of the record, concluded his remarks with: "You see, gentlemen, what the boys at the Saginaw have done. Two hundred men working and not an accident! What they have done, we can do, and next month we must tie the record." With the intention of leaving this last thought, he was about to dismiss the meeting when he was interrupted by Dicky, one of the Cornish shift bosses who was on the committee that month: "See 'ere, now. I 'as been listenin' to this 'ere bit, an' seems to me them there bloody beggars over to Saginaw mine 'as it far from truthful. Why, damme, m' son, I naws bloody well that you or me would 'ave one 'el of a time jus' marchin' two 'undred to church without 'urt, say nothin' of workin' they!"

Mining Industry and the Liberty Loan

As in the Third Liberty Loan, a special Advisory Trades Committee has been appointed in New York, with various sub-committees covering different lines of business, the object being for each committee to bring the loan before every firm and individual in its respective group and secure their subscriptions.

Following are the members of the special Mining Industry Committee: Charles Hayden, chairman; W. B. Thompson, vice chairman; Marshall M. Ferguson, secretary; Sherwood Aldrich, W. A. Bostwick, Arthur V. Davis, E. P. Earle, Daniel Guggenheim, John Hays Hammond, J. G. Hopkins, W. R. Ingalls, C. F. Kelley, D. C. Jackling, Arthur C. James, S. J. Jennings, Adolph Lewisohn, C. M. Loeb, Charles M. MacNeill, C. W. Nichols, Edgar Palmer, F. Y. Robertson, E. N. Skinner.

Total subscriptions to the Third Liberty Loan obtained through the special Liberty Loan Committee for the mining industry amounted to $27,967,750. In the present loan the new and increased quota for the mining industry committee is $40,000,000.

Following are subscriptions received up to and including Oct. 1:

Arthur Feust	$500
Robert Peele	2,000
C. D. Kaeding	1,000
Mrs. C. D. Kaeding	100
L. Vogelstein & Co., Inc.	500,000
U. S. Smelting, Refining and Mining Co. and subsidiaries	750,000
O. B. Perry	5,000
Coronet Phosphate Co.	10,000
Howard & Co.	500
Edward W. Lawler	200
Charles A. Bohn	100
H. A. Guess	5,000
Fred Hellmann	10,000
Charles K. Lipman	5,000
P. A. Mosman	1,000
Great Western Smelting and Refining Co.	100,000
American Metal Co., Ltd.	1,000,000
Cerro de Pasco Copper Co.	500,000
C. H. Munro	1,500
Judd Stewart	17,000
Charles A. Burdick	200
Robert H. Cromwell	100
H. W. Hardinge	10,000
Josef Radnai	200
George W. Feakins	900
Adolph Lewisohn and Sons	500,000
New Jersey Zinc Co.	2,000,000
Officers of New Jersey Zinc Co.	80,000
Albert R. Ledoux	20,000
Employees, Albert R. Ledoux	6,100
Frank Wilson	1,000
Whittaker, Clark & Daniels, Inc.	2,600
Phelps Dodge Corporation	1,000,000
James McLean	250,000
Thompson, Weinman & Co.	1,100
Big Ledge Copper Co.	50,000
Frederick Taber Rubidge	1,000
Lewis C. Beaumont	1,000
Inspiration Consolidated Copper Co.	1,000,000
Greene Cananea Copper Co.	500,000
G. P. Bartholomew	2,500
G. T. Bridgman	1,000
Total	$8,336,600

It should be noted that the Mining Industry Committee covers only the New York Federal Reserve District, and the amount by no means represents the entire mining industry and its patriotic response to the Liberty Loan appeal.

Headquarters of the committee are at 25 Broad St., Room 811, New York City.

The Mining Index

his index is a convenient reference to the current literature mining and metallurgy published in all the important periodi of the world. We will furnish a copy of any article (if in nt) in the original language for the price quoted. Where no e is quoted the cost is unknown. Inasmuch as the papers st be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons furnished at the following prices: 20c. each, six for $1, 33 for and 100 for $15. When remittance is made in even dollars, will return the excess over an order in coupons if so requested

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852—ANALYSIS—A New Method of Determining Copper. nes Moir. (Journ. Chem., Met. and Min. Soc. of So. Afr., y, 1918; 1 p.) Discussion of article previously indexed.

853—ARIZONA—New Cornelia Copper Co.'s Plant a Success B. Leach. (Min. and Oil Bull., July, 1918; 4½ pp., illus.)

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856—QUEENSLAND—The Arbouin Copper Mines at Carss on the Chillagoe Mineral Field, North Queensland. Lionel Ball. (Pub. No. 261, Dept. of Mines, Queensland Geol. Surv., 8; 70 pp., illus.)

857—QUEENSLAND—The Cloncurry Copper District of eensland. W. H. Carbould. (Eng. and Min. Journ., Sept. 7, 8; ¾ p.) 20c.

858—REFINING—Recovery of Selenium and Tellurium in pper Refining. M. H. Merriss and H. T. Binder. (Eng. and n. Journ., Sept. 7, 1918; 2¾ pp.) 20c.

GOLD AND SILVER—GEOLOGY

859—ALASKA—The Upper Chitina Valley, Alaska. Fred H ffit, with description of the Igneous Rocks by R. M. Overbeck. ll. 675, U. S. Geol. Surv., 1918; 82 pp., illus.)

860—ONTARIO—Gold Deposits in MacMurchy and Churchill vnships. (Can. Min. Journ., Aug. 15, 1918; 5½ pp., illus.)

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861—LEAD SALTS—The Supply of Lead Salts for Use in anide Plants. Thos. B. Stevens. (Monthly Journ. Chamber of nes of West Australia, May 31, 1918; 1½ pp.)

862—SOLUTIONS—The Estimation of Oxygen in Working anide Solutions. H. A. White. (Journ. Chem. Met. and Min. . of So. Afr., June, 1918; 5 pp.) 60c.

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863—COLORADO—Mining in the Telluride District of Coldo. Harry J. Wolf. (Eng. and Min. Journ., Aug. 31, 1918; pp., illus.) 20c.

864—COLORADO—Ore Treatment in Colorado. (Eng. and n. Journ., Aug. 31, 1918; 2¾ pp.) 20c.

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866—PRODUCTION—The Importance of Gold Production. nel Phillips. (Min. and Sci. Press, Aug. 3, 1918; 2½ pp.)

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868—FRANCE—Iron and Coal in France After the War on and Coal Tr. Rev., May 24 and Aug. 9, 1918; 2½ pp.)

869—IRELAND—Iron Ore in Ireland. (The Statist, Aug. 17, 8; 1 p.)

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870—BLAST-FURNACE PRACTICE—Correcting Air Volume Blowing. L. C. Loewenstein. (Iron Tr. Rev., Sept. 12, 1918; pp., illus.) Paper before Am. Soc. Mechan. Engrs. 20c.

871—COLD-WORK—The Effect of Cold-Work on the Divorce Pearlite. J. H. Whiteley. (Advance copy, Iron and Steel t., May, 1918; 9 pp., illus.)

872—ELECTRIC FURNACE—The Webb Electric Steel Furce. (Iron Age, Aug. 1, 1918; 3 pp., illus.) 20c.

873—ELECTRIC STEEL—War Industries Board Discourages rther Expansion of Electric Steel. (Chem. and Met Eng., g. 15, 1918; 1½ pp.)

874—FERROALLOYS—The Manufacture of Ferroalloys in Electric Furnace. Robert M. Keeney. (Bull. A. I. M. E., g., 1918; 53 pp.) 40c.

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876—HEAT TREATMENT—Effect of Mass on Heat Treatnt. E. F. Law. (Advance copy, Iron and Steel Inst., May, 18; 15 pp., illus.)

877—IRON, CARBON AND PHOSPHORUS. J. E. Stead dvance copy, Iron and Steel Inst., May, 1918; 24 pp., illus.)

9878—METALLOGRAPHY and Heat Treatment of [illegible] in Aeroplane Construction. F. Grotts. (Chem. and Met. Eng., Aug. 1, 15 and Sept. 1, 1918; 20 pp., illus.) First three of a series of articles dealing with cast iron, steel, aluminum, copper, bronze and brass, typical examples of investigations of aeroplane parts, with microphotographs and results of physical and chemical tests.

9879—ORE BRIDGE—Bethlehem Ore Bridge Built in 65 Days. (Iron Age, Aug. 22, 1918; 1¼ pp., illus.) 20c.

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9884—BURMA—Geology and Ore Deposits of the Bawdwin Mines. J. Coggin Brown. (Geol Surv. of India, Vol. XLVIII Part 3, 1917; 58 pp.)

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9886—METALLURGY—La Metallurgia dello Zinco. Erminio Ferraris. (L'Industria, Vol. XXXII, No. 10, 1918; 8 pp.)

9887—QUEENSLAND—Mount Prospect Silver-Lead Lode Cania. W. E. Cameron. (Queensland Govt. Min. Journ., July 15, 1918; 1½ pp.) 60c.

9888—SMELTERY—The Blast-Furnace Charge of the Bunker Hill Smeltery. C. T. Rice. (Eng. and Min. Journ., Sept. 7 1918; 2¾ pp., illus.) 20c.

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9889—ALUMINUM and Its Light Alloys. Paul D. Merica (Chem. and Met. Eng., Aug. 1 and 15, 1918; 8½ pp., illus.) To be continued.

9890—ALUMINUM—Procedimientos Actuales de Fabricacion de Aluminio. Juan Escard. (Bol. Soc. Nacional de Mineria Jan., Feb., Mar., 1918; 18½ pp., illus.)

9891—ANTIMONY—Blast-Furnace Smelting of Stibnite with Considerations on the Metallurgy of Antimony. W. R. Schoeller (Bull. 165, I. M. M., June 27, 1918; 3 pp.) Author's reply to discussion of paper previously indexed.

9892—CHROME AND MANGANESE ORES in Cuba. Investigation by Government Bureaus. (Press Bull., U. S. Geol. Surv. Sept., 1918; 8 pp.)

9893—CHROMITE. Albert Burch and Samuel H. Dolbear (Pamphlet Pub. by Min. and Sci. Press, 1918; 31 pp., illus.)

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9896—MANGANESE and Manganiferous Ores in 1916. D. F. Hewett. (Mineral Resources of the U. S., 1916—Part I: 26 pp., illus.)

9897—MANGANESE DEPOSITS of East Tennessee. G. W. Stose and F. C. Schrader. (Vol. VIII, Resources of Tenn., July, 1918; 55 pp., illus.)

9898—MANGANESE MINING in the Magdalena Mining District, New Mexico. R. H. West. (Eng. and Min. Journ., Sept. 7, 1918; ½ p.) 20c.

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9903—QUICKSILVER AND TUNGSTEN. Production of Quicksilver and Tungsten, as Discussed Before the U. S. Tariff Commission at San Francisco. (Min. and Sci. Press, July 6, 1918; 1 pp., illus.) 20c.

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9907—TIN—Solder Without Tin. Chas. W. Hill. (Chem. and Met. Eng., Aug. 15, 1918; 1 p., illus.)

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9909—VANADIUM—Metodos de Valoracion de Vanadio en los Ferrovanadios. Vicente Garcia Rodeja. (Revista Minera, July 16, 1918; 2½ pp.)

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9910—ASPHALT DEPOSITS and Oil Conditions in Southwestern Arkansas. Hugh D. Moser and A. H. Purdue. (Bull. 691-J, U. S. Geol. Surv., Aug., 1918; 22 pp., illus.)

9911—CLAY—Kaolin in Quebec. J. Keele. (Journ. Am. Ceramic Soc., Jan., 1918; 6 pp., illus.)

9912—CLAY—Report on the Clay Resources of Southern Saskatchewan. N. B. Davis. (Mines Branch, Can. Dept. of Mines, 1918; 93 pp., illus.)

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9923—SULPHUR—Our Sulphur Supply. (Editorial, Eng. and Min. Journ., Aug. 31, 1918; 1 p.) 20c.

9924—SULPHUR in Jemez Canyon, New Mexico. Philip S. Smith. (Eng. and Min. Journ., Sept. 7, 1918; ½ p.) 20c.

9925—TALC—Report on Certain Minerals Used in the Arts and Industries. Percy A. Wagner. (So. Afr. Journ. of Ind., June, 1918; 6 pp.)

9926—TRIPLITE: A Possible Source of Phosphoric Acid. A. E. V. Zealley. (Report, Rhodesia Munitions and Resources Committee, 1918; 2½ pp.)

PETROLEUM AND NATURAL GAS

9927—ARKANSAS—Asphalt Deposits and Oil Conditions in Southwestern Arkansas. Hugh D. Miser and A. H. Purdue. (Bull. 691-J, U. S. Geol. Surv., Aug., 1918; 22 pp., illus.)

9928—NORTH DAKOTA—The Nesson Anticline, Williams County, North Dakota. A. J. Collier. (Bull. 691-G, U. S. Geol. Surv., Aug. 15, 1918; 7 pp., illus.)

9929—TENNESSEE—The Glenmary Oil Field. L. C. Glenn. (Vol. VIII, Resources of Tenn., July, 1918; 9 pp.)

9930—WYOMING—The Salt Creek Oil Field, Wyoming. Carroll H. Wegeman. (Bull. 670, U. S. Geol. Surv., 1918; 52 pp., illus.)

ECONOMIC GEOLOGY—GENERAL

9931—ALASKA—The Upper Chitina Valley, Alaska. Fred H. Moffit, with description of the Igneous Rocks, R. M. Overbeck. (Bull. 675, U. S. Geol. Surv., 1918; 82 pp., illus.)

9932—DEPTH AND THICKNESS OF STRATA—New Graphic Method for Determining the Depth and Thickness of Strata and the Projection of Dip. Harold S. Palmer. (Prof. Paper 120-G, U. S. Geol. Surv., Aug. 21, 1918; 6 pp., illus.)

9933—HOLLANDITE—On the Crystallography and Nomenclature of Hollandite. L. Leigh Fermor. (Records of the Geol. Surv. of India, Vol. XLVIII, Part 3, 1917; 18 pp.)

9934—INDIA—The Biana-Lalsot Hills in Eastern Rajputana. A. M. Heron. (Rec., Geol. Surv. of India, Vol. XLVIII, Part 4, 1917; 23 pp.)

9935—LATERITE—On the Origin of the Laterite of Seoni, Central Provinces. R. C. Burton. (Rec., Geol. Surv. of India, Vol. XLVIII, Part 4, 1917; 14 pp.)

9936—MEXICO—Bibliografia Geologica y Minera de la Republica Mexicana, 1915-1918. Rafael Aguilar y Santillan. (Bol. Minero, Mar. and Apr., 1918; 14 pp.)

9937—NEW MEXICO—Geologic Structure of Sierra del Oro, in New Mexico. Chas. R. Keyes. (Eng. and Min. Journ., Sept. 14, 1918; 1 p., illus.) 20c.

9938—WESTERN AUSTRALIA—Recent Earth Tremors in Western Australia. Inter-Action of Geological Causes and Mining Operations. A. Montgomery. (Chem., Eng. and Min. Rev., July 5, 1918; 3 pp.) 40c.

MINING—GENERAL

9939—ACCIDENT PREVENTION—Progress in Accident Prevention. (Eng. and Min. Journ., Sept. 14, 1918; 1¼ pp.) 20c.

9940—ACCIDENTS—Coal Mine Fatalities in the United States, January to May, 1918. Albert H. Fay. (U. S. Bureau of Mines, 1918; [illegible] pamphlets; [illegible] pp.)

9941—BLASTING METHODS at Ajo. S. C. Champe. (Min. and Sci. Press, July [illegible], 1918; [illegible] pp., illus.) 20c.

9942—BRITISH COLUMBIA—Mining in Kootenay, B. C. E Jacobs. (Can. Min. Journ., July 15, 1918; 2¼ pp.) 20c.

9943—BURMA—The Material Resources of Burma. Harvey Adamson. (Bull. Imp. Inst., Vol. XVI, No. 1, Jan., Mar., 1918; 39½ pp., illus.) Brief enumeration of commercial products, agricultural and mineral illustrated by map.

9944—CEMENTATION PROCESS Applied to Mining (Francois System.) A. H. Krynauw. (Journ. Chem., Met. and Min. Soc of S. Afr., May, 1918 12 pp., illus.) 60c.

9945—COLORADO—War Minerals of Colorado. A. H. Hubbell. (Eng. and Min. Journ., Aug. 31, 1918; 2½ pp.) 20c.

9946—DUST—The Estimation of Injurious Dust in Mine Ai by the Kotze Konimeter. John Innes. (Journ. Chem., Met. and Min. Soc. of So. Afr., May, 1918; 7½ pp.) Discussion of article previously indexed. 60c.

9947—EXPLOSIVE—Sengite: A New Explosive. J. P. Udal (So. Afr. Journ. of Ind., July, 1918; 2 pp.)

9948—EXPLOSIVES—Handling and Storing of Explosives Arthur La Motte. (Eng. and Min. Journ., Sept. 14, 1918; 5¾ pp. 20c. Paper before Seventh Annual Congress of the National Safe y "La Suriana." Distrito de Aldama, Estado de Guerrero. Theo

9949—HOISTING With Steel Cables. Ernest Levy. (Min and Sci. Press, July 6, 1918; 1 p.) 20c.

9950—MEXICO—Los Criaderos Minerales de "Campo Morado" y "La Suriana," Distrito de Aldama, Estado de Guerrero. Theodore Flores. (Bol. Minero, Mar. and Apr., 1918; 3 pp.)

9951—MEXICO—Visita Practicada a Las Negociaciones Mineras, Fundiciones y Plantas Metalurgicas del Estado de Nuev Leon. Jesus Ibarra. (Bol. Minero, Mar. and Apr., 1918; 24 pp.

9952—MINING METHOD—Method of Mining Pillars at th Fortuna Mine of the Braden Copper Co., Chile. Chas. Hollister (Eng. and Min. Journ., Sept. 14, 1918; 2 pp., illus.) 20c.

9953—SHAFT—The Repair of a Circular Shaft of Small Diameter. Stewart Chambers. (Trans., Min. Inst. of Scotland, June 1918; 6½ pp.)

9954—SHAFT PILLAR—Notes on the Removal of a Vertica Shaft Pillar. J. Chilton. (Journ. Chem., Met. and Min. Soc of S. Afr., June, 1918; 4¼ pp., illus.) 60c.

9955—SIGNAL SYSTEM—Anaconda Company's Bell and Buzzer Signal System. R. H. Richards. (Eng. and Min. Journ Sept. 7, 1918; 1 p., illus.) 20c.

9956—TIMBER SET—A New Timber Set for Inclined Shafts James E. Harding. (Eng. and Min. Journ., Sept. 7, 1918; 1½ pp illus.) 20c.

9957—WATER SUPPLY—Filtered Water for Industrial Use Harold C. Stevens. (Iron Tr. Rev., Aug. 29, 1918; 3 pp., illus.

FLOTATION

(See also "Lead and Zinc")

9958—APPARATUS—The "Little" Janney Mechanical Flotation Machine. Will C. Higgins. (Salt Lake Min. Rev., Aug. 1 1918; 3 pp., illus.) 20c.

9959—ADDITION AGENTS—The Effect of Addition Agents i Flotation. Martin Harmon Thornberry and Horace Tharp Mann (Vol. IV, No. 2, Bull. Mo. School of Mines, Nov., 1917; 48 pp illus.)

9960—RUTH FLOTATION MACHINE, The. Arthur J. Hoskin (Min. and Sci. Press, July 27, 1918; 2¾ pp., illus.) 20c.

ORE DRESSING—GENERAL

9961—CRUSHING—Grinding Ore in Ball Mills. Discussio of article by Algernon Del Mar. (Eng. and Min. Journ., Sep 7, 1918; 1¼ pp.) 20c.

9962—ELEVATOR-BUCKET DISCHARGE, Automatic. H. M Schleicher. (Eng. and Min. Journ., Sept. 14, 1918; 1 p., illus.) 20c

METALLURGY—GENERAL

9963—AËROPLANE CONSTRUCTION—The Metallography an Heat Treatment of Metals Used in Aëroplane Construction. F Grotts. (Chem. and Met. Eng., Aug. 1, 15, and Sept. 1, 1918 20 pp., illus.) First three of a series of articles dealing wit cast iron, steel, aluminum, copper, bronze and brass; typica examples of investigations of aëroplane parts, with microphotographs and results of physical and chemical tests.

9964—ALLOYS—The Constitution and Influence of a Core Dendritic Structure in Alloys. O. Smalley. (Journ. Soc. of Chem Ind., July 15, 1918; 10½ pp., illus.)

9965—BABBITT—Notes on Babbitt and Babbitted Bearings Jesse L. Jones. (Bull. A.I.M.E., Aug., 1918; 7 pp., illus.) 40c

9966—BRASS—The Influence of Small Quantities of Som Metallic Elements on the Mechanical Properties of Brass. F Millington. (Chem. Ind., May 31, 1918; 5½ pp., illus.)

9967—CHIMNEYS—Standard Safety Ladder for Tall Chimneys Geo. M. Douglass. (Eng. and Min. Journ., Sept. 14, 1918; ½ p illus.) 20c.

9968—ELECTRODES—The Manufacture of Carbon Electrode for Electrometallurgical Purposes. (Chem. and Met. Eng., Au 15, 1918; 6 pp., illus.) Trans. from "Stahl u. Eisen," Vol. 3 1912.

FUELS

(See also "Petroleum and Natural Gas")

9973—CALORIMETER—A Convenient Multiple-Unit Calorimeter Installation. J. D. Davis and E. L. Wallace. (Tech Pape 91, U. S. Bureau of Mines, 1918; 48 pp., illus.)

9974—CALORIMETER EFFICIENCY, Some Points Regardin Walter P. White. (Journ. Soc. Chem. Ind., July 15, 1918; 8 pp.

9975—CARBONISATION—Aspects of the Low Temperatu Carbonisation of Coal. Edgar C. Evans. (Journ. Soc. of Chem Ind., July 31, 1918; 8¼ pp.)

9976—COAL—Monograph on the Constitution of Coal. Mar C. Stopes and R. V. Wheeler. (Dept. of Scientific and Ind. Research of Great Britain, 1918; 58 pp., illus.) Based on pap read before the London Section of the Society of Chemical Industry.

9977—COAL SAVING by the Scientific Control of Steam Boil plants. D. Brownlie. (Reprint from Engineering, July 12 an 19, 1918; 16 pp.)

Personal

Have You Contributed to the Association of the 27th Engineers?

L. F. S. Holland has been in Mexico City and left there about Oct. 1.

J. B. Tyrrell is visiting some parts of Newfoundland that are but imperfectly known.

Olaf P. Jenkins has been appointed to the staff of the Arizona Bureau of Mines as geologist.

D. C. Jackling has been elected president of the Butte & Superior Mining Co., succeeding the late N. Bruce MacKelvie.

J. C. Gwillem has resigned as professor of mining and ore dressing in Queen's University, Kingston, Ont., on account of ill-health.

R. B. Watson recently visited the Glencoe oil field, in western Ontario, and examined several properties on behalf of E. P. Earle, of New York.

John Kiddie, mine superintendent at Morenci, Ariz., for the Arizona Copper Co., is back at his post from a month's vacation spent in southern California.

Howard F. Wierum, general manager of the American Mineral Production Co., at Valley, Washington, is in New York in connection with business for his company.

L. H. Goodwin, with the firm of Rogers, Mayer & Ball, has returned to New York from a month's examination work in the Southwest and is leaving for similar work in Nevada.

Archiebald C. H. Gerhardi, who resigned last March as manager of the Wall Street Copper Co.'s mine at Luning, Nev., to enlist in the Canadian Engineers, has just received a commission.

Julius Kruttschnitt, Jr., of Tucson, Ariz., general manager in Arizona for the American Smelting and Refining Co., has been appointed as an advisor to the southern Arizona district exemption board.

Arthur Notman, of Bisbee, Ariz., assistant superintendent of mines, Copper Queen branch of the Phelps Dodge Corporation, has taken an examination at Camp Cody for entrance to the Engineers' Corps.

Arthur J. Bensusan, superintendent at the mines of the Ouro Preto Gold Mines of Brazil, Ltd., at Passagem, Minas Geraes, Brazil, is at the Hotel Belmont in New York. He is on his way back to Brazil from England.

A. E. Drucker has joined the firm of Howard, Morinni & Co., Inc., industrial engineers, 111 Broadway, New York, and 106 Boulevard Haussmann, Paris, as manager of their chemical and metallurgical department.

J. W. Rawlins and **J. C. Nichols**, general manager and mine superintendent, respectively, of the International Nickel Co. of Copper Cliff, Ont., recently visited Jerome, Ariz., where they showed especial interest in the new United Verde Extension smeltery.

M. E. Cassidy, of Bisbee, Ariz., for several years chief claim agent for the Copper Queen Consolidated Mining Co., has been commissioned a captain in the U. S. Army, and assigned to Camp Cody, where he will be adjutant of one of the regiments being organized there.

A. L. Dowdell, formerly superintendent of the cyanide plant of the Empire Mines and Investment Co., at Grass Valley, Calif., is now in France with the Signal Corps. **Elliott Downing**, formerly surveyor for the same company, is a lieutenant of engineers and also in France.

Thomas W. Fitzgerald, for four years head of the University of Arizona electrical engineering department, has resigned to take charge of the electrical equipment of the Ray Consolidated Copper Co., at Hayden, and to serve as consulting engineer in the same division at Ray.

Morril B. Spaulding, recently superintendent of maintenance, Chester Shipbuilding Co., Ltd., at Chester, Penn., has been appointed resident engineer, division of shipyard plants of the Emergency Fleet Corporation, and has been assigned to the same plant at Chester.

Richard H. Vail, formerly on the editorial staff of the "Journal," has been commissioned a captain in the technical division of the Chemical Warfare Service and expects to be ordered to France soon for service with the American Expeditionary Forces. For the last seven months Captain Vail has been engaged in technical work in the Ordnance Department at Washington.

Obituary

Artemas L. Grow, a pioneer of Tombstone, Ariz., died recently at Sawtelle, Calif aged 81 years.

Edward Woods Hunt, metallurgical engineer of New York, died in this city on Sept. 25. He was born in Chicago in 1880 and was graduated from the Sheffield Scientific School in 1901. Mr. Hunt had done much work in the Far East as well as in the western part of the United States.

William A. Hendryx, inventor of the Hendryx appliance intended for the cyanide treatment of ores, died suddenly in Allentown, Penn., on Sept. 22, aged 69 years. He was born in Seymour, Conn., and was graduated in medicine from Rush Medical College. Dr. Hendryx later became interested in mining in various parts of the world.

S. M. Rodgers, metallurgist for the American Steel and Wire Co., Pittsburgh, Penn., died at Pittsburgh on Sept. 17, aged 58 years. He was born near Wellsburg, W. Va., and was a graduate of the University of Michigan. He was a member of the American Institute of Mining Engineers, the American Iron and Steel Institute and other technical societies.

Robert Elmer Booraem died recently. He was born in Jersey City, N. J., Mar. 28, 1856, and was graduated as a mining engineer at the Columbia School of Mines in 1878. In the following year he went to Leadville, Colo., where he gained practical experience and soon became manager of the then famous Morning Star and Evening Star mines, on Carbonate Hill. During that time he befriended that interesting character, Ferdinand Van Zandt, from whom Mrs. Foote drew the hero in her famous novel, "The Led Horse Claim." Van Zandt remained only a short time in Leadville, departing thence to enter upon his adventurous career, in the course of which he acquired and developed the Bluebird mine, at Butte, Mont., which made him a very wealthy man. As soon as the great value of the Bluebird seemed to be well assured, Van Zandt, ever loyal to Booraem and mindful of the helping hand extended when it was greatly needed, sent for Booraem to come to Butte to be general manager of the Bluebird, this being in 1887. At Butte, Booraem participated in the exciting times of those days and experienced some great personal hazards, but he continued to work the mine, which paid large dividends for a good many years. When the fortunes of the mine had waned, Booraem returned to New York and lived a life of considerable retirement; but in 1911 he went West again and engaged in gold mining in Arizona and Nevada, making his home in Denver. He was a member of the University Club and St. Nicholas Society in New York, and of the Sons of the Revolution and Society of Colonial Wars.

Societies

American Peat Society held its annual meeting at the Hotel McAlpin, New York, on Sept. 25-27.

Teknik Club, of Denver, Colo., held its first dinner and meeting of the season at the Shirley Hotel on Sept. 10. A paper was read by Thomas A. Dickson, on "Blast-Furnace Smelting With Oil." Experiments and commercial tests on blast furnaces fired with oil were described in detail. It appears that the process has been successful in treating ores free from magnetite, but that this mineral presents difficulties not yet satisfactorily overcome. H. B. Lowden, of the Colorado Iron Works Co., was appointed secretary-treasurer for the ensuing year.

Association of Iron and Steel Electrical Engineers elected the following officers at its convention in Baltimore, Md., on Sept. 11-14: President, D. M. Petty, superintendent electrical department, Bethlehem Steel Co.; first vice president, B. W. Gilson, superintendent electrical department, Carnegie Steel Co., Youngstown; second vice president, H. C. Cronk, McKinney Steel Co., Cleveland; treasurer, James Farrington, La Belle Iron Works, Steubenville, Ohio; secretary, John F. Kelly, Empire Bldg., Pittsburgh; directors, E. S. Jefferies, Steel Co. of Canada, Hamilton, Ont.; G. W. Richardson, American Bridge Co., Pencoyd, Penn.; F. A. Wiley, Wisconsin Steel Co., South Chicago, Ill.; and Walter Kennedy, Pittsburgh Crucible Steel Co., Midland, Pennsylvania.

Faraday Society met in London on July 23, Sir Robert Hadfield presiding. The following three papers were presented: "Contributions to the Chemistry of Aluminum and Aluminum Alloys," by John G. A. Rhodin; "Metallography of Aluminum: Recrystallization and Grain-Growth—the Result of Deformation in the Cold Prior to Annealing," by Robert J. Anderson, of Cleveland, Ohio; "Reinforced Concrete vs Salt Brine and Sea Water," by Prof. H. J. M. Creighton, of Swarthmore College, Pennsylvania.

Industrial News

Electrolytic Zinc Co., has discontinued operations at its plant in Baltimore, Md., which will be dismantled.

Electric Furnace Co., of Alliance, Ohio, has secured the services of Leonard W. Egan, formerly special engineer with Wellman-Seaver-Morgan Co. and, previous to that, electrical engineer for five years with the Pittsburgh Crucible Steel Co., Midland Pennsylvania.

W. J. Armstrong, manager of the crushing and pulverizing sales department, of the Jeffrey Manufacturing Co., Columbus, Ohio, has recently received an appointment as captain in the U. S. Army and been assigned to the Ordnance Department in Washington, D. C.

Magnesia Association of America has issued in pamphlet form a specification for "85% Magnesia" non-heat-conducting coverings for power and heating systems, which has been compiled and indorsed by the Mellon Institute of Industrial Research of the University of Pittsburgh.

Walworth Manufacturing Co., Boston, Mass., announces that it will discontinue making the 6-in. genuine Walworth Stillson wrench, also the manufacture of the wood-handle Stillson wrench, making only the steel handle. It has adopted a special "war finish" for its Stillson wrenches for the period of the war.

Johnson, Matthey & Co., Ltd., refiners and assayers of London, England, have conducted during 1918 an exhibition of 'British Science Products,' including the metals and salts of gold, silver, and the platinum group, bismuth, copper, selenium, tellurium and thorium, to show the firm's connection with these in the past, as well as the developments therein due to the war.

Wood Equipment Co., has recently purchased and equipped commodious shops, at Grand Crossing, Chicago, so as to provide greater facilities for manufacturing the pneumatic rotary dump and other mining specialties. The main offices will be at the new plant, but the company will maintain city offices in the McCormick Bldg., Chicago, as well as branch offices in New York, Pittsburgh, Knoxville and Denver.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alloy Containing Cu, Al and Zn. Frank S. Hodson, Philadelphia, Penn. (U. S. No 1,276,916; Aug. 27, 1918.)

Alloy Containing Ni, Zr, Al, Si, and a Metal of the Cr Group. Hugh S. Cooper, Cleveland, Ohio, assignor to the General Alloys Co. (U. S. No. 1,277,046; Aug. 27, 1918.)

Copper-Nickel Matte, Separation of Metals in. George W. Pawel, Hudson Falls, and Edward A. Rekate, Lancaster, N. Y., assignors to United States Nickel Co., New Brunswick, N. J. (U. S. No. 1,276,809; Aug. 27, 1917.)

Drill, Mining. John Arthur Kaye, Sault Ste. Marie, Ont., Canada. (U. S. No 1,277,220; Aug. 27, 1918.)

Flotation. Frank Groch, Cobalt, Ont., Canada. (U. S. No. 1,276,753; Aug. 27, 1918.)

Flotation. Walter A. Scott, Chicago, Ill., assignor to Minerals Separation North American Corporation. (U. S. No. 1,276,974; Aug. 27, 1918.)

Hoist, Portable Electric. Samuel Edward Kalbach, Reading, Penn. (U. S. No. 1,277,218; Aug. 27, 1918.)

Editorial Correspondence

SAN FRANCISCO—Sept. 24

Comstock Northend Mines milled 196 tons of ore in the week ended Sept. 21, despite the acute labor shortage caused by the desertion of miners to the copper-mining camps. The Comstock has a record of 51 years without a labor strike, because of the well-known fact that the miners have been fairly treated and received the highest wages paid in gold-mining camps since the organization of the first miners' union at Virginia City, Gold Hill and Silver City more than half a century ago. But miners, like other workmen, want the money, and they go after it when a higher wage is offered in other camps. During the week mentioned Consolidated Virginia contributed to the milling total 306 tons, averaging $13.28 per ton; Union Consolidated, 131 tons at $10.48 and 29 tons at $6.14; Sierra Nevada, 30 tons at $13.94 per ton. The aggregate yield amounted to $6033, or an average of $12.16 per ton.

Chrome Shipments from Eureka, Humboldt County, in the second week of September totaled six carloads, or about 300 tons. Five of the cars were from Del Norte County, brought into Humboldt Bay by schooners and one car was from Horse Mountain, Humboldt County. This is the second shipment from Horse Mountain mines; another carload is waiting transportation at Essex, and a third is ready for hauling to the station. No manganese shipments were made during the week, owing to damage to roads and bridges by recent forest fires. Recent development of the old Tyson chrome mine, in Del Norte County, has disclosed sufficient ore to start motor-truck hauling for rail shipment. Large tonnage of ore has been exposed, and bunkers and hoisting machinery have been installed. A new deposit has been developed on the north fork of Smith River, in Oregon just north of the California line. The property is leased to the Northwestern Chrome Co., of Seattle, which is shipping 30 tons a day.

Production of Potash from Searles Lake deposits under development by the West End Mining Co. of Nevada is expected within the coming year, according to an announcement made by the directors of the company. In declaring a recent dividend, the directors carefully considered several matters of vital interest to the company, referring to the necessity of continued development of the Searles Lake property, which is leased from the Government. Two other items of general interest were mentioned by the directors as affecting the present dividend: The subscription of the company of $25,000 to the fourth Liberty Loan, which will make a total of $165,000 of Liberty bonds. Regarding the money received from the settlement of the suit against the Jim Butler Mining Co., the West End company is not advised how it will be treated respecting taxation. In addition to these special matters the company has acquired promising gold- and silver-mining properties in Honduras, where operations are now being started. The properties at Tonopah, the directors state, are in excellent condition, and the yield continues to meet expectations. The West End company is controlled by California men, the president, F. M. Smith, and the directors being residents of Oakland.

SALT LAKE CITY—Sept. 26

Tintic Mine Owners and lessees are protesting the state occupation tax, which practically places a double tax on mines operating under the leasing system, as both the owner and the lessees pay 3% on their net profits. Most of the mines paying the tax, which is now due, are doing so under protest. The whole matter is more or less in abeyance, however, until after the elections, when the proposed constitutional amendment has been voted on and the mining public knows better where it stands.

The Eastern Part of the Tintic District is being actively developed in an effort to find another mine like the Tintic Standard. This property operated several years without opening ore in paying quantity until a good orebody was finally opened at depth since then the mine has been steadily adding to reserves and at the same time increasing shipments, and is now a regular dividend payer. Neighboring properties are naturally expecting to find their ore at depth, and considerable shaft sinking is in progress. The Iron King shaft is down almost 1100 ft. and the Copper Leaf, the Apex Standard and the Eureka Lily are sinking. The shaft of the Eureka Bullion is down 825 ft., and crosscutting here has opened a vein carrying iron, with some gold and silver. It is thought that the ore horizon is considerably further down. The North Lily and the Zuma are working. Also, work on the Tintic drain tunnel, further to the southeast than the properties mentioned, is expected to give interesting information as to the possibilities of this section.

Question of Mine Taxation in this state, pending before the Legislature, is again coming before the public in the autumn elections, when a constitutional amendment making a radical change in the present method of taxation is proposed. Mining companies will this year, as in the past, be assessed accordng to the amount of their annual net proceeds and on their surface improvements. The new law, if passed, would tax coal mines at their full cash value, and metal mines at a multiple or submultiple of their value. It is exceedingly difficult, for obvious reasons, to place a value on a mining property, and the feeling of the industry is in favor of the law as it now stands. In accordance with procedure in this state, arguments for and against the proposed constitutional amendment are being presented in pamphlet form to the voting public. The mining men's side is being presented by Jesse Knight, one of the oldest operators in the state. The proposed new law would undoubtedly increase the burdens of taxation on the mining industry, which is already bearing its full share, and the Utah Chapter of the American Mining Congress is coöperating with operators in gathering data to combat the proposed measure.

DENVER—Sept. 25

The Tungsten Industry of Boulder County may be hard hit by the new draft, according to preliminary estimates. It appears that about 500 men registered from Boulder County, and that about 230 of these are miners from the Nederland tungsten district alone. From the Lakewood district 41 men registered. It is feared that the labor shortage already existing in the tungsten camps of Nederland, Beaver Creek, Tungsten and Lakewood will become more serious after the draft begins to operate. Ways and means of replenishing the labor supply in the tungsten fields are being discussed by interested operators. Plans are being formulated to take men from other lines of work, where they can be spared, and train them as miners. It has been suggested that many men now in clerical positions can be taught how to mine, and that their places can be filled by competent women.

Colorado School of Mines introduced military training on Sept. 8. The student Army training corps has been organized and is under the command of Lieut. H. J. Shepard, of the U. S. Army. Instructions regarding the details of organization have been received by the school from Washington. A contract between the school and the Government, covering the housing and feeding of the students,, has been signed. Plans have been completed for a mess hall to accommodate 200 students. The building will cost $1500, and construction will begin as soon as the plans arrive. All work at the school will be done in accordance with Army regulations. All members of the student Army training corps are privates in the U. S. Army in active service, They may be recommended for officers' training camps, the selection to be made on a competitive basis. All members will be required to eat in the mess hall, and will be housed in buildings on or near the campus in units of not less than 25 each. All members will receive a salary of $30 a month, and will be furnished subsistence, housing, equipment, clothing, and college expenses, except text books and supplies. Some of the men will be housed in fraternity houses, and under the direction of a non-commissioned officer. The attendance at the school has recently increased to over 200.

TUCSON, ARIZ.—Sept. 27

Deferred Classification of skilled miners, smelter and mill men and mine railroad operators was discussed here at a recent meeting of the Southern Arizona district exemption board and representatives of southern Arizona and Sonora mining companies. The latter included: From Bisbee, G. H. Dowell, of the Copper Queen, and W. B. Gohring, of the Calumet & Arizona; from Douglas, Harry Clark, of the Calumet & Arizona works; J. S. Williams, of the Moctezuma, and L. R. Budrow, of the Lucky Tiger-Combination; from Cananea, Casey Stiles, of the Cananea Consolidated; from Morenci, Milton McLean, of the Detroit Copper. The board held that the industries represented were essential, but that individual claims must be presented in each case, with affidavits from the applicant's immediate superiors. The mine managers stated their output, generally, had been only 72% of that possible during the last year, due to labor shortage. Practically no development work is being done, and all men are used on ore production. Conditions in the Mexican camps are said to be worse than in Arizona, as the men called home for the draft usually are foremen or exceptionally skilled men who can hardly be replaced.

WALLACE, IDAHO—Sept. 24

Cœur d'Alene Mine Operators are preparing to ask deferred classification for practically all employees in conformity with the announced policy of the Government to retain men employed in essential war industries. It appears that the reduced production of lead, due to the shortage of labor, has already become a matter of serious concern to the Government, and unless steps are taken to prevent the working forces being further depleted through the operation of the draft, it may become necessary for the Government to take a direct hand in providing labor for the mines. The chief lead producers of the Cœur d'Alene district in some cases have less than half of their normal force, and all are seriously handicapped by the labor shortage. The standard wage scale is $5.25 per shift of eight hours, and some of the mines are paying $5.75 as an inducement to get men.

An Investigation of the Quicksilver and antimony deposits of central Idaho has been made by Robert N. Bell, state mine inspector, who has issued a report, which covers in general the topographical and geological conditions of the district and describes in detail the development and equipment of the Fern mine, which is now producing quicksilver on a small scale. The ore is being taken from a tunnel, in which the vein has been followed 80 ft., showing a width of from one to four feet, which includes a high-grade streak of from six inches to a foot in thickness. Ore is also being extracted from a surface cut. The ore is treated in a furnace of the Johnson-McKay type, which consists of a battery of steel cylinders built into an oblong brick structure 6 ft. high, 8 ft. wide and 20 ft. long. These cylinders are 12 in. in diameter and 6 ft. long, with 4-in. inclined discharge pipes at the rear for condensing the fumes. The metallic doors of the cylinders are clamped on and sealed with a paste made of wood ash. There are 12 cylinders, each with a charge capacity of 150 lbs. of ore. A firebrick flue extends under and over this battery of retorts, and the smokestack is directly over the furnace. It requires about eight hours to run through a charge. The process is simply to heat the retorts to a red heat, which drives off the volatile metal in the form of a fume, which is condensed and precipitated in the discharge pipes at the rear of each retort and dropped into a container as metallic quicksilver, from which it is ladled out and placed in ordinary quicksilver flasks ready for shipment. To compensate for the small capacity of the plant, the ore is sorted to an average of 5%, or 100 lb. of metal to the ton of ore, which yields a handsome profit. Other properties are described by Mr. Bell, and he regards the field one of great promise. A good wagon road is the most pressing necessity to encourage development.

BUTTE, MONT.—Sept. 26

The Attempted Strike in the Butte Mines has proved to be a failure. The men who endeavored to create trouble among the miners and shut off the production of copper made greater efforts than heretofore, but to no avail. Circulars were scattered about the roads, in the boarding houses and on the streets asking that the men quit work until six hours was declared to be a day's work, and that an agreement be made that the men be lowered and hoisted on company time and the rustling card system be abolished. At first not more than 1000 men responded to the call of the I. W. W., and, finding the call a failure, the leaders had men visit the homes of miners while they were at work and warn the wives that if their husbands went to work they would be badly handled. In addition to this, men were posted in boarding houses to intimidate the men, and also stationed at points leading to the mines for the purpose of beating persons going to work. In a few cases workmen were assaulted, but this was met by the military authorities posting numerous guards at all points taken by the miners going to and returning from work, with the result that some arrests were made and severe fines imposed so that the radical element soon ceased to interfere in a public way. The I. W. W. held a mass meeting, and after some radical speeches by leaders, a resolution was adopted calling upon the Government to take over the mines and operate them. This method was adopted only to make outsiders believe that the men had some real grievance. Federal Labor Mediator Barker has arrived in the city to make an investigation into the causes of the trouble and report to the War Labor Bureau. Mr. Barker purposes taking some time in going thoroughly into the situation from every standpoint before reporting to the board. He will not listen to any one section or class, but will investigate from an independent point of view.

TORONTO—Sept. 28.

The Reid Newfoundland Railway has established a national resources department to explore large areas of land owned by the company. J. McNeil [illegible], formerly of Montreal, has been placed in charge of the new department. During the summer promising coal and mineral deposits were discovered under his direction, and active exploration of the coal area is now being undertaken. H. B. Hatch, formerly of Porcupine, is also attached to the department.

The Construction of a Railway from the Pas to the new copper district in northern Manitoba is probable, according to the Hon. Edward Brown, provincial treasurer of Manitoba. This new district, known as the Flin Flon section, lies about 70 miles from the Hudson Bay railway, and is at the boundary of Saskatchewan and Manitoba. The two principal properties are the Flin Flon and the Mandy. The former has been extensively diamond drilled, and several million tons of ore carrying gold, silver and copper have been proved up. The ore will have to be smelted on the ground, and this will require a railway and hydro-electric development. It gives promise of being one of the largest mining undertakings in Canada. The Mandy is a smaller body, and is owned by the Tonopah Mining Co. A considerable tonnage of copper ore has been developed, and this is being mined and hauled out over the winter roads for shipment to the smelter. The railway would also open up the Beaver Lake Gold section, where there are several properties of considerable promise.

VICTORIA, B. C.—Sept. 20

Question of the Joint Administration of all minerals in the Esquimalt & Nanaimo R. R. Co.'s land holdings on Vancouver Island with the exception of gold and silver which alone are vested solely in the province was taken up with Lord Shaughnessy, president of the Canadian Pacific Ry. Co., by the Hon. William Sloan, Minister of Mines at Vancouver, B. C., on Sept. 19 with satisfactory results. Mr. Sloan found that Lord Shaughnessy agreed with the position taken by the Department of Mines and unanimously endorsed by the Legislature of British Columbia at its last session, that the present system of mineral control within the area owned by the island railway was most unsatisfactory from a public standpoint. Because of the existing dual control, the development of the mineral resources of the 3,296.9 square miles of railway land on the island was being seriously retarded, and owing to the complications likely to arise in the securing of title to minerals other than gold and silver in this section, prospectors were not inclined to go into the field and develop it. The difficulties were aggravated by the fact that where gold and silver was discovered on the island the ore usually contained other minerals. For the encouragement of prospecting in the Esquimalt & Nanaimo belt, and in the interests of the mining industry of this part of the province, it was desirable that there should be some understanding between the province and the railway company as to the development of resources known to exist but hitherto practically untouched in an economic sense.

The Mining News

ARIZONA

Cochise County

DRAGOON MOUNTAIN (Johnson)—Drifting east and west on 300 level of vertical shaft. New ore has been cut on 400 level of inclined shaft.

PEABODY (Johnson)—To resume development on extensive scale.

HILLTOP EXTENSION (Paradise)—Lead-silver ore to be shipped upon completion of new road to the mine.

Graham County

ARIZONA SYNDICATE (Geronimo)—Work started on 1500-ft. tunnel to cut vein containing copper with some gold and silver.

Greenlee County

ARIZONA COPPER (Clifton)—Copper production during August was 4,300,000 pounds.

Mohave County

TUCKAHOE (Kingman)—Shaft has reached 250 level. Hoist and compressor have been installed.

TOM REED (Oatman)—Installing new mill machinery, including crusher.

Yavapai County

CALUMET & JEROME (Jerome)—Announcement has been made of suspension of operations till after the war. Last drilling contract completed.

GRAND ISLAND (Jerome)—Development work has been suspended, after completion of 4500 ft. of drilling, until after next directors' meeting, when it is expected that sinking will be resumed on main shaft. New bunk houses are being built.

JEROME VERDE (Jerome)—Has resumed shipments to Humboldt smeltery. Mining from stopes above the 900 level in Maintop section.

UNITED VERDE (Jerome)—In August produced 7,910,000 lb. of copper. Smeltery operating at capacity.

VERDE COMBINATION (Jerome)—Drifts have been driven in both directions on a decomposed quartz vein cut by a crosscut from the 1080 station.

CALIFORNIA

Madera County

GREEN MOUNTAIN (Raymond)—Sold to W. H. Wilson, of Alameda. Development has started.

Nevada County

LABOR SHORTAGE, which has been felt by mining companies at Grass Valley and Nevada City, is at an end. Miners who left during the summer months to work at the shipyards have found living expenses higher and are returning.

KENOSHA (Grass Valley)—To be reopened by Alcalde Gold Mines Co. under management of George W. Root, of San Francisco. Formerly large producer.

EL ORO (Lake City)—Complaint lodged against manager for storing powder in old blacksmith shop without license. John M. Griffin, Federal inspector, is investigating.

Tuolumne County

DUTCH (Jamestown)—Good grade of ore developed on 2300 level. Concrete foundations for new mill nearly complete.

ALPHA (Sonora)—Recent shortage of water caused temporary shut-down of mill. Rains of past week promise good supply.

CONFIDENCE (Sonora)—New mill in operation on ore from recent development and lower levels.

SIERRA NEVADA EXPLORATION (Sonora)—Good gravel extracted in development drift to old Berry channel. J. J. Hadecker is manager.

IDAHO

Shoshone County

COPPER KING (Mullan)—Work suspended probably until end of war. Planning to build mill to treat large body of low-grade lead-zinc ore.

JACK WAITE (Murray)—Hauling lead ore by motor truck from mine to railroad at Prichard.

YUKON GOLD (Murray)—New spud. 50 ft. long, 4 ft. square and weighing 20 tons, to be delivered at dredge on Prichard Creek. Will be loaded on two heavy transfer trucks and drawn by caterpillar tractor.

KANSAS

Joplin District

MIAMI VOLUNTEER (Baxter Springs)—To build 200-ton mill. Will use, but have not purchased, tables, crushers, compressors and conveyors.

MISSOURI

Joplin District

COW CREEK (Carl Junction)—To build 200-ton mill. Need, but have not purchased, tables, crushers, compressors and conveyors. W. H. Clark is superintendent.

HEATON & HODGES (Neosho)—To build 500-ton mill. Need, but have not purchased, crushers, tables, conveyors, compressors and ore cars.

NEVADA

Esmeralda County

SILVER PEAK RAILWAY is being dismantled, and equipment will be shipped to France, it is stated. This road, 17 miles long, connected Blair with Blair Junction, on Goldfield branch of Southern Pacific Ry. Since the closing down of Pittsburg-Silver Peak company, upon which Blair depended, there has been no use for the branch.

C. O. D. (Goldfield)—Lessees mining high-grade ore in vein recently opened in winze 125 ft. below 65 level. Work being done through main Gold Bar shaft. Milling-grade ore also opened on 200, 300 and 400 levels.

FLORENCE GOLDFIELD (Goldfield)—Several lessees making good production, some in neighborhood of main shaft, and some in old Reilly lease block.

RED HILL FLORENCE (Goldfield)—Drifting from winze 50 ft. below 400 level has opened vein of ore. Stoping on 400, 450 and 500 levels. Development on 600 level will be started as soon as shaft station is enlarged.

Humbolt County

SILVER DISCOVERY in old Rileyville district, 30 miles west of Unionville, has been made recently. Another silver discovery reported made on Duffner property, in Spring Hill mining district, 10 miles from Antelope station on Western Pacific Railway.

TWO NEW TUNGSTEN MILLS are being built at new camp of Tungsten, 30 miles west of Winnemucca, and nine miles from Mill City. Companies building are Nevada-Humboldt Tungsten Co., a subsidiary of Tungsten Products Co., and Pacific Tungsten Co., with which W. J. Loring is associated. Former company building 100-ton plant, and latter 125-ton plant.

SUNSET MINING AND DEVELOPMENT (Unionville)—Has taken over Arizona property, and preparing to reopen. Machinery for flotation plant now being hauled in. Development work progressing with satisfactory results, and, in addition to ore developed, dumps contain considerable tonnage of commercial-grade ore.

Lincoln County

PRINCE CONSOLIDATED (Pioche)—-Has secured adjoining manganese property; previous development has opened large tonnage of commercial ore.

Lyon County

NEVADA-DOUGLAS (Ludwig) — Hoisting and pumping equipment being installed on 800-ft. level. Winze to be sunk to open ore below big caved stope extending from 800 to 700 level. Buildings and equipment of copper-leaching plant, built four years ago, and which did not prove to be a metallurgical or economical success, being sold f.o.b. Wabuska, Nevada. Equipment consists of crushing machinery, elevators, belt conveyors, Oliver filters, digestors, acid proof tanks and pipes.

McCONNELL (Mason)—Shipping regularly to smeltery. Lessees opening carbonate ore at surface on north end of group.

MINNESOTA-NEVADA (Wabuska) — Shipments of high-grade copper ore being made.

BLUESTONE MINING AND SMELTING (Yerington)—Regular shipments of copper carbonate ore made to Thompson smeltery, and mill treating 300 tons daily of copper sulphide ore. Janney flotation machines used entirely in mill, slimes being dewatered on Oliver filter. Number of cottages being built to accommodate workmen.

Mineral County

CANDELARIA MINES (Candelaria)—Has acquired large acreage covering several early-day producers, and is planning considerable development. Three veins, opened by tunnel in Lucky Hill at depth of 220 ft., show some milling-grade ore. Old dumps of camps contain large tonnage of low-grade silver ore, which it is now believed can be milled at a profit.

Nye County

WHITE CAPS (Manhattan) — Three shifts sinking main shaft, now below 500 level. Stoping on 300, 400 and 500 levels, and milling plant operating to capacity.

CASH BOY (Tonopah)—Main shaft to be sunk 155 ft. deeper than 1435 level to facilitate extraction of ore below.

JIM BUTLER TONOPAH (Tonopah)—Net earnings for August were $29,813.

MONARCH PITTSBURGH (Tonopah)—Crosscutting south on 600 level to be continued to Ohio vein.

RESCUE EULA (Tonopah) — Raising from 1150 level to cut ore on 1050 level.

TONOPAH BELMONT (Tonopah) — Milling plant now treating ore from Tonopah Mining Co. and Jim Butler in addition to its own ore.

TONOPAH DIVIDE (Tonopah)—Northwest drift on 370 level being advanced in milling-grade ore. Southeast drift discontinued until surface plant in operation, as material cannot be handled. Shaft will be sunk to water level at once.

TONOPAH MINING (Tonopah)—Large tonnage low-grade dump material being shipped to milling plant at Millers.

WEST END CONSOLIDATED (Tonopah)—New hoisting machinery being installed. larger ore pocket being built below 900 level of No. 2 shaft and station on 800 level to be enlarged to accommodate double tracks

Storey County

COMBINATION SHAFT (Virginia City)—Unwatered to point 140 ft. below Sutro tunnel. New pumps will be installed and unwatering continued

CONSOLIDATED VIRGINIA (Virginia City)—Ore being hoisted during development work on 1800, 2000 and 2200 levels; and ore mined from raise above 2200 level

HALE & NORCROSS (Virginia City)—Extensive development work will be done in near future. Control acquired by H. L. Slosson and associates.

SIERRA NEVADA (Virginia City)—Drifting north on 2500 level in low-grade quartz; also raising to 2400 level.

UNION CONSOLIDATED (Virginia City)—South drift on 2500 level in low-grade quartz; better grade ore being stoped above level.

White Pine County

CONSOLIDATED COPPER MINES (Kimberly)—Developing on 1100 and 1200 levels. Crosscut being driven on 1300 level to explore downward continuation of ore from levels above. Power line connecting Kimberly with the Nevada Consolidated main transmission line has been completed.

NEVADA CONSOLIDATED (McGill)—Copper production during August was 6,500,000 pounds.

LUCKY BOY (Osceola)—Development progressing with satisfactory results, and gold-silver-lead ore is being opened up. New shaft sunk 125 ft. in ore. Better grade ore to be shipped, and rest stockpiled until jigging plant is built. Mace Clays is manager.

NEW JERSEY

Morris County

SCRUB OAK (Hibernia)—Operating at full capacity and supplying iron ore to Wharton Steel Co.'s furnaces.

NEW MEXICO

Grant County

CHINO COPPER (Hurley)—August output of copper was 5,065,818 pounds.

REPUBLIC (Hurley)—Recently installed 350-ft. compressor. Mining zinc sulphide ore. Dave Ball is superintendent.

BONNEY (Lordsburg)—Lease of Lawrence Mining Co. has expired. Property will be operated by owners, Bonney Mining Co. James P. Porteus is general superintendent.

LAST CHANCE (Lordsburg)—Work on new mill progressing. Mining force increased to 25 men. J. Shotwell is superintendent.

Luna County

EL PASO (Cooks Peak)—Shipping two cars of lead carbonates per week to El Paso smeltery. T. S. Grover is superintendent.

LIBERTY MANGANESE (Deming)—Have car of high-grade manganese ready to ship. Fred Kohlmeyer is superintendent.

NEW YORK

Sullivan County

ST. NICHOLAS ZINC (Summitville)—Has been leased on a royalty basis. Changes and improvements are being made in the mill.

OKLAHOMA

Joplin District

CONSOLIDATED (Commerce) — Has taken over Emma Gordon mine.

ST. LOUIS LEAD & ZINC (Miami)—To move new mill near Quapaw, to Jefferson mine, south of St. Louis.

MIAMI WONDER (Picher)—New 300-ton mill in operation.

AURORA (Quapaw)—New 200-ton mill in operation.

SCOTT-EAGLE (Quapaw) — Operating after several weeks' shut-down. R. P. Sharp is manager.

TEXAS

El Paso County

MAGNESITE DEPOSITS near El Paso have been optioned to the Magnesite Products Corporation, of New York

UTAH

Juab County

TINTIC SHIPMENTS for week ended Sept. 21 amounted to 150 cars, although below average of shipments in the past.

CHIEF CONSOLIDATED (Eureka)—New shaft down 211 ft. Daily progress averaging 7 feet.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Shipping ore from three stopes and developing iron ore carrying silver and copper

MICHIGAN-UTAH (Alta)—Pipe line for air to Lost tunnel to be extended and power drill installed

WASATCH MINES (Alta)—Drain and operating tunnel in 2750 feet.

Summit County

PARK CITY SHIPMENTS for week ended Sept. 21 amounted to 1800 tons, as compared with 2083 tons week preceding and 1789 tons week before that.

ONTARIO SILVER (Park City)—Shipments coming chiefly from new stopes between 1500 and 1800 levels.

Tooele County

WESTERN UTAH COPPER (Gold Hill)—Shipping only lead-silver ores at rate of 100 tons daily. Greater part of this coming from main workings at Gold Hill. Shaft at Yellow Hammer property down 100 feet.

SILVER QUEEN LEASING (Wendover)—Fluorspar being developed. First car shipped. Also good showing of silver-copper ore.

VIRGINIA

Smyth County

MANGANESE PRODUCTS (Sugar Grove)—Considering installation of additional trackage and equipment to carry on extensive development of open pit during winter. Company has complete washing plant. Stephen Robinson, Jr., is president; H. H. Green is superintendent of mines.

WISCONSIN

Zinc-Lead District

RAISBECK MINING (Cuba City)—New organization formed to take over and operate the old Raisbeck, formerly operated by the C. S. H. Mining Co. James Drought and others, of Milwaukee, are interested.

ZINC HILL (Cuba City)—Sinking new shaft at the mill site, near Elmo, where the Springhill mill equipment has just been assembled. Charles Wolfe is manager.

WICKS MINING (Mineral Point)—Prospecting Senator lease near Rewey.

CANADA

Manitoba

EMPRESS CLAIMS (Falcon Lake)—An initial shipment of scheelite ore has been made. Camps have been completed and preparations made for work during the winter.

Ontario

PARAGON-HITCHCOCK (Elk Lake)—Two properties have been consolidated and arrangements are being made to develop.

DOME (Porcupine)—Contract let to drive raise from the 800 level to the 700 level, connecting workings with other parts of the mine.

CHAMBERS FERLAND (Cobalt)—Mine is closing down. Small amount of ore next to the Nipissing line still to be extracted, but this will be left until the latter has been mined.

COBALT PROVINCIAL (Cobalt)—Will be reopened as soon as new electric pumps have been installed. Flotation equipment has been ordered, which will give the plant a capacity of about 50 tons per day.

LA ROSE (Cobalt)—Contract to haul ore from Violet property to concentrator has been let.

PITTSBURG-LORRAIN (South Lorrain)—Operating old Currie property and using mill of the Wettlaufer mine, to which has been added a small flotation equipment.

KIRKLAND PORPHYRY (Kirkland Lake)—Minority interests in the Orr Gold Mines are opposing the sale of the two northerly lots of the company to the Kirkland Porphyry, and have secured an injunction

MONTREAL-KIRKLAND (Kirkland Lake)—Shaft down 50 ft. to be continued to 100 level and another shaft sunk on a second vein.

TECK HUGHES (Kirkland Lake)—To reopen and proceed with development work. Eventually a new mill will be built.

TOUGH OAKES (Kirkland Lake)—Activity resumed. Dewatering workings and cleaning up the mill.

WRIGHT HARGRAVES (Kirkland Lake)—To proceed with construction of 150-ton cyanide mill.

MEXICO

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper production during August was 1,730,400 lb. Copper ore averaged 3.60% copper.

CHILE

CHILE COPPER (Chuquicamata)—During August produced 8,496,000 lb. of copper

The Market Report

;ILVER AND STERLING EXCHANGE

	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Sept. Oct.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
	4.7550	101⅛	49½	30	4.7550	101⅛	49½
	4.7550	101⅛	49½	1	4.7550	101⅛	49½
	4.7550	101⅛	49½	2	4.7550	101⅛	49½

ew York quotations are as reported by Handy arman and are in cents per troy ounce of bar r, 999 fine. London quotations are in pence per ounce of sterling silver, 925 fine.

..Y PRICES OF METALS IN NEW YORK

	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
	*26	†	8.05	7.75	8.85 @8.95
	*26	†	8.05	7.75	8.85 @8.95
	*26	†	8.05	7.75	8.85 @8.95
	*26	†	8.05	7.75	8.80 @8.90
	*26	†	8.05	7.75	8.75 @8.85
	*26	†	8.05	7.75	8.75 @8.85

Price fixed by agreement between American per producers and the U. S. Government, according to official statement for publication on Friday, tember 21, 1917, and July 2, 1918.

No market.

he above quotations (except as to copper, the e for which has been fixed by agreement between erican copper producers and the U. S. Government, wherein there is no free market) are our raisal of the average of the major markets based rally on sales as made and reported by producers agencies, and represent to the best of our judgt the prevailing values of the metals for the veries constituting the major markets, reduced to s of New York, cash, except where St. Louis is normal basing point.

he quotations for electrolytic copper are for cakes, ts and wirebars.

'e quote electrolytic cathodes at 0.05 to 0.10c w the price of wirebars, cakes and ingots.

uotations for spelter are for ordinary Prime tern brands. We quote New York price at 35c. 100 lb. above St. Louis.

LONDON

ot. t.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
6	122	122	137	337	337	29½	28½	54
7	122	122	137	337½	337½	29½	28½	54
8								
0	122	122	137	337½	337½	29½	28½	54
1	122	122	137	337½	337½	29½	28½	54
2	122	122	137	337½	337½	29½	28½	54

he above table gives the closing quotations on don Metal Exchange. All prices are in pounds ling per ton of 2240 lb. For convenience in parison of London prices, in pounds sterling per 0 lb., with American prices in cents per pound following approximate ratios are given, reckoning hange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; 0 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; 0 = 59.3937c.; £300 = 63.6362c. Variations, £1 2121205c.

Metal Markets

NEW YORK—Oct. 2, 1918

here have been no features of especial rest except the further weakness in

opper—As usual, there is nothing cial to report. There were conferences New York this week between representaes of the War Industries Board and the nufacturers over the matter of contracts which were disturbed by the change of price on July 2. This controversy is not yet settled in so far as the manufacturers are concerned, but their complaint seems to be against the War Industries Board rather than against the producers.

The supply of copper is becoming scarcer than ever, the Government ordering out large quantities. Practically no copper is left for ordinary industrial consumption.

There is no particular interest in the forthcoming meeting between the producers and the price-fixing committee. Nobody among the producers expects that the price will be changed. Everything has settled down on the policy of curtailed production and curtailed consumption. The labor situation has reached such a stage that producers probably could not now increase production anyhow.

Copper Sheets—The base price of copper sheets remains at 35¾c. per lb. Copper wire is quoted at 29½ to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—The control and allotment of this metal have become similar to what prevail in the cases of copper and lead, except that no price has yet been made. It seems as if some definite statement ought to be made. The War Industries Board has issued a questionnaire to everybody handling tin, calling for a statement of business from June 1 to Oct. 1, replies returnable not later than Oct. 15. In the meanwhile, there seems to be no interference with imports that are arriving. Banka and Chinese tins are quoted nominally at 82@84c., but it is doubtful whether there would be either buyers or sellers for any quantities worth mentioning.

The London tin quotations for Sept. 25, which had not been received at the time of going to press with the Sept. 28 issue, are: Spot, 338; 3 mo. 338.

Lead—There is no change in the situation, which remains as tight as ever.

Zinc—The market became weaker from day to day on relatively small business. There were plenty of sellers on comparatively small quantities, but there was no pressure to sell by interests which might make large offerings.

Zinc Sheets—Unchanged at $15 per 100 lb. less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—The situation became stronger without there being much change in price. We quote spot at 14⅛@14⅜c., but there were more buyers than sellers at those prices. Some considerable speculative buying was reported, and there was talk about prospective Government buying. It is the general expectation in the market that upon real buying by consumers the price will advance. Nobody would quote antimony for shipment. The Chinese market is above the level of the price here and is very strong.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50 @$2 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—New York became a little easier, owing to some considerable arrivals. We quote $125@130. San Francisco reports, by telegraph, $120, strong.

Silver and Platinum

Silver—London and New York price of bar silver steady and unchanged 49½d. and $1.01⅛ for 999 fine. China exchanges are still disturbed by the lack of consignments to that quarter. It is expected, however, that the British government will give this matter its attention. Shipments to London for the week ended Sept. 28 were 500,000 ounces.

Mexican dollars at New York: Sept. 26, 78; Sept. 27, 78; Sept. 28, 78; Sept. 30, 78; Oct. 1, 78; Oct. 2, 78.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 28—Blende, per ton, high, $78; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $55; calamine, basis 40% zinc, $40@35. Average selling prices: blende, $54.95; calamine, $35.67; all zinc ores, $54.79.

Lead, high, $104.80; basis 80% lead, $103@100; average selling price, all grades of lead, $100.55 per ton.

Shipments the week: Blende, 10,163; calamine, 765; lead 1481 tons. Value, all ores the week, $748,960.

Shipments nine months: Blende, 360,680; calamine, 16,146, lead, 56,614 tons. Value all ores nine months, $24,363,550.

The return this week of one smelting agency to the market, after several weeks' rest, with an order for 5000 tons, set the basis price of Prime Western grades of blende up to $55 on all classifications.

Platteville, Wis., Sept. 28.—Blende, basis 60% zinc, highest settlement price reported, $75.80. Base price for premium grade, $75. Base price for high-lead blende, $52 to $53 per ton. Lead ore, basis 80% lead, $97 per ton. Shipments reported for the week were 2367 tons blende, 145 tons galena, and 463 tons sulphur ore. For the year to date the figures are 96,678 tons blende, 5928 tons galena and 35,751 tons sulphur ore. During the week 2509 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Charles Hardy reports that considerable offerings come daily from the West and considers that the bottom has dropped out of the market, few of the Eastern buyers being willing to take chances at the present time.

Manganese Ore—Unchanged.

For the schedule of manganese ore prices refer to page 1053 of our issue of June 8, 1918.

Molybdenum Ore—There seems to be a good deal of talk about this mineral, but not much business. It is quoted nominally at $1.25, but we hear of no sales. Undoubtedly, it could be bought at $1.15 in large quantities. We quote $1.15.

Pyrites—Prices of domestic pyrites are no longer quotable, as they are determined by negotiation between buyer and seller. Some quotations are 30 to 35c. per unit, according to location.

Tungsten—Market remains active. High-grade scheelite commands a premium of 50c. per unit; scheelite free from impurity is almost unobtainable. High-grade wolframite $24@24.50; low-grade ores $19@24 per unit, according to amount and kind of impurity.

Iron Trade Review

PITTSBURGH—Oct. 1

The revision in iron-ore and pig-iron prices for the fourth quarter of the year seems to have satisfied producers fairly well. The integrated-steel producers are not affected and had presented no complaint. Class 3 steel works—those that buy their pig iron—will receive no more for their steel products, but will have to pay more for pig iron, and are not well satisfied, but it is not definitely shown that any will fail to make moderately large profits.

The price readjustments do not amount to much in actual money value compared with the total amount of iron and steel business under control. There has been no important change in finished-steel prices, and as the output is over 3,000,000 net tons a month, and the average price about $75, there is an annual turnover of nearly $3,000,000,000, practically unchanged. The advances in iron ore and pig iron, on the tonnage that is actually sold, total less than $15,000,000 a year. Roughly speaking, three-fourths of the Lake Superior iron ore and three-fourths of the pig iron are produced by those who consume it. The Lake Superior iron ore advance is 25c. per ton.

Apart from the price revision of the War Industries Board, for the fourth quarter, a new batch of prices has been announced by the Institute, effecting numerous small changes. Cut nails are advanced from $4 to $5, and the jobbers' margin on both cut and wire nails is reduced from $1 to 50c. a keg. Cold-rolled strip steel is made f.o.b. Pittsburgh, instead of delivered, making an advance of 15c. to 31c. per 100 pounds.

Pig-iron and steel production is increasing, partly by reason of efforts to produce better coke and partly through the weather becoming favorable. The War Industries Board continues its work of endeavoring to conserve steel, by making agreements with commercial consumers producing wares necessary for the civilian population whereby their operations will be limited. In many cases operations in the last four months of this year are to be 50% of the operations in the same period last year, the operations to include the filling of Government and Allied orders. At the same time, the steel demands of the war program are being studied to find possible cases in which the supply of steel can be decreased without decreasing the war operations. The only finishing line for which a large increase in the supply of raw steel is definitely desired is rails, and it is understood rail production is being increased from 65,000 tons to 85,000 tons a week, about two-thirds of the tonnage being for domestic roads and one-third for operations abroad, partly by France and partly by the A. E. F. Prospects are that the apparent gap between steel requirements and steel supply, lately estimated at possibly 5,000,000 net tons for the current half year, will be greatly reduced. It has not been shown that any war activity has thus far suffered from the lack of a large tonnage of steel, and the pressure for more steel has been largely a measure of safety, particularly as there might be interruptions to production in the winter. The Railroad Administration, however, seems to feel reasonably certain that there will be full service this winter, and that last winter's curtailment in steel output was due chiefly to transportation conditions.

Pig Iron—Under the former competitive system there was a Pittsburgh pig-iron market, furnaces with different freight rates equalizing under stress of competition. Now the price delivered Pittsburgh varies according to point of production. Since quotations were fixed, and until today, prices were uniform f.o.b. furnace. Now Tennessee and Virginia iron is f.o.b. Birmingham and Eastern Pennsylvania iron f.o.b. Pittsburgh, the establishment of the removed basing points giving the furnaces affected higher prices f.o.b. furnace. Prices on all grades except bessemer are advanced $1 per ton, making basis prices as follows: Foundry iron, $33; forge, $32; malleable, $33.50; basic, $33; bessemer, $35.20. Freight from Valley furnaces to Pittsburgh is $1.40 and from six detached furnaces somewhat less. Common practice is to assume the Pittsburgh market to be the Valley price plus freight. W. P. Snyder & Co. report averages for September, based on actual sales (chiefly allocations) at $32 for basic and $35.20 for bessemer, at Valley furnaces. Foundry iron was quotable at $33, Valley, throughout September.

Steel—Apart from some rearrangements in contracts for ingots, there has been nothing done in the unfinished-steel market. Billets remain quotable at $47.50, sheet bars and small billets at $51, slabs at $50 and rods at $57.

Ferroalloys—There is somewhat more activity in manganese alloys, chiefly in ferromanganese, for first half of 1919. Ferromanganese remains at $250, delivered, for 70%, and spiegeleisen at $75, furnace, for 16%. Furnaces are now quoting a $3.50 unit differential on ferromanganese above 70%. Though $3.50 appears superficially to be a lower unit price than obtains with 70% alloy at $250, it is really higher, as the buyer loses the iron the manganese displaces.

Coke—The Carnegie Steel Co. last week put in operation the seventh 64-oven battery at its Clairton byproduct plant, making 448 ovens in operation. The eighth is to start in about a fortnight, and two more by about Nov. 1, making a total of 640 ovens at the plant. Twelve additional batteries are to follow considerably later. The 448 ovens are now rated at 4550 tons of coke per day, on 19 hours' coking time and using high volatile coal from the Lower Connellsville, which gives only a 65% coke yield but produces much more sulphate of ammonia and toluol. Old basin coal would give about a 70% coke yield. Reports from furnaces now are that the quality of Connellsville coke is showing improvement as a result of the Fuel Administration's strenuous campaign for better coke quality. Connellsville coke remains at $6 for furnace and $7 for foundry, per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York 1916	New York 1917.	New York 1918	London 1916	London 1917	London 1918
Jan	56.775	75.630	88.702	26.960	36.682	44.356
Feb	56.755	77.585	85.716	26.975	37.742	42.792
Mar	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.375	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	......	32.361	44.324	..
Nov.	71.604	85.891	.....	34.192	43.584	.....
Dec	75.765	85.960	.....	36.410	43.052	......
Year	65.661	81.417	...	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York Electrolytic 1917	New York Electrolytic 1918	London Standard 1917	London Standard 1918	London Electrolytic 1917	London Electrolytic 1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	3.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	....	110.000	......	125.000	.....
Nov.	23.500	.....	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York 1917	New York 1918	London 1917	London 1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	(a)	244.038	343.905
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	.....	237.563	......

(*a*) No average computed.

Lead	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	....	6.650	......	30.500	....
November	6.249	..	6.187	..	30.500	....
December	6.375	...	6.312	..	30.500	....
Year	8.787	.....	8.721	...	30.500	.....

Spelter	New York 1917	New York 1918	St. Louis 1917	St. Louis 1918	London 1917	London 1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983		7.813		54.000	
November	7.847		7.672		54.000	
December	7.685		7.510		54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh	Bessemer‡ 1917	Bessemer‡ 1918	Basic‡ 1917	Basic‡ 1918	No. 2 Foundry 1917	No. 2 Foundry 1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.5	34.40
October	37.25		33.95	.	33.95	
November	37.25		33.95		33.95	..
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct. 1
Alaska Gold M.	3½
Alaska Juneau	2
Am.Sm.&Ref.,com.	77½
Am. Sm. & Ref., pf.	104½
Am. Sm. Sec., pf., A.	‡90¼
Am. Zinc	15½
Am. Zinc, pf.	51¼
Anaconda	69
Batopilas Min.	1⅛
Bethlehem Steel	78½
Butte & Superior	26
Butte Cop. & Zinc	10
Cerro de Pasco	34⅞
Chile Cop.	17½
Chino	39¼
Colo.Fuel & Iron	45
Crucible Steel	62⅜
Crucible Steel, pf.	89¼
Dome Mines	10
Federal M. & S.	10⅜
Federal M. & S., pf.	39
Great Nor., ore ctf.	30⅞
Greene Cananea	51
Gulf States Steel	76⅛
Homestake	78
Inspiration Con	55½
International Nickel	30
Kennecott	33¼
Lackawanna Steel	80
Mexican Petrol	116½
Miami Copper	28⅛
Nat'l Lead, com.	58¼
National Lead, pf.	101½
Nev. Consol.	20⅜
Ontario Min	6⅞
Ray Con	23⅞
Republic I.&S.,com.	90⅜
Republic I. & S., pf.	100
Sloss-Sheffield	60
Tennessee C. & C.	16¼
U. S. Steel, com.	109⅝
U. S. Steel, pf.	110⅜
Utah Copper	84
Va. Iron C. & C.	71

BOSTON CURB*	Oct. 1
Alaska Mines Corp.	‡.12
Boston Ely	70
Boston & Mont.	.45
Butte & Lon'n Dev.	.15
Calaveras	‡1
Chief Con	3⅜
Contact	‡.15
Corbin	.10
Cortez	.14
Crown Reserve	.15
Crystal Cop.	.45
Eagle & Blue Bell	2¼
First Nat. Cop.	1$\frac{11}{16}$
Houghton Copper	.50
Intermountain	‡.05
Iron Cap	19
Mexican Metals	.30
Mines of America	.90
Mojave Tungsten	09
Nat. Zinc & Lead	.14
Nevada-Douglas	.42
New Baltic	.75
New Cornelia	17
Oneco	20
Pacific Mines	‡.35
Rex Cons	.06
Yukon Gold	.85

SAN FRAN.*	Oct. 1
Alta	.02
Andes	.03
Best & Belcher	.01
Caledonia	02
Challenge Con.	‡.03
Confidence	.08
Con. Virginia	.12
Gould & Curry	‡.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.06
Mexican	.05
Occidental	.40
Ophir	‡.01
Overman	.01
Savage	.02
Sierra Nevada	.08
Union Con.	.18
Utah Con.	‡.01
Belmont	2.00
Jim Butler	.48
MacNamara	.25
Midway	.06
Mont.-Tonopah	.09
North Star	.03
Rescue Eula	.08
West End Con.	.95
Atlanta	.02
Booth	.03
Comb. Frac.	‡ 02
Florence	.10
Jumbo Extension	.09
Kewanas	‡.02
Nevada Hills	.02
Nevada Packard	20
Round Mountain	16
Silver Pick	03
White Caps	09
Big Jim	‡ 75
United Eastern	3.70

COLO. SPRINGS*	Oct. 1
Cresson.Con	4 75
Doctor Jack Pot.	03½
Elkton Con	‡ 04
El Paso	10
Gold Sovereign	‡ 02
Golden Cycle	1 53
Granite	15
Isabella	04
Mary McKinney	07
Portland	80
United Gold M.	.10
Vindicator	37

BOSTON EXCH.*	Oct
Adventure	‡ 60
Ahmeek	75
Algomah	‡ 15
Allouez	49
Ariz. Com., ctfs.	15
Arnold	.20
Bingham Mines	9
Bonanza	16
Butte-Balaklava	35
Calumet & Ariz.	67
Calumet & Hecla	450
Centennial	11
Copper Range	46
Daly West	2
Davis-Daly	5
East Butte	9
Franklin	3
Granby	82
Hancock	5
Hedley	‡12
Helvetia	20
Indiana	80
Isle Royale	25
Keweenaw	.99
Lake	5
La Salle	2
Mason Valley	3
Mass	4
Mayflower	2
Michigan	2
Mohawk	55
New Arcadian	1
New Idria	14
North Butte	14
North Lake	.50
Ojibway	.75
Old Dominion	39
Osceola	52
Quincy	65
St. Mary's M. L.	46
Santa Fe	.60
Seneca	11
Shannon	3
Shattuck-Ariz	14
So. Lake	1
So. Utah	.12
Superior	4
Superior & Bost.	4
Trinity	2
Tuolumne	.93
U. S. Smelting	44
U. S. Smelt'g, pf.	43
Utah Apex	1
Utah Con.	9
Utah Metal	1
Victoria	2
Winona	1
Wolverine	22
Wyandot	.50

N. Y. CURB†	Oct.
Big Ledge	
Butte & N. Y	‡.75
Butte Detroit	.07
Caledonia	.46
Calumet & Jerome	.75
Can. Cop. Corpn.	2
Carlisle	‡2
Cashboy	.04
Con. Ariz. Sm.	1
Con. Coppermines	5
Emma Con.	.03
Goldfield Con.	.20
Goldfield Merger	.01
Greenmonzter	‡
Hecla Min.	4
Howe Sound	4
Jerome Verde	.50
Louisiana	‡
Magma	‡32
Majestic	.18
Marsh	03
McKinley-Dar-Sa.	.41
Milford	‡ 75
Mother Lode	.34
Nixon Nevada	.34
Ohio Cop.	.87
Rawley	‡2
Ray Hercules	4
Richmond	‡ 56
Rochester Mines	.33
St. Joseph Lead.	14
Standard S. L.	25
Stewart	15
Success	‡.11
Tonopah	‡2
Tonopah Ex.	1
Tribullion	‡.12
Troy Arizona	10
United Verde Ext.	37
United Zinc	1
Utica Mines	‡ 08

TORONTO*	Oct.
Adanac	.10
Bailey	.03
Beaver Con.	28
Chambers Ferland	10
Coniagas	2 50
Hargraves	02
Kerr Lake	5 75
La Rose	43
Min. Corp. of Can.	2 25
Nipissing	8.37
Peterson Lake	08
Temiskaming	28
Wettlaufer-Lor.	‡ 03
Davidson	‡ 30
Dome Exten.	14
Dome Lake	13
Hollinger	4.87
McIntyre	1 37
Newray	06
Porcu. Crown	‡ 14
Teck-Hughes	20
Vipond	10
West Dome	.08

* Bid prices. †Closing prices. ‡ Last quotations.

Engineering and Mining Journal

w-Hill Co., Inc. Price, 20c. New York, October 12, 1918

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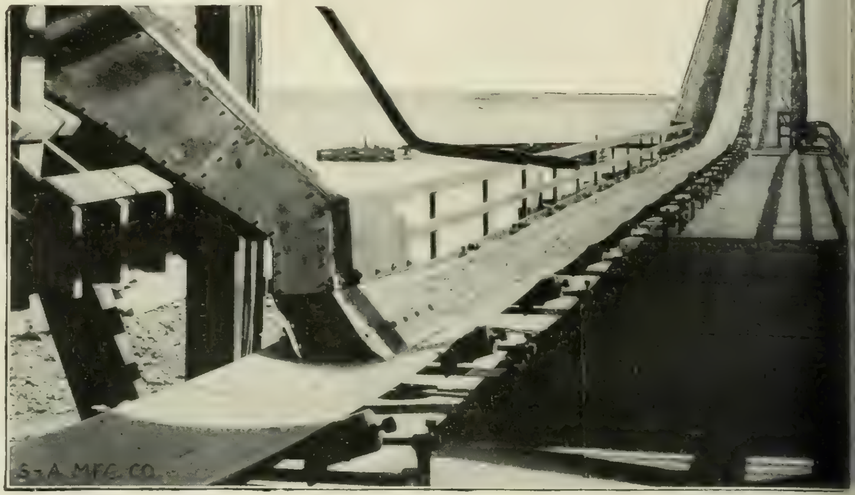
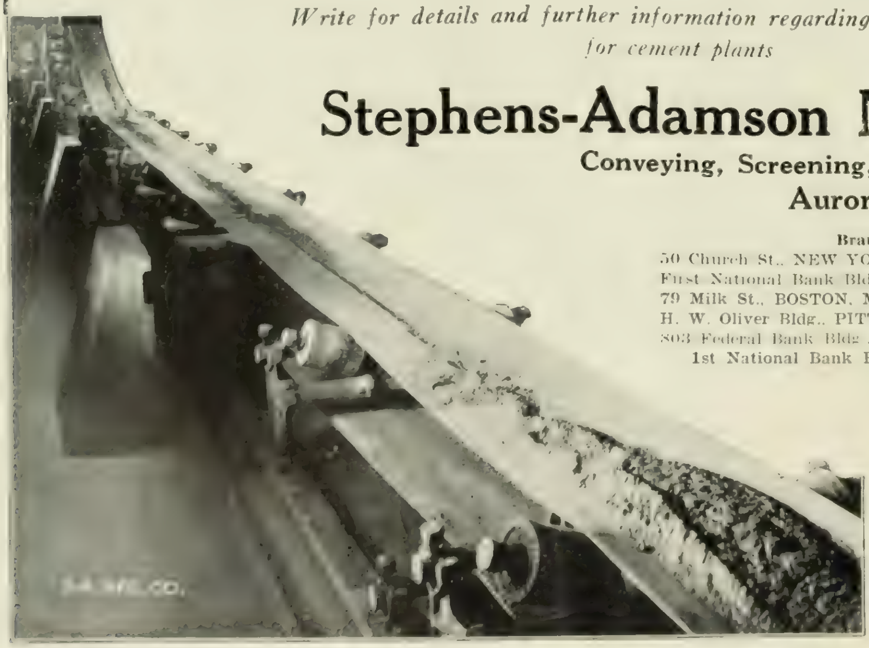


These two conveyors represent a part of the very extensive system of "S-A" Belt Conveyors used in the various mills of the Canada Cement Co., totaling a capacity of 20,000 barrels per day.

The upper illustration shows a 36-inch "S-A" Belt Conveyor 260 feet between centers. It delivers ground clinker to barges for transportation to another plant. This standard type of carrier is used in all the mills of this company.



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Engineering and Mining Journal

October 12, 1918

olume 106

Number 15

VIEW OF BUNKER HILL PLANT FROM THE WEST

Sintering and Charge Delivery at the Bunker Hill Plant[*]

BY C. T. RICE

A detailed description of the features of the Bunker Hill plant and the methods adopted to insure efficient and economical operation. The Trail self-cleaning grate bar is used in the Dwight & Lloyd sintering machines, and other improvements over normal design are features.

OWING to the increased amount of zinc blende in the charge, three additional Dwight & Lloyd sintering machines had to be installed at the Bunker Hill & Sullivan smeltery, and in order to increase the capacity of the plant as a whole another blast furnace is being added. At the lead refinery two more softening and two more desilverizing furnaces are being put in; also a byproduct furnace to work the antimonial skim into hard lead. At the silver refinery another cupel furnace is being erected. As all these improvements will add materially to capacity and efficiency, by the time the present period of expansion and reconstruction is over the Bunker Hill installation will be one of the most important lead plants in the West. However, it is probable that the method there will always be characterized by a high lead charge, so that tonnage of ore treated will not be relatively great.

The necessity of keeping the plant in operation has, in the meantime, been a problem. Added to this, difficulty has been encountered in breaking in a green crew at a time of serious labor shortage and far from a source of efficient smeltermen. Consequently, there has been little time for developing the finer points in metallurgical practice. Both on that account and because the changes now under way or contemplated will not be completed until the autumn, the present article must be viewed as little more than a preliminary description, and a rough outline of the main features that will finally characterize the metallurgical practice at this plant.

There are many interesting features in the operation of the Bunker Hill works. All products are refined for final marketing, even the copper sulphate obtained in parting the silver from the gold of the doré bars. The cleanliness and success with which powdered coal is used, not only for generating steam but also for

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[*] The third of the series of articles on the design and operation of the Bunker Hill & Sullivan smeltery and refinery which began in the July 20 issue.

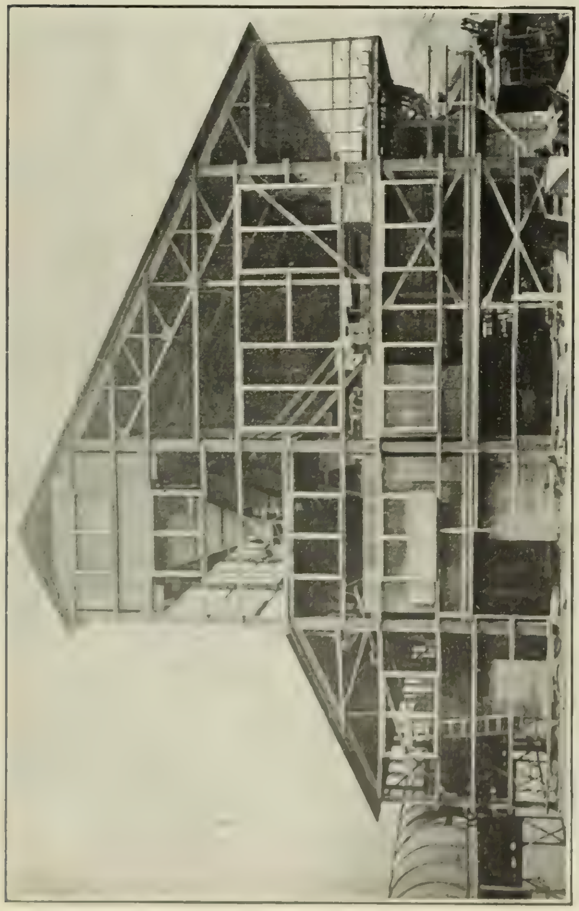

FIG. 1. ROASTER BUILDING AND BALLOON FLUE

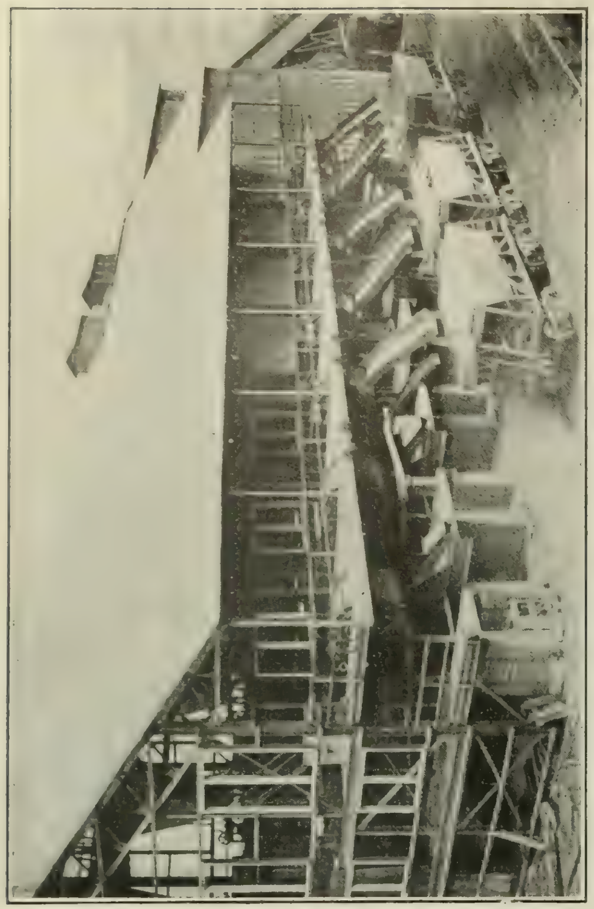

FIG. 2. ROASTER BUILDING AND SINTER CARS

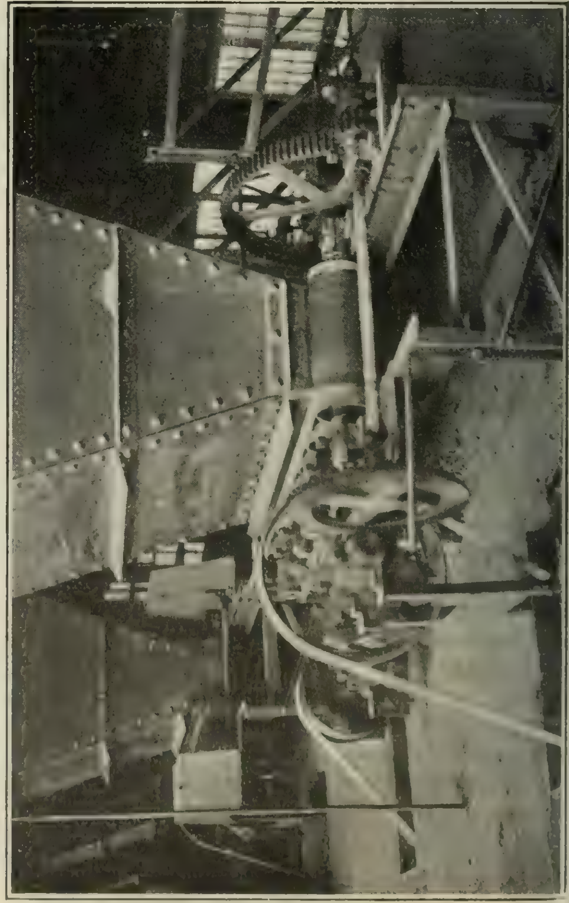

FIG. 3. ROASTER BUILDING—PUG MILL FLOOR

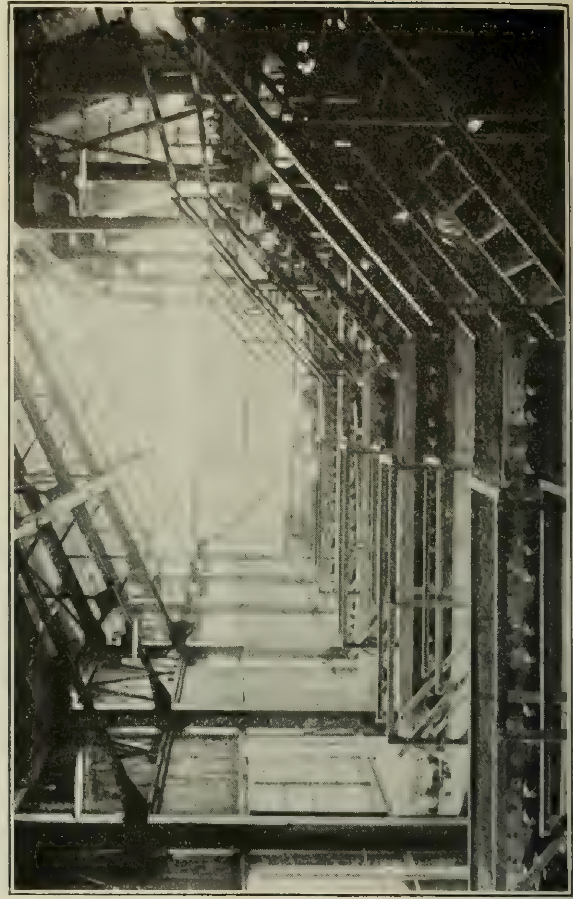

FIG. 4. ROASTER BUILDING—OPERATING FLOOR

he heating of the various refining furnaces and ettles, is notable; and, as a result, it is the ultimate tention to make it the only fuel used, other than ke, in the smelting operations. Another feature of he plant is the attention which has been given in

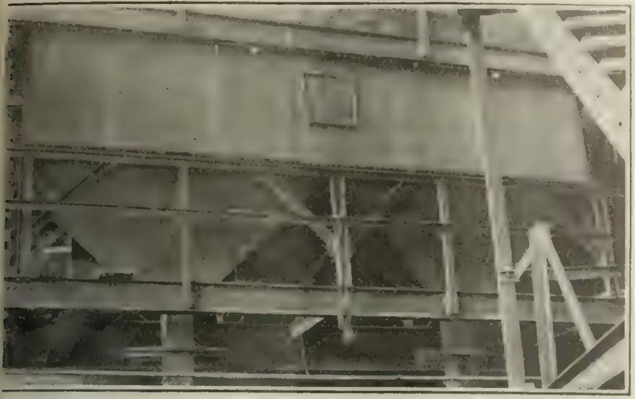

FIG. 5. AUXILIARY DUST BOX BESIDE SINTERING MACHINES

he design, both of the plant as a whole and in detail, n order to save labor. This is especially evident in he admirable design which was finally adopted for the Dwight & Lloyd installation, where everything from

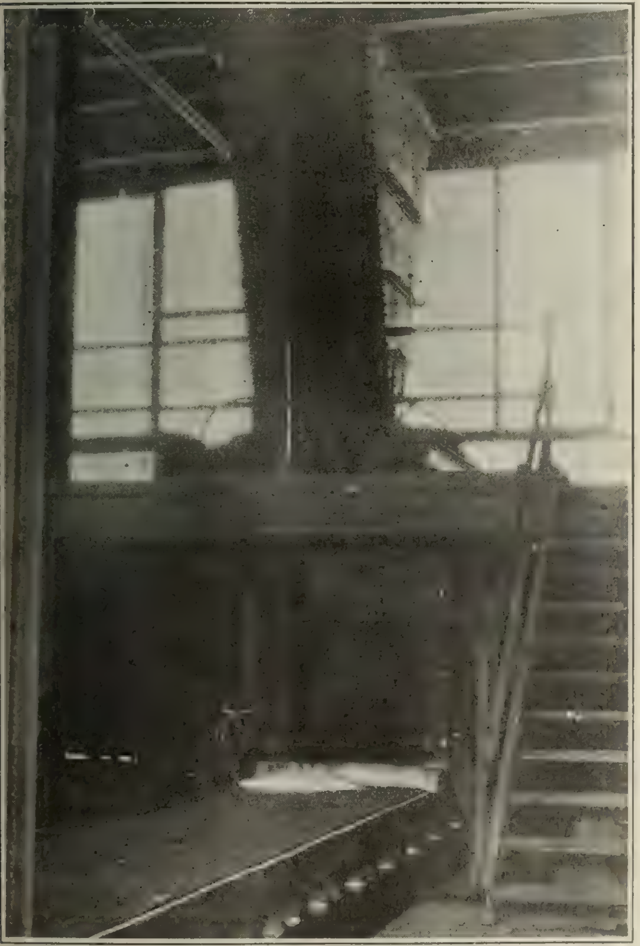

FIG. 6. D. & L. MACHINES, END VIEW

pug mill to D. & L. dampers and motors is controlled from the operating floors. The equipping of these machines with Trail self-cleaning grates has also aided materially in saving labor.

Still another feature in this program of labor economy is the adoption of the Miller casting machine for molding the refined lead into pigs. This machine has been developed by John F. Miller, who was formerly in charge of refining operations at Trail. The Miller machines used at the Bunker Hill plant have a capacity of 20 tons an hour each, and require only four men to operate them at this rate and to load the pigs into railroad cars.

DISPOSAL OF FUME

The manner in which the smelter fumes are handled also deserves attention. Those from the D. & L. and the Wedge roasters and the various refining furnaces go to the Cottrell plant for removal of the dust and fume by static precipitation. The blast-furnace gases, being variable in quantity, temperature, and quality, go to a baghouse for mechanical removal of the dust and fume. A high efficiency will therefore be attained in recovering both fume and dust, for each of these devices is used in a field in which it has shown itself to be the most effective and economical. Still another feature of the plant is the high lead charge—between 35% and 40%—being smelted in the blast furnaces, as well as the purity of the metal which is obtained by the refining, the pigs, as shipped, assaying 99.989% lead. Consequently, nearly all Bunker Hill soft lead is of corroding grade.

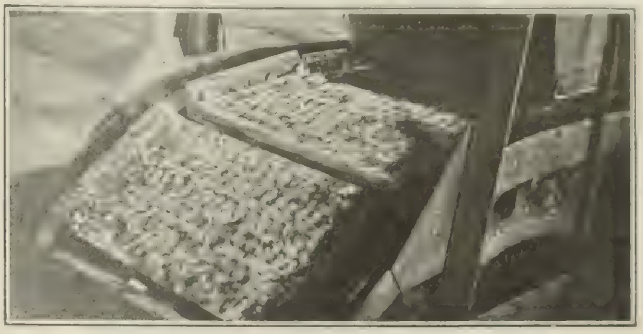

FIG. 7. TRAIL GRATE

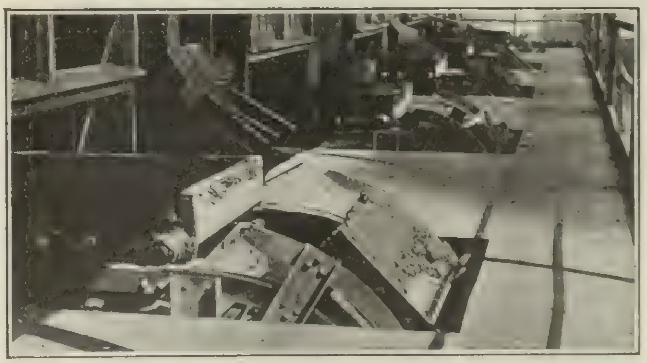

FIG. 8. SINTER CAKE ON TRAIL GRATE

A minor feature of the smeltery is the use of standard-gage tracks throughout the plant. With the necessity of transferring equipment to and from the machine shop at the mine for repair, as well as of moving it about the plant itself, the adoption of standard-gage track throughout, even to the charge and slag tracks, gives great flexibility, and is a point which will appeal to smeltery superintendents. In the valley

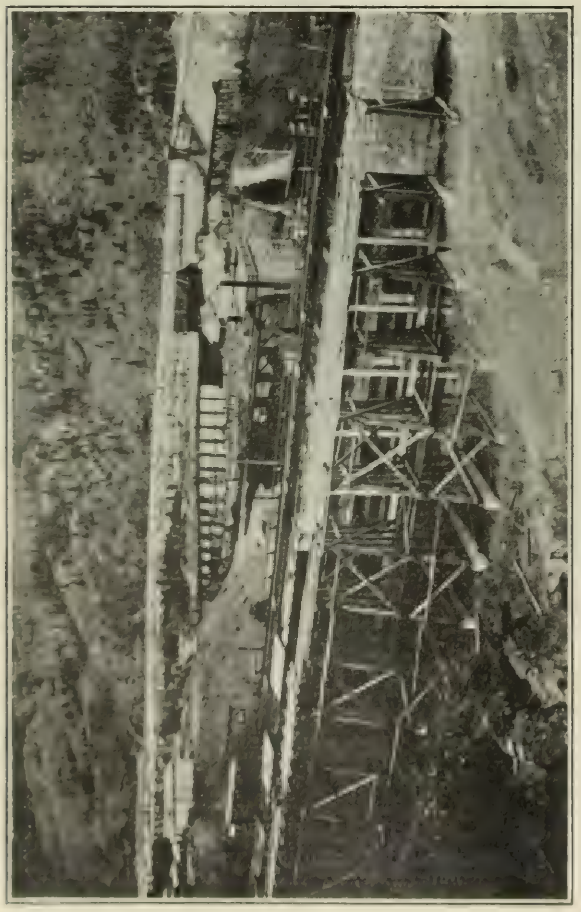

FIG. 9. CONCRETE BINS FOR SINTER

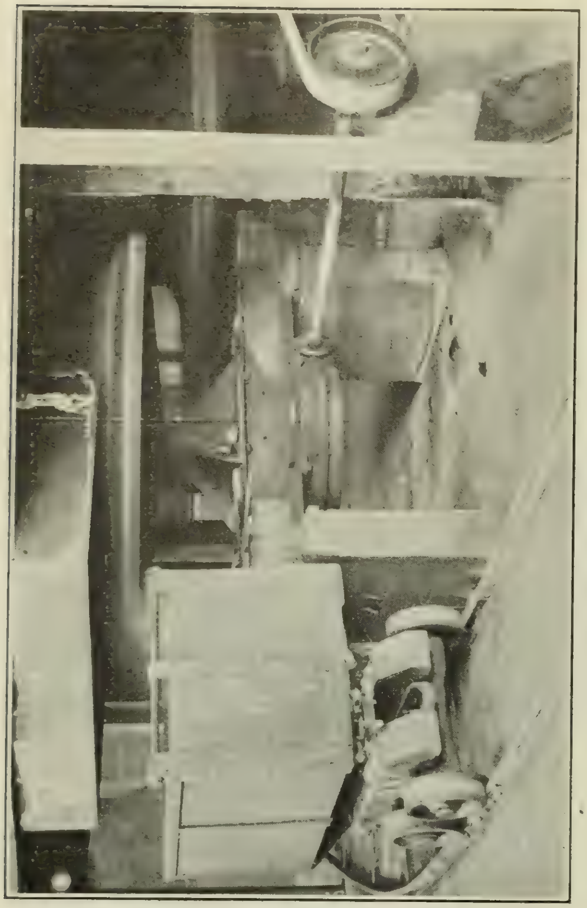

FIG. 10. WEDGE COOLING TABLE

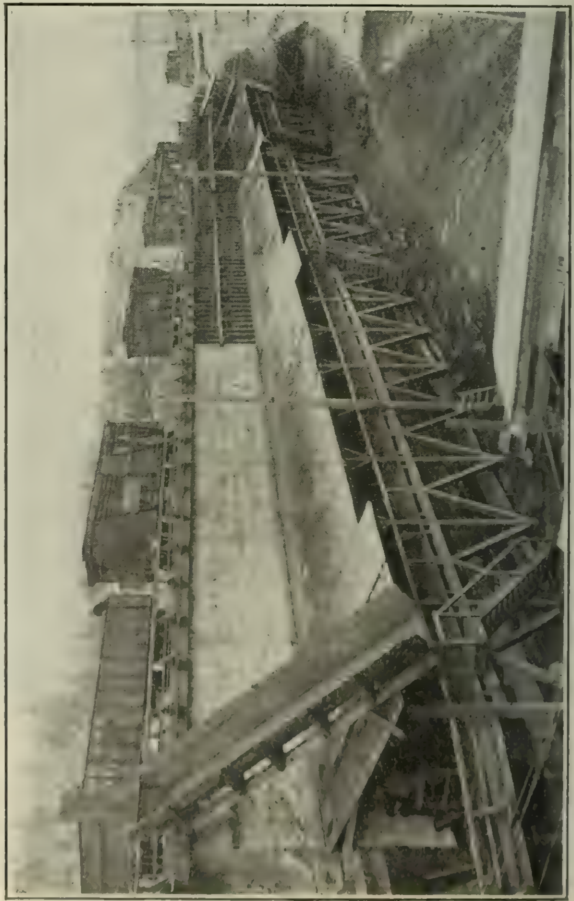

FIG. 11. FRONT VIEW SECONDARY BINS

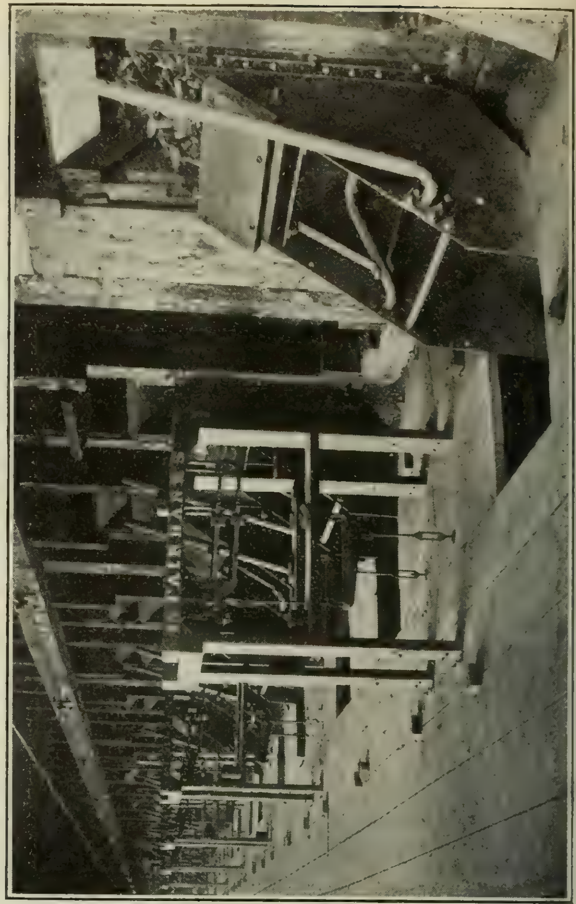

FIG. 12. WEIGHING FLOOR, SECONDARY BINS

low the plant there is unlimited space for dumping e slag within a few hundred feet of the blast fur- aces—a feature which will be appreciated greatly in e future.

The question of whether to place the plant in the strict or at some coast point, where a wider selection ores would be available, was debated for some time, ut finally it was decided that a site near the mines nd concentrator of the company was preferable. The ne finally selected has several distinct advantages. is on an existing railroad spur (no small consider- ion when construction time is limited); it is reached y a direct 2½% grade from the mill bins and the ain line, and yet has every advantage of a hillside cation. On account of the peculiarity of the site, it as been possible to place both the receiving and the arge bins in neighboring gulches, so that the main acks come in at the same level over the tops of both ets of bins, with the result that little switching is ecessary in distributing the various cars in a train their proper destinations about the plant. This also nables the D. & L. and Wedge products and the lean-ups to be sent in either direction from the oaster building with no adverse grade.

In every way the site is ideal, not only topographically, ut also from the fume-damage standpoint. Only a light flattening was needed in putting in the founda- ions of the various buildings. The smeltery has been laced well up on the side of the valley, and the revailing winds take the stack gases up a mountain ide, covered only with scattered second-growth timber, aving little value. The farms in the neighborhood are ew and small, and little trouble is to be expected in he matter of smoke litigation. Every advantage has een taken of topographical contour. The ore as it ravels through the plant is elevated only once, and that by belt conveyor from the primary ore bins to the op of the roaster building.

The Dwight & Lloyd Installation

The roaster building is 160 ft. long by 68 ft. wide, nd has five floors, with ample room and light for ork (Fig. 1 to 4). This building contains a seven-hearth Wedge furnace 21 ft. in diameter, and seven D. & L. sintering machines. The Wedge furnace is used to give the matte and high-sulphur ores a preliminary roast before they go to the D. & L. machines for final roasting and sintering. The Wedge furnace is at the near end of the building, and beyond it are the seven 42 x 264-in., Type E, D. & L. sintering machines. These are standard and are provided with special dust boxes (Fig. 5) having baffle screens for catching the coarsest of the dust sucked through the grates. They are set at 16-ft. centers, giving ample elbow room.

A feature of the installation is the grouping on the operating floor of the devices for controlling the different D. & L. auxiliary mechanisms, such as the hand-wheels for opening and closing the slide gates to the hoppers which deliver to the belts going to the pug mills; the clutches controlling the belt-feeder drives; the levers for starting or stopping the pug mills; the switches for the driving motors of the sintering machines; the levers for starting or stopping D. & L. grate motions; the levers operating the dampers on the D. & L. machines; the switches for starting and stopping the exhaust fans; the ammeters showing the current taken by the different roaster fans; and the cones for regulating the speed of grate travel on all the machines. Thus each unit and its subsidiary apparatus can be controlled without leaving the one floor, or the immediate locality of the machine itself.

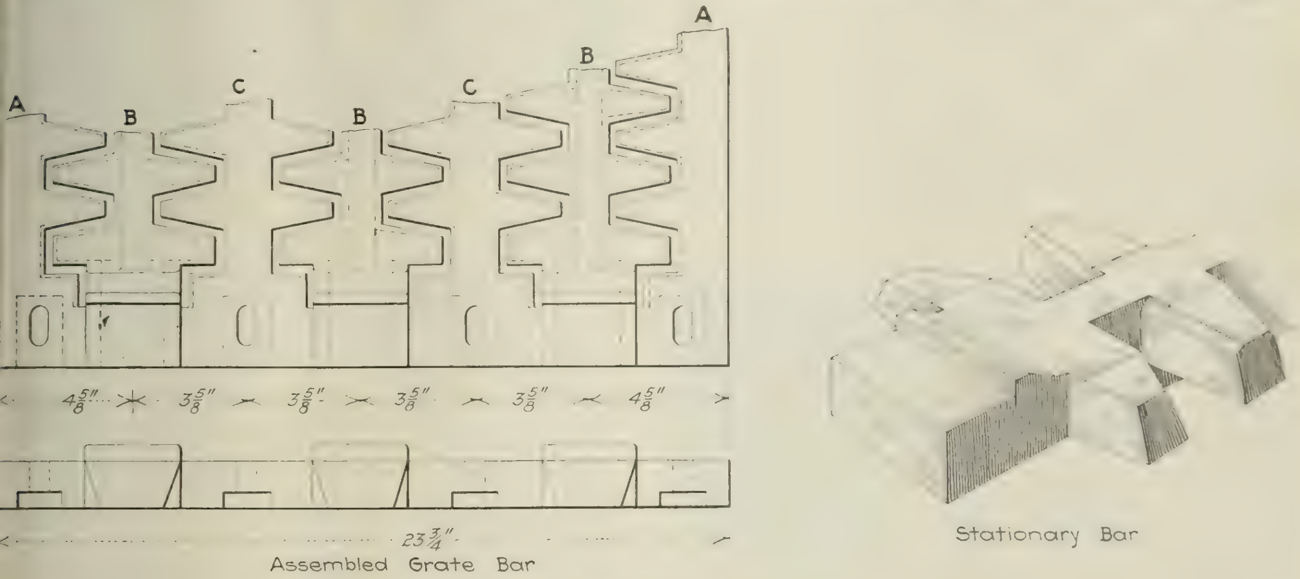

FIG. 13. PLAN OF TRAIL GRATE

Trail Self-Cleaning Grate Bar

The herringbone grate bars usually sent out on D. & L. machines are generally so unsatisfactory and become so quickly clogged with sinter that they are soon changed for some other type. Probably one of the main reasons why the slots on such grates clog rapidly is that they run diagonally to the direction of the jerk or travel of the grates; consequently the tendency is for this jerk to break the sinter from the cake which has formed in the slots, instead of pulling the sinter out of the slots, together with the cake itself, as is the case when the slots run parallel with the jerk.

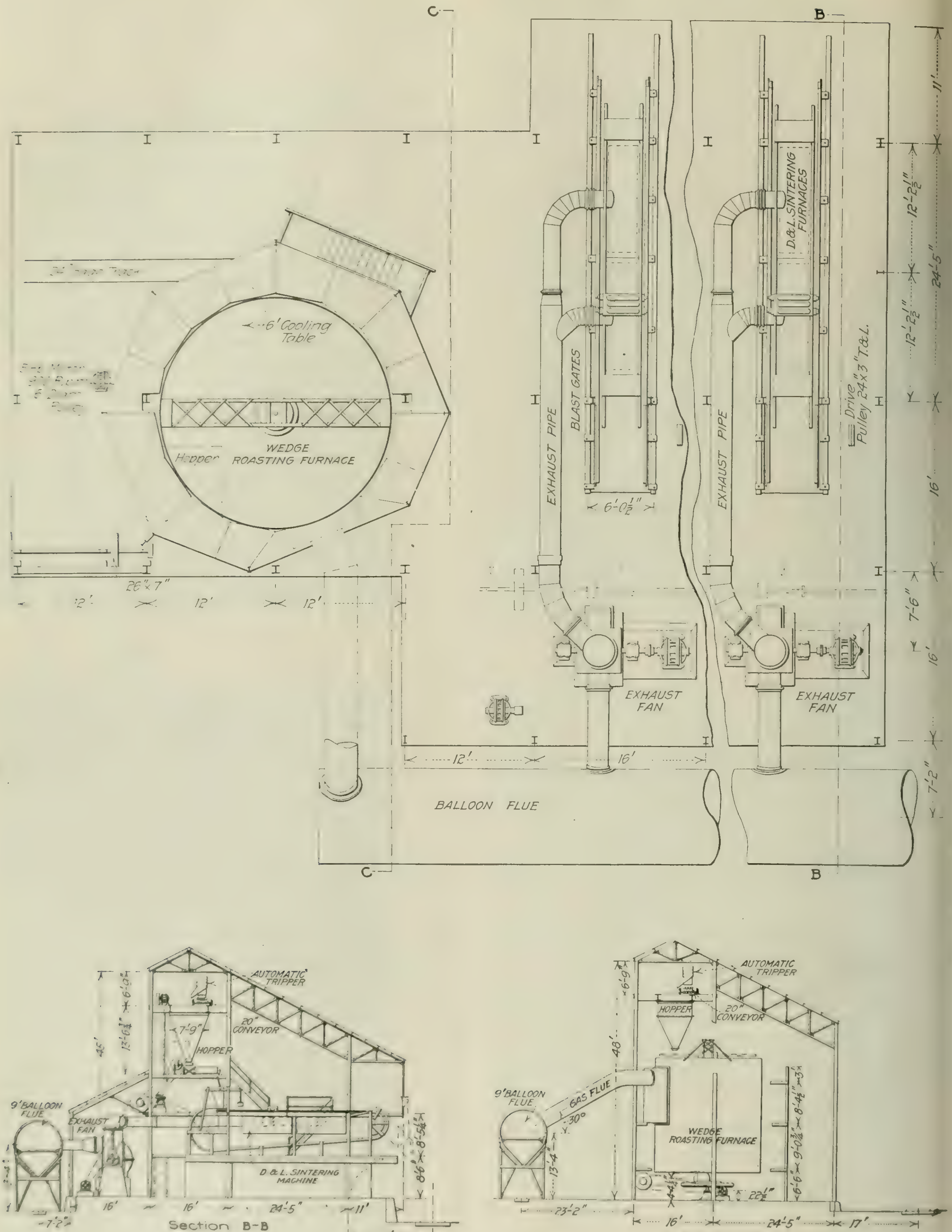

FIG. 14. PLAN AND CROSS SECTION OF ROASTER PLANT

This tendency for the grates to clog depends upon te readiness with which the roaster charge sinters, ad also upon the way in which the feed is mixed ad put on the grate. If returned fines or other mateal which is coarser than the easily fusible part of the ed is mixed with the charge, and the feed is allowed bank up on the grate in front of the spreader board, that the coarse and not easily fusible part rolls o the toe of the feed pile, the tendency is to form a coarse and refractory bed immediately above the bars. The readily fusible part is caught on top of this layer, and thus kept from reaching to the slots, and so forming a sinter in them.

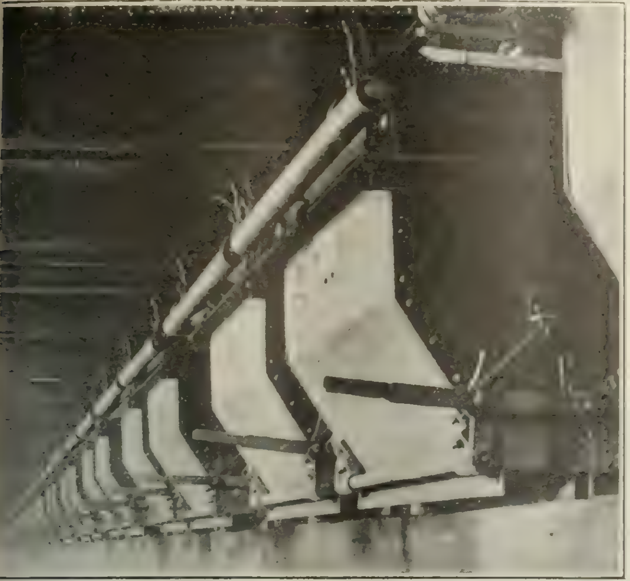

FIG. 15. WEIGHING HOPPERS, SECONDARY BINS

Several of the Utah smelteries use locally designed grate bars in which the slots are cast parallel with the direction of grate travel. At the edges the ribs that form the slots are tied together by webs, and under the center of each grate bar runs a longitudinal reinforcing rib. Both because of the webs and the reinforcing ribs, a considerable tendency still remains for the grate bars to become clogged with sinter; for, try as hard as one may, it is impossible to keep all the easily fusible fines from reaching the grate itself. By cutting away the margin webbing of the Utah grate bars, the Riddell grate, which is patented, is obtained. But there still remains much room for improvement even with this bar, so far as blinding of the slots is concerned; and a pneumatic hammer with chisel tool must be used from time to time to clean the grates. The trouble seems to be that the grate is rigid throughout the pallet, and no rocking to keep the slots free of sinter occurs between the grate bars. The richer the feed in lead or in other easily fusible components, the more rapidly do the slots in the grate bars become clogged with sinter. Probably that is the reason why it remained for the management of the Trail smeltery, where a high lead charge is being treated, to devise what appears to be in many ways the most satisfactory grate bar for use on D. & L. machines.

The Trail grate bar, which was developed more than six years ago at the plant of the Consolidated Mining and Smelting Co., Trail, B. C., when the property was under the management of R. H. Stewart, embodies a rocking motion in the individual grates. Any sinter which tends to form between the fingers of the grate bars is broken off, and the slots are thus automatically kept free. Owing to its successful operation, even when the feed is high in lead and easily fusible, the design has been adopted at both the Northport and the Bunker Hill smelteries, where the roaster feed is also high in lead, and a hard, clinging cake is formed on the grates of the sintering machines. The only modification made in the original design of the grate at these plants has been to cut down the opening between the fingers to $\frac{1}{8}$ in., thereby reducing the amount of fine material that runs through the slots while the feed is being spread on the grates, and until sintering really begins.

DETAILS OF THE TRAIL GRATE BAR

The Trail grate, as can be seen from the accompanying drawings, which show the device as it is used in British Columbia, is built with three different types of bars so arranged that a loose bar alternates with a fixed bar. Both are cast with fingers extending out from a longitudinal rib; and the loose bar rocks as the grates pass around the guide rails and over the drive wheel at the ends of the machine, thus breaking up any sinter which may have formed between the fingers. As both the fingers and the longitudinal ribs on the grates are tapered, the sinter, as soon as it is broken up, must pass on through the fingers, leaving the slots free.

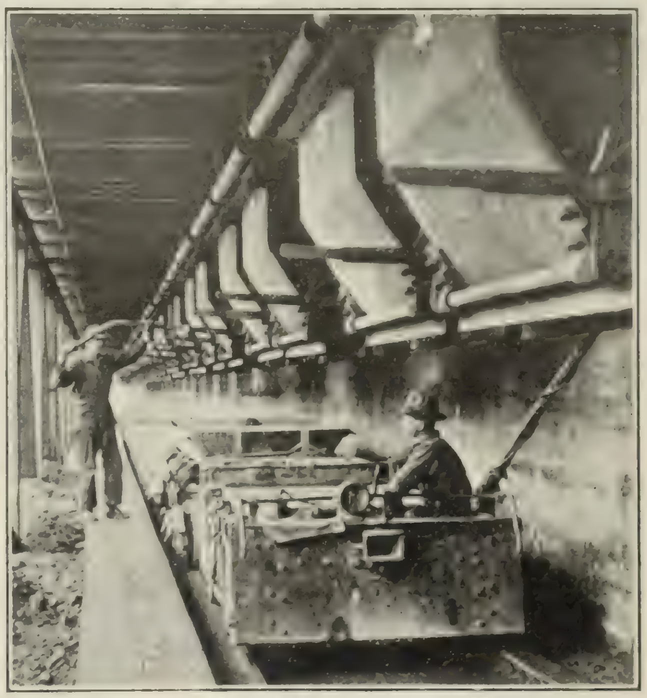

FIG. 16. CHARGING FEED CAR

The bars *A* (see Fig. 13) along the sides of each pallet are fixed. Between these two side bars are two stationary central bars *C*, and three movable central bars *B*. The fixed grate bars are attached to the pallet through the connecting angle castings, which bolt to the sides of the pallet. To facilitate centering of the fixed bars, the bolts which secure these to the connecting angles are carried in slotted openings. The movable grate bars are held loosely in sockets formed by the pallet and the notches in the under sides of the connecting angles. Owing to the size of the sockets, as compared with the ends of the loose bars, and also because the loose bars are of somewhat shorter length than the distance between the sides of the pallets, a movement in all directions of the loose bars is obtained.

Most of the rocking movement of the bars occurs as grates drop ahead to go around the guide rails of the machine, while the sintered cakes are being broken loose. A less violent rocking, which gives a final cleaning to the slots, is obtained while the grates are being lifted around the track by the drive wheel. Consequently, the slots in the grates are not only cleaned automatically, but full grate opening is also obtained while the cake is being sintered.

As at present designed, no provision is made for automatically centering the loose grate bars. Consequently, it is necessary for the attendants occasionally to center these loose bars on the several grates by inserting a chisel bar between the fingers. If desirable, this can easily be avoided by casting the movable grate bars with lugs on the under side, and then placing tapered guides under the traveling grate and between the drive wheel and the feed box.

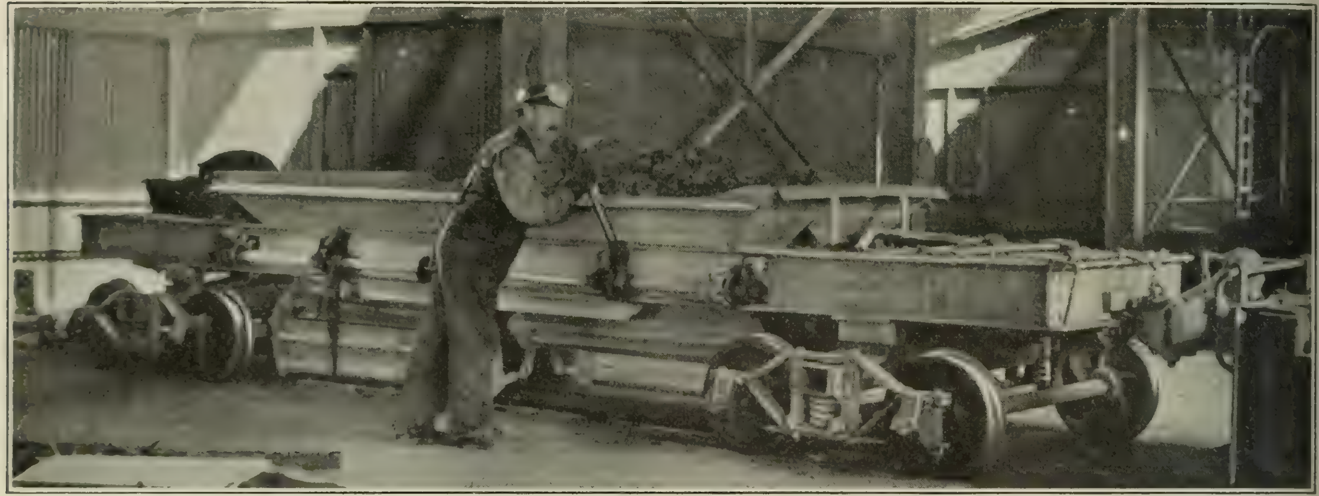

FIG. 17. CHARGING A BLAST FURNACE

A modification which will be found highly desirable at installations where an easily sintered feed is being treated and a hard and firm cake is obtained, consists in casting the connecting angles with recesses for receiving the outer ends of both the grate and the pallet bolts, so that these will not extend beyond the angles, as they do at present. It has been found at the Bunker Hill plant, where a high-lead feed is being sintered, that the charge often fuses so tightly around the ends of these bolts that the cake becomes firmly attached to the grate and is not broken loose by the jar as the pallet drops over at the end of the machine. However, few sintering plants appear to be making a cake strong enough to make trouble in this connection.

Advantages of the Trail Grate

Not only is the labor of frequent chiseling of slots and hammering of grates, to free them from sinter, avoided by the use of the Trail type of grate, but the life of the bars is prolonged indefinitely. As the Trail grate is not patented and has so many good points, it would appear reasonable to assume that the device will be tried at other plants and to a greater extent than heretofore. Especially is this true at a time like the present, when labor is scarce and expensive, for the Trail grate will be found to aid materially in reducing the amount of help necessary to operate a sintering plant consisting of five or more D. & L. machines.

The sintered cake, which is 4½ in. thick, is discharged (Fig. 8) by chute into hopper-bottom steel cars that stand on the track below and is taken, after being weighed, to the concrete bins in the gulch to the right of the plant (Fig. 9), where the charge for the blast furnaces is made up. As will be noted from Fig. 14 (plan), the exhaust fans that serve the D. & L. machines are set at an angle of 30° with the balloon flue, so as to deliver the roaster gases with the proper direction of motion. This is the only balloon flue in the plant, the only place where there is enough dust in the gases to warrant its use.

Owing to the use of the Trail grate, and to the way in which the controls are assembled on the operating floor, only nine men will be required at the roaster building when all seven D. & L. machines are in operation—a conveyor man and helper, two furnacemen and three helpers at the seven sintering machines, and one man and a helper at the Wedge furnace.

At the roasting furnace, the sulphur in the matte and in the high-sulphur concentrates is brought down to 8 or 9% without fuel. After being sprayed on the cooling table, Fig. 10, the Wedge calcine goes back to one of the steel bins, to be added to the D. & L. charge. The D. & L. feed is made up to contain from 10 to 11.5% sulphur, and the sinter as it leaves the machine carries from 2 to 4% sulphur. Each of the D. & L. machines has a capacity of 80 tons of this charge per 24 hours. In order to make the sinter charge porous, and thus to facilitate the elimination of the sulphur, as well as to increase the capacity of the machines, the jig middling supplying most of the iron to the blast-furnace charge (15 mm. and under) is added to the D. & L. charge. The ores coming from the sampling mill are rather fine, having all been crushed to pass a 4-mm. trommel, and, owing to the high percentage of lead, the feed fuses easily unless diluted with the jig middling.

The matte-fall at the blast furnaces has been about [illegible]%, so that double roasting on the D. & L. machines as been adopted to obtain a considerably lower sulphur ontent in the sinter sent to the blast furnaces, and hus cut down the amount of matte which has to be ent back for re-roasting.

THE DELIVERY OF THE BLAST-FURNACE CHARGE

The different parts of the blast-furnace charge sinter, xide ore, furnace returns, lime rock, and coke, are rought together at the secondary bins, which are all de by side in the gulch on the west of the plant. Wooden bins are used for the oxidized ore, coke and lime rock, and reinforced concrete ones for D. & L. nter and blast-furnace and refinery returns. There re 8 concrete and 16 wooden bins, each having a olume of 3300 cu.ft., and a capacity of about 200 tons f ore or sinter or 52 tons of coke. Behind the coke ins is a stock pile, so that stock material can easily e loaded by locomotive crane and grab bucket directly nto the coke bins.

The secondary bins are all built with two mouths. n front of each bin mouth is a Fairbanks-Morse scale, rom the beam of which is suspended a weighing hoper. These beams are arranged side by side along the weighing platform, from which the arc gates of the ifferent bins are easily operated. The different parts f the charge are rapidly weighed out as the two calemen pass quickly along in front of the bins. On ach beam the amount of charge to be weighed out s set, and all the weigher has to do is to run the harge into the hopper until this beam balances.

The weighing hoppers are fitted with bottom-disharge gates (operated by cleverly linked levers) from he loading track, which runs directly under the center ine. Just as there are two chute mouths to each bin, o each charge car has two hoppers. As the charge hoppers are placed the same distance apart as the two weighing hoppers, both hoppers of a discharge car are oaded at each bin with one spotting of the car.

LOADING AND CHARGING

The general arrangement of the bins, the weighing platform, the weighing hoppers and the loading tracks, s shown in Figs. 12, 14, 15 and 16, the order being similar to that used by Jules Labarthe at Mason Valley in making up the charge for the blast furnaces at that copper smeltery. Charges are kept in readiness n the different hoppers, so that the feed cars can be quickly loaded. In order to economize headroom, the charge cars are built low, and are fitted with longitudinal, bottom-discharge doors. These are closed by a chain and ratchet arrangement and are tripped by the same lever arm, Fig. 17, with which the chains are wound in closing the doors.

A five-ton Baldwin-Westinghouse electric locomotive is used to pull the charge car to the furnaces, of which two are in use at present, as it is desired to have charge at the furnaces whenever it is needed. The two cars will be more than sufficient to supply three blast furnaces when these are running.

The blast-furnace feed is bedded in the hoppers of the charge cars. First the coke is dumped into each of the two hoppers, then the crude ore, the lime rock, slag, dross, and, finally, sinter. Owing to their fineness, the Alaska-Juneau concentrates are not made part of the hopper charge, but are fed into the furnace in sacks; and the charge from the car itself is then dumped in on top, so as to hold them better in the furnace.

New Treatment for Sulphur

Recovery of native sulphur from rock mixtures with which it occurs in several Western regions is one of the problems calling for solution because of the increased war demand for sulphur and the consequent attempts to operate deposits of native sulphur in West Texas, Idaho, Wyoming and Nevada. The liquation method, which has been practiced solely heretofore, involves relatively costly installation; the operation is expensive under the usually prevailing fuel conditions, and the recovery of sulphur has been low. Liquation plans have been operated in Wyoming and Nevada, and recently two were installed in the West Texas sulphur district.

About a year ago the engineers for Minerals Separation Co. made tests for the purpose of demonstrating that the flotation method was applicable to the separation of native sulphur, and at about the same time Kirby Thomas, of New York, conducted a series of experiments which indicated that the recovery of sulphur by flotation methods was commercially feasible and presented advantages over the liquation operation. The data were subsequently presented to the Bureau of Mines, at Washington, and the Bureau arranged with James A. Hyde, of San Francisco, to make a complete and adequate series of tests. This work is now being done, and the results are reported to be satisfactory.

The flotation process permits of the treatment of fines and of sulphur-bearing material not adaptable to the liquation method. The West Texas Sulphur Co., of Culbertson County, Tex., is planning to install flotation equipment as soon as the results of the Government tests are made available.

Silver Mining in Ontario, Canada

Although shipments of silver from Ontario for the first half of 1918 were lower by 1,367,785 oz. than for the corresponding period of 1917, the value was $683,185 greater, the average price of silver per ounce for the first half of 1918 being 92.8c., as against 75.4c., in the corresponding period of 1917, states an Ontario Bureau of Mines report. Companies shipping more than 500,000 oz. were Nipissing Mining Corporation, Kerr Lake, O'Brien, Buffalo, Coniagas, and Temiskaming. New shippers this year include Edwards & Wright. Ltd., operating the old Green-Meehan mine; the Silver Eagle, of Silver Centre; and the Keeley mine, in South Lorrain, where a high-grade vein has been uncovered. The Lumsden Mining Co. also made a clean-up. The National Mines, Ltd., recovered and treated tailings from Cross Lake that had been deposited there by the Old King Edward and Silver Cliff mines. The Mining Corporation of Canada is now treating a large tonnage of slimes and tailings from Cobalt Lake in the new mill. Silver was recovered from gold ores to the extent of 47,427 ounces.

The Morale of Mill Crews

BY PAUL T. BRUHL*

The absence of enthusiasm on the part of the average mill crew is traceable to a number of causes, and the author of the paper suggests remedial consideration of the conditions thus produced. Fair wages, bonuses, comfortable surroundings, and other features of advanced practice in administration are urged as conciliatory measures in the alleviation of conditions productive of discontent and irritation. The transitory nature of employment in mills and the feeling of insecurity sometimes present among employees are conducive to decreased efficiency. The author's purpose is to make things easier for the millman—his chief consideration being the welfare of those under the supervision of shift bosses.

ONE of the most noticeable features of industrial conditions, not only in this country but in every important mining center in the world, is the lack of harmony that exists among the personnel of the mill crews. In this paper I purpose analyzing the reasons for this deficiency and suggesting some ways in which matters may be improved. The main reason for an unfortunate absence of enthusiasm for the interests of his employer on the part of the worker is the feeling that he has no stake whatever in the welfare of the concern, and that he is not receiving in just proportion to what he is giving. If it be a fact that the workman is not receiving a fair living wage, in contradistinction to merely a living wage, the trouble can be remedied easily enough by increasing his remuneration. In this connection it must be remembered that such men as a class are not unreasonable, and there need be no fear that if an inch be granted an ell will be demanded. There must be mutual confidence, otherwise the whole fabric of industrial success will collapse.

VALUE OF THE BONUS SYSTEM

If the wages are adequate, a waning enthusiasm can be directly stimulated by the introduction of the bonus system. The bonus the company can afford to pay is not difficult to calculate, because the management can estimate the profit that will accrue from a certain increase in tonnage and can set aside a small portion of it for the operators. I have never known this system to fail. The standard set must be a high one, but obviously not one almost impossible to attain; and the bonus, to be an inducement, must be earned occasionally. It is unwise to award a bonus to the shift which puts through the largest tonnage. Credit should be divided equally among all the operators, and the day should be considered as consisting not of three eight-hour shifts but as one period of 24 hours. Millmen have often told me that they receive, say, only $5 a shift, whereas they produce $10. What these men need before leaving high school is a course in economics, so that an insight into the principles on which the business of the world is conducted may be obtained. Men of this type fall a ready prey to the sophistries of extremists; and it is to the interest of every company to endeavor to patiently educate and not merely run them out of town, and pass them along to the neighboring camp, more embittered but certainly no wiser.

FAVORABLE CONDITIONS LEAD TO CONTENTMENT

The manager should always bear in mind that contented men will remain in his service. Let housing conditions be equally comfortable for both married and single men; especially let bunk houses be so fitted that the night-shift man can sleep undisturbed during the day. A man who has not had sufficient rest cannot be an efficient worker. Change of shift should take place every week, at any rate during the hot summer months. These may appear trifling matters, but anything that adds comfort engenders harmony; and economy in mill management is more easily effected by an increase in mutual respect than by a cheeseparing policy in the matter of wages.

An efficient millman is proud of his work. To encourage this the mill must be kept clean and tidy on all shifts. Each millman should, I think, be given an opportunity to work, for a few days at least, with the mechanics in his department, so that he can do minor repairs himself and thereby obviate the need of a mechanic for a job requiring but five minutes and a monkey wrench. I have seen, in a large mill, an operator hang up a Wilfley table for several hours because tools were issued only to mechanics. The reason given for this rule was that if a wrench had been provided matters might have been made worse! Surely the logical and most economical step to have taken would have been to instruct the operator as to the correct thing to do and the correct way in which to do it. An operator, if relieved of all responsibility, degenerates into a mere watchman, and certainly does not improve by remaining in the service of a company where such conditions obtain. The chief reason for this is that a large number of operators are not millmen in the real sense of the word, and are following the work, temporarily, as a side issue.

MILLING CONSIDERED A TRANSITORY OCCUPATION

It is difficult to understand why milling should not be regarded as a profession; or why the lack of even a semblance of sound argument in the statement that any man is good enough is not immediately recognized. A man may be good enough, but does that argue that he is the best man for the job?

To be able to find employment with facility must mean that the labor supply is constantly shifting. It certainly is not due to a shortage of labor, otherwise there would not be evidence of so much unemployment. It must be because there is a great lack of contentment in mining organizations, attributable either to poor living conditions, to poor working conditions, or to both. The former are inevitable in new camps, but hey should be improved at the earliest possible moment. For the latter there is never any excuse. What contitutes poor working conditions? First and foremost here is unsympathetic management, creating an environment wherein the operator finds in foremen and hift bosses not fellow workers but beings holding aloof from him. Such a state of affairs is bad business and poor democracy. The success of the men in charge depends not so much on their taking themselves seriously as on their working in harmony with the rest of he force. They should strive to be looked upon with respect, and not with awe—to be regarded not as the men who have the power of "firing," but as co-workers.

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*Metallurgical engineer, Berkeley, California.

Feeling of Insecurity Is Demoralizing

The widely prevailing feeling among millmen that the element of permanency is absent from their jobs, and that their employment depends upon the whims and fancies and grouches of the shift bosses, is a source of indifference, discontent and inefficiency. For this reason I am opposed to any one but the superintendent having the power to discharge, and this power he should exercise only after inquiry into the facts of the case. What would one think of a judge who considers that loyalty to a district attorney obliges him to give a decision without hearing the defense? No district attorney expects him to. If no question of breach of discipline is involved, a man should be dispensed with only as a last resort.

It is an undoubted fact that lack of ability in a certain job engenders a dislike for the work, and persistence in that job—unless further experience has conquered the dislike—is demoralizing. An objection to this policy that is frequently put forward is that the plant is not a training school; but that is precisely what a modern mill ought to be. What better service can an organization hope to get than from the men whom it has itself trained? The expenditure of a little time on a man of suitable character is one of the finest investments, for it saves the monetary loss inherent to a system which permits a constant succession of men to come and go.

Transfer to Other Occupation Sometimes Desirable

A man sometimes falls off in efficiency because he becomes "stale." Whenever this occurs, let him be given a change in occupation by transferring him to another department. There is always a disinclination to make changes, but I think that, besides being economical, it has the advantage of providing the superintendent with a potential supply of shift bosses. A shift boss should never be brought in from the outside as long as there is a man already on the mill force who is capable of holding the position. Such a practice kills all enthusiasm by removing most of the incentive to hard competitive work. It is impossible for all to pluck the golden apple from the tree, but it is a satisfaction to know that all have an equal opportunity to reach for it.

The practice of permitting continual overtime—in some cases of enforcing it—is an unsound one. The question ought to be regarded not from the point of view of what the operator likes, but of what is good for him. The problem of sick-pay has been partly solved by industrial commissions, but no provision has been made for the man who is incapacitated by illness for two or three days. If the medical officer certifies him unfit for work, he ought to receive half pay. This is no new idea, for it was the custom in African mills several years ago. The British Labor Party recently suggested that every workman ought to be entitled to two weeks vacation every year on full pay. The suggestion was turned down, wrongly, I think, by the labor people of this country.

Coöperation in Solving Problems

The following quotation is taken from an article by F. Dean Bradley in a recent issue of the *Journal*: "The employees as well as the superintendent's office were consulted freely. . . . as a result . . . the men had become so interested that they were still figuring improvements not only on the filter but in other units of the mill." This is pleasant reading and shows a correct appreciation of human nature. In some mills suggestion boxes are provided, and employees are invited to contribute ideas. The matter ought not to rest with the reading of a suggestion and its refusal as impracticable, but an explanation should be given as to why it cannot be utilized. If a suggestion is adopted and proves a success, the value of the prize awarded ought to bear some relation to the economy effected.

Feasibility of Sunday Closing

A matter which has a definite bearing on coöperation and efficiency is the question of Sunday closing. The subject, if my memory serves me right, was once referred to in the columns of a technical paper, but created no discussion. One of the most prolific causes of dissatisfaction and lack of efficiency is seven-day operation—the same old grind, with never a break. If it is asked why Sunday should not be observed as a day of rest, nine men out of ten will reply that mills would not pay unless they ran full time; and, believing that, they are content to make no further inquiry. A New Zealander once told me that when Sunday work was stopped by law in his country, people were astonished to find that no industrial catastrophe occurred. If other industries are not dislocated by Sunday closing, why should mining prove to be an exception? It is hardly necessary to say that I am perfectly aware that all mill work could not be brought to a standstill on Saturday night, but I maintain that the machinery that could be stopped ought to be stopped.

The reader may now offer the criticism that my suggestions are all in the direction of making things easier for the millman. That is indeed the effort of this paper. I would like to see his working and living conditions improved, but I also want to see a higher standard set. I have seen the millman in his native habitat in several parts of the world, and I must confess that I have never seen a class working under greater disadvantages. To build up confidence and contentment, which is to win the battle, to prevent the constant restless shifting of labor, the discontent and strikes, there is only one requisite—honest labor must be made content.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Determination of Nitrates in Caliche and Its Products

By J. E. CLENNELL*

Methods in vogue in Chile of estimating nitrate content in caliche are insufficient for precise laboratory experimentation. The excuse that exactness in such chemical tests would be meticulous, in view of the inaccurate sampling systems in practice, is becoming less tenable as new methods of caliche treatment are introduced, based largely on modern hydrometallurgical practice. Improved methods of testing caliche and caliche products are described in the present article, and much data given in tabular form of the results of adopting more precise methods of manipulation.

IN THE course of an investigation on the mechanical treatment of caliche, or nitrate-bearing earth from Chile, a reasonably accurate and rapid method of estimating the nitric acid radical, which is reported in terms of sodium nitrate, was found necessary. The system commonly used in the Chilean oficinas, though simple and rapid, did not appear sufficiently exact, particularly with low-grade material, as the end point is somewhat indefinite. The Chilean method, as is well known, consists in acidifying the nitrate extract strongly with sulphuric acid, heating to 70° or 80° C., and titrating direct with a strong solution of ferrous sulphate, usually about 12% $FeSo_4.7H_2O$, acidulated with H_2SO_4.

Lester Strauss, in his report on the Chilean nitrate industry (reprinted from *Mining and Scientific Press*, June 13 to 27, 1914), describes the application of the method to the analysis of caliche as follows:

"Five gm. of the finely pulverized sample is boiled in 100 cc. of water and filtered. The filtrate is made up to 100 cc. Of this, 20 cc. is taken, to which 10 cc. of H_2SO_4 (50° Beaumé equal to 62.53% H_2SO_4 or sp.gr. 1.53) is added, and the solution heated in a porcelain evaporating dish to between 70° and 80° C. This temperature is maintained, the solution being stirred with a thermometer, and titration made out to a 12% $FeSO_4$ solution, accidulated with H_2SO_4. A dark-brown coloration is produced, which disappears on stirring, but leaves a sage-green tint to the solution, which deepens as the titration proceeds. Effervescence is noticed as the titration approaches completion; the end point is reached when further addition of $FeSO_4$ ceases to produce the brown coloration. Practice is necessary to note the end point. The method is correct to within 2%, which is near enough for practical purposes."

The last sentence is ambiguous as to whether the author means 2% of the amount of nitrate to be determined, or a variation of 2% in the reported percentage; e.g., whether a 20% solution would be determined as 19.8 to 20.2%, or be reported anywhere from 19 to 21%. My experience of the method inclines rather to the latter interpretation.

The reaction involved is:

$$6FeSO_4 + 2NaNO_3 + 4H_2SO_4 = 3Fe_2(SO_4)_3 + 2NO + Na_2SO_4 + 4H_2O$$

MODIFIED PELOUZE METHOD

The reaction is obviously the same as that involved in the well-known Pelouze method of nitrate determination, but in that case the estimation is made indirectly, i.e., ferrous sulphate is added in excess; and when the reaction is complete, the excess is determined by titrating the residual ferrous iron with permanganate, bichromate, or otherwise. The amount of ferrous iron originally added must be known exactly, and the difference between this and the amount remaining unconverted into ferric iron at the end of the reaction is the equivalent of the nitrate.

It was thought that this method, or a simple modification of it, might serve for the required determinations. Numerous variations of the method are described in different textbooks. Much care is generally taken to protect the ferrous sulphate from atmospheric oxidation during the process, but experiments show that this is a comparatively unimportant source of error, and can be avoided with sufficient exactness for all practical purposes by the simple expedient of placing a stopper with Bunsen valve in the neck of the flask used for the operation.

CONDITIONS AFFECTING THE REACTION

A large number of experiments, some of which are detailed below, demonstrated the following points in connection with this method:

1. The reaction is incomplete, even after prolonged boiling, unless the concentration of H_2SO_4 in the mixture is considerable, say 25% of the total volume.

2. The reaction is affected by the presence of chlorides. When nitrates and chlorides are acted upon simultaneously by H_2SO_4, chlorine or some chlorous gas is produced, and the amount of $FeSO_4$ consumed is greater than if nitrate alone had been present. Consequently the amount of nitrate shown by the test is too great.

3. When the final titration of excess $FeSO_4$ is made by permanganate, a slight error occurs in presence of chlorides, owing to the reducing action of HCl on $KMnO_4$. This may be eliminated for all practical purposes by sufficient dilution after the decomposition of the nitrate is complete.

STANDARD FERROUS SULPHATE

When the necessity for a high concentration of sulphuric acid was recognized, it was thought that the process might be shortened and simplified by using a ready prepared standard solution of ferrous sulphate, containing the requisite amount of free acid. It was found, however, that the addition of sulphuric acid in arge quantity, approaching 25% by volume, produced white precipitate, presumably anhydrous ferrous ulphate, which did not redissolve on agitation or on boiling. By mixing well-cooled solutions of ferrous ulphate and sulphuric acid (50% H_2SO_4 by volume) it was sometimes possible to get a clear solution of the required strength; but, even so, the liquid was likely to become turbid and to deposit the above-mentioned precipitate on standing. Conversely, a neutral or nearly neutral solution of ferrous sulphate is unstable and rapidly loses strength, giving a yellowish-brown deposit. On the whole, therefore, it is preferable to use a slightly acidified standard solution, and add the requisite amount of strong H_2SO_4 to each test, cooling thoroughly before adding the nitrate solution. The addition of this concentrated H_2SO_4 must be carefully regulated, as variations in the amount affect the result materially.

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A convenient standard, which has been adopted in the Butters laboratory, consists of 50 gm. $FeSO_4.7H_2O$ and 100 cc. concentrated H_2SO_4 diluted to 1000 cubic centimeters.

METHOD OF MAKING THE DETERMINATION

The amount of ferrous sulphate to be taken is dependent on the quantity of nitrate in the portion of liquid to be tested. When this amount is not approximately known, time may sometimes be saved by making a rough preliminary test by the Chilean method described above.

In an ordinary case, 50 cc. of standard ferrous sulphate would be taken. To this is added 20 to 25 cc. of concentrated H_2SO_4 in a conical flask, with stopper and Bunsen valve. After cooling by immersion in running water, a measured volume (say 10 cc.) of the nitrate solution is added. The liquid is then gradually heated and allowed to boil gently until all trace of brown coloration has disappeared, leaving a clear yellowish liquid in the flask. Then 100 cc. of previously boiled and cooled distilled water is added, the mixture cooled and titrated with standard permanganate without undue delay.

APPLICATION OF METHOD TO A SAMPLE OF CALICHE

The sample is ground as fine as convenient, say to 60 or 80 mesh. From 5 to 10 gm. (dependent on richness in nitrate), is weighed out and boiled in a flask or casserole with 100 cc. of water. It is then filtered, allowed to drain and washed by three applications of water, using about 25 cc. and heating to boiling each time. Finally the filtrate is cooled and made up to 200 cc., and an aliquot part taken for the nitrate determination. This may vary from 5 to 25 cc., according to the richness in nitrate, and should be accurately measured with a pipette. The portion of liquid so taken is added to a previously prepared mixture of standard $FeSO_4$ and H_2SO_4, containing a sufficient excess of the former, and the process carried out as above described. A few preliminary trials are generally necessary to determine the best conditions of acidity and dilution and the amount of standard $FeSO_4$ required for each class of material to be assayed, which must, of course, be accurately measured.

A sample of caliche residue was ground to 60 mesh, and 10 gm. was treated, as described, with boiling water, and the filtrate made up to 200 cc.; 25 cc. of this filtrate was added to a previously prepared mixture of 10 cc. of standard $FeSO_4$ and 20 cc. of concentrated H_2SO_4, and boiled till the reaction was complete. On titration, 12.8 cc. $KMnO_4$ was required; and 10 cc. of the $FeSO_4$, with addition of 20 cc. concentrated H_2SO_4 and 25 cc. of distilled water, required 16.9 cc. of $KMnO_4$. Hence 16.9 — 12.8, or 4.1 cc., corresponds to the amount of ferrous iron oxidized by the nitrate. Assuming 1 cc. $KMnO_4$ = 2.982 mg. $NaNO_3$, then 4.1 cc. = 12.23 mg. $NaNO_3$ on 25 cc. of filtrate, or 97.8 mg. on 200 cc., representing 10 gm. of residue. Hence the residue contains 0.978% of $NaNO_3$.

STANDARDIZING THE FERROUS SULPHATE

Standardizing must be done under conditions strictly similar to those of the actual assay. For this purpose a solution is prepared certaining sodium nitrate and sodium chloride in about the same relative proportions as they occur in the extracts from the caliche. The c.p. sodium nitrate should be heated to incipient fusion in a small porcelain dish, and allowed to cool in a desiccator before weighing, as it is somewhat deliquescent. The amount of chloride in the solution to be tested is easily and rapidly determined by the well-known silver-nitrate reaction with chromate indicator, as the caliche extract is practically neutral to litmus.

In standardizing, a quantity of this mixed nitrate and chloride solution is measured exactly, so as to contain as nearly as possible the amount of nitrate which is present in the actual assay solution. This is mixed with previously prepared $FeSO_4$ and H_2SO_4 in the same amount as in the assay, and put through the same treatment. A blank test is also made to determine the equivalent of the ferrous sulphate in absence of nitrate. In this case distilled water should be used in volume equal to that of the nitrate solution taken in the assay.

PRECAUTIONS NEEDED

The sudden disappearance of the black or brown color shows that insufficient ferrous sulphate has been used. This is also indicated by the appearance of nitrous fumes in the upper part of the flask. In either case the assay is spoiled, and a fresh test should be started, with increased volume of standard $FeSO_4$ or diminished volume of nitrate.

Violent boiling should be avoided, not only because it may occasion loss by spirting; but, as there is only a narrow outlet for escape of steam, the stopper may be suddenly forced out and large quantities of strongly acid liquor scattered about, which might possibly cause serious accidents.

RELATION OF IRON STANDARD OF FERROUS SULPHATE TO NITRATE STANDARD

From the equation given it is evident that the nitrate standard of the ferrous sulphate or permanganate could theoretically be calculated from the iron standard. Assuming $NaNO_3 = 3Fe''$ converted to Fe''', and $Fe = 55.85$, $NaNO_3 = 85.01$, then 1 mgm. Fe = 0.5075 mgm. $NaNO_3$; hence the nitrate standard is obtained by multiplying the iron standard by 0.5075.

When the proper conditions of acidity and dilution are observed, and when chlorides are absent or in negligible quantity, the figures obtained from the iron standard agree closely with those given by the c.p.

TABLE I. ILLUSTRATING EFFECT OF VARYING NITRATE IN ABSENCE OF CHLORIDES

	Standard Ferrous Sulphate Solutions			Standard of Permanganate		
Mark	$FeSO_4.7H_2O$, gm.	H_2SO_4, c.c.	Diluted to c.c.	$KMnO_4$, c.c.		$NANO_3$, mg.
A	44	367	1000	1	=	2.979
B	60	300	1000	1	=	2.979
C	50	100	1000	1	=	2.840

In all cases, 100 c.c. water added after boiling to complete reaction.

	Standard Ferrous Sulphate Taken				Sodium Nitrate Added		Permanganate		Sodium Nitrate	
Test No.	Mark	c.c.	Conc. H_2SO_4 Added, c.c.	Water Added, c.c.	Volume, c.c.	$NaNO_3$, %	Required in Titration, c.c.	Equivalent of Fe″ Used by $NaNO_3$, c.c.	Present, mg.	Found, mg.
Blank	A	25	..	25	..	...	38.4	.....	...	.....
1	A	25		..	2	1	31.6	6.8	20	20
2	A	25	.	..	4	1	24.8	13.6	40	40
3	A	25		..	8	1	11.5	26.9	80	80
4	A	25	..	..	10	1	4.5	33.9	100	101
Blank	B	25	..	10	..	...	51.4	.....	...	.....
5	B	25	..	..	3	1	41.05	10.35	30	31
6	B	25	..	..	6	1	31.5	19.9	60	59
7	B	25	..	..	9	1	20.5	30.9	90	92
8	B	25	..	..	12	1	11.45	39.95	120	119
Blank	B	25	5	10	..	...	51.3	.....	...	.....
9	B	25	5	..	3	1	40.8	10.5	30	31
10	B	25	5	..	7	1	27.3	24.0	70	71.5
11	B	25	5	..	10	1	16.9	34.4	100	102.5
12	B	25	5	..	13	1	7.2	44.1	130	131
Blank	C	50	20	30	..	...	78.6	.....	...	.....
13	C	50	15	..	10	0.5	60.8	17.8	50	50.6
14	C	50	17.5	..	20	0.5	42.9	35.7	100	101.4
15	C	50	20	..	30	0.5	26.1	52.5	150	149.1
16	C	50	22.5	..	40	0.5	8.7	69.9	200	198.5

TABLE II. ILLUSTRATING INFLUENCE OF CHLORIDES ON TITRATION OF NITRATE

Standard Ferrous Sulphate Solutions			Standard of Permanganate
$FeSO_4.7H_2O$,	H_2SO_4,	Diluted to	
60 gm.	350 c.c.	1000 c.c.	1 c.c. = 2.979 mg. $NaNO_3$

After completion of reaction, 100 c.c. water added in each test

				Permanganate		Amount Present		Found
Test No.	Standard Ferrous Sulphate Taken c.c.	Sodium Nitrate 1% $NaNO_3$ Added, c.c.	Sodium Chloride 5% NaCl Added, c.c.	Required in Titration, c.c.	Equivalent to Fe″ Used by $NaNO_3$, c.c.	Sodium Chloride, mg.	Sodium Nitrate, mg.	Sodium Nitrate, mg.
Blank	30	..	..	63.8	....	...	...	...
1	20	10	..	8.2	34.3	...	100	102
2	30	15	..	12.0	51.8	...	150	154
3	40	20	..	16.4	68.6	...	200	204
Blank	30	..	5	63.7	0.1	250	...	...
4	20	10	5	10.2	32.3	250	100	96
5	30	15	5	12.1	51.7	250	150	154
6	40	20	5	16.4	68.6	250	200	204
7	25	10	2	22.9	30.2	100	100	90
8	40	15	3	36.2	48.8	150	150	145
9	50	20	4	39.9	66.4	200	200	198
10	30	15	10	11.9	51.9	500	150	155
11	40	20	10	15.6	69.4	500	200	207

TABLE III. ILLUSTRATING EFFECT OF VARYING NITRATE WITH AND WITHOUT CHLORIDE

	Standard Ferrous Sulphate Solutions		
Mark	$FeSO_4.7H_2O$, gm.	H_2SO_4, c.c.	Diluted to c.c.
A	36.4	364	1000
B	33.3	417	1000

Standards of Permanganate

A. 1 c.c. $KMnO_4$ = 2.91 mg. $NaNO_3$

B. 1 c.c. $KMnO_4$ = 2.93 mg. $NaNO_3$

After completion of reaction, 100 c.c. water added in each test.

	Standard Ferrous Sulphate Taken,					Permanganate		Present in Test		Found
Test No.	Mark	Volume, c.c.	Sodium Nitrate 0.5% $NaNO_3$, c.c.	Mixed Solution 0.5% $NaNO_3$ 0.5% NaCl, c.c.	Water Added, c.c.	Required in Titration, c.c.	Equivalent to Fe″ Used by $NaNO_3$, c.c.	Sodium Chloride, mg.	Sodium Nitrate, mg.	Sodium Nitrate, mg.
Blank	A	50	..	..	25	62.9	....	...	...	.....
1	A	50	10	..	..	46.2	16.7	...	50	48.6
2	A	50	20	..	..	28.8	34.1	...	100	99.2
3	A	50	30	..	..	11.1	51.8	...	150	150.7
4	A	50	..	10	..	45.7	17.2	50	50	50.1
5	A	50	..	20	..	28.7	34.2	100	100	99.5
6	A	50	..	30	..	11.7	51.2	150	150	149.0
Blank	B	50	..	..	25	58.3	....	...	...	.....
7	B	50	10	..	..	41.5	16.8	...	50	49.2
8	B	50	20	..	..	24.3	34.0	...	100	99.6
9	B	50	30	..	..	7.7	50.6	...	150	148.3
10	B	50	..	10	..	41.1	17.2	50	50	50.4
11	B	50	..	20	..	23.6	34.7	100	100	101.7
12	B	50	..	30	..	6.6	51.7	150	150	151.5

TABLE IV. ILLUSTRATING EFFECT OF VARYING CHLORIDE WITH CONSTANT AMOUNT OF NITRATE

Standard Ferrous Sulphate Solutions			Standard of Permanganate
$FeSO_4.7H_2O$. gm.	H_2SO_4, c.c.	Diluted to c.c.	
50	100	1000	1 c.c. = 2.85 mg. $NaNO_3$. (Based on Test No. 4 and Blank No. 2)

After completion of reaction, 100 c.c. water added in each test.

						Permanganate		Present in Test		Found
Test No.	Standard Ferrous Sulphate Taken, c.c.	Conc. H_2SO_4 Added, c.c.	Sodium Nitrate 0.5% $NaNO_3$ Added, c.c.	Sodium Chloride 5% NaCl Added, c.c.	Water Added, c.c.	Required in Titration, c.c.	Equivalent to Fe″ Used by $NaNO_3$, c.c.	Sodium Chloride, mg.	Sodium Nitrate, mg.	Sodium Nitrate, mg.
Blank 1	50	17		.	20	85.8	....	...	...	....
Blank 2	50	18		3	20	85.6	....	150	...	....
1	50	17	20			49.5	36.1	...	100	102.9
2	50	17	20	1	..	50.4	35.2	50	100	100.3
3	50	17.5	20	2	..	50.8	34.8	100	100	99.2
4	50	17.5	20	3	..	50.5	35.1	150	100	100.0
5	50	18.5	20	5	..	50.3	35.3	250	100	100.6

odium nitrate standard. With a considerable amount f chloride, however, there is a wide divergence; and eliable results can be obtained only by standardizing n a mixed nitrate and chloride solution as above decribed.

As before stated, acidity and dilution of test solutions re the most important factors in the method. In genral, the best results were obtained when the total mount of concentrated sulphuric acid present was oneourth the volume of the entire solution before boiling. or solutions weak in nitrate the proportion of H_2SO_4 o total volume should be increased, and, conversely, or very strong solutions, it may be diminished.

The tables illustrate the effect of varying conditions n the results obtained. A single determination usually requires about 45 min., as the boiling should not e hurried. A large number of tests may be made imultaneously and, where this is required, the method will probably be found as rapid in practice as the regular Chilean system.

Story of a Small Oil Company*

About three years ago I and some associates thought we would have a try at the oil game. We could not go against the big operators, so we did what the little fellows must perforce do—we went "wildcatting." We got some leases in territory miles away from development, ground that had really been partly condemned. But we concluded to have a try at it. We estimated that it would cost $16,000 to put down a well.

We organized with $20,000 capital and went to work. We got a small well, not enough to pay, but enough to encourage us. The well cost $24,000—more than our capital—but we chipped in the difference to finish it out. When the well was completed our money was gone. To raise more, we sold the lease where the well was for $30,000, and started another well. At the end of three years we had developed a handsome property besides opening up a new field that is now producing hundreds of thousands of barrels of oil. We did not have easy going. At one time we were in debt more than $100,000. We had discouragements and disappointments. But we stuck at it, and finally won out.

We felt good, thinking that the property would afford us all a good return for the time and the money spent, and even a modest competency, which it was quite capable of doing. Thousands of people in our section had played the game with the usual result, that is, failure. We alone had succeeded; everybody thought us lucky.

Now mark the result! Our property became productive about the time the war started, that is, about a year ago. We knew we would have to pay war taxes, but did not know how much. We paid no dividends and no salaries, putting all our money in the bank and waiting to see what we would have to pay. When the taxes became due this summer we had saved up $485,000. The Government, after some figuring, said our taxes would be $483,000. Out of all the money we had made the first year the Government proposed to take $483,000, leaving up for our share $2000.

We protested this and got a reduction of $112,000. But this is not the whole story. We do not dare to touch the $112,000, because we understand the Government is coming stronger than ever, and next year we do not know where we will get the money to pay our taxes. Next year, also, our property will be largely depleted.

But I have not yet told the worst. Our neighbor across the road is a big company. While our taxes are 80% of production its taxes are 25%. Out of each 100 bbl. of oil taken out of the ground by us the Government takes 80 bbl. Out of each 100 bbl. of our powerful neighbor it takes 25 bbl. Although engaged in the same business as our neighbor, we pay three times as much tax. On top of this, of course, we pay all kinds of local taxes. It does not take much of an actuary to tell where we are.

Have we presented these facts at Washington? Certainly we have. Every one admits at once that it is all wrong. But the committee has just one answer for everything of this kind, "We've got to have the money."

It is absurd to say that Congress cannot frame a more just and equal tax law than this law, which ruins the small companies that have observed the law by small and legitimate capitalization, and plays directly into the hands of the big companies that monopolize the business. We inveigh against the exactions of autocracy. We hold up to the people the blessings we enjoy under just and equal laws and a free government, as compared, say, with the burdens borne by the French people before the Revolution. I have done this very thing in my war work, and felt it in my own case to be a mockery.

There is not the slightest doubt that present conditions are interfering with oil development. Work is being suspended or held back in the hope that conditions will improve. There is no sound reason why this should be so. Price will keep reasonable pace with the cost of production and take care of that. But it is immaterial what the price is if the Government takes all or more than a just proportion of the product. In a greater or less degree the inequality of Federal taxation affects the entire petroleum industry, and unless means be found to correct this the effect, from every standpoint, practical, legal and moral, must be viewed with concern.

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*C. G. Hornor, of Guthrie, Okla., in the New York "Sun."

Potash Production Increasing

The statistics on the production of potash for the first six months of 1918 received by the U. S. Geological Survey to date show a total output of 20,000 to 25,000 short tons of pure potash (K_2O), indicating that the output for the entire year may reach 50,000 to 60,000 tons. As only 32,573 tons was produced in 1917, the production is evidently increasing rapidly. The domestic production now equals 20 to 25% of the normal domestic consumption before the war, which is estimated to have been about 240,000 tons. The statistics for the first half of the year are incomplete, returns not having been received from a few large producers, and it is possible that the production in 1918 may exceed 60,000 tons, as reports indicate that a number of new enterprises may be put in operation during the second half of the year.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Valuation of Mines in Arizona

By E. JACOBS*

THE last published report of the proceedings of the State Board of Equalization of Arizona shows that the value of property directly connected with the mining industry of the state constituted about 56% of the total value of all property subject to taxation by the state for the year 1917. Though the approximate percentage for the year 1918 has not yet been determined, it will no doubt be larger than that of 1917, as the increase in valuation of the producing mines of Arizona, as shown in the table, is larger proportionately than that of all other taxable property. Incidentally, it may be mentioned that in 1917 the percentage for productive patented and unpatented mines was 46.9; for non-productive patented and unpatented mines and mill sites, 1, and for smelteries, concentrators, and improvements on all mining property, 8.1 per cent.

The principal duties of the State Tax Commission of Arizona include those of valuing and assessing all producing mines. In the last biennial report of the commission, the following observation is made:

> The labor involved in determining the proper valuation for the great producing mines, the railroads, and other classes of property, valued and assessed by the Tax Commission, is exceedingly great. . . . During the time in which the many different properties are being considered, it is customary to grant hearings to all interested parties. Of necessity, these hearings consume a great deal of time, as does also the later review of the testimony taken. In this connection, it is interesting to note that more than 54% of all taxable property in the state is valued and assessed by the Tax Commission.
>
> The laws of Arizona require the Tax Commission to supervise the work of all county assessors, as well as county boards of equalization, and to require that all property be listed and valued at its full cash value, and in this connection it may require any county board of equalization to reconvene at any time and make such orders as the Tax Commission shall determine are just and necessary.

As to assessment of producing mines, the report says:

> The greatest achievement of the Tax Commission has been the successful solving of the great mine-tax problem. For the last 20 years the question of mine taxation has been puzzling county assessors and boards of equalization, as well as the Legislature itself. In 1907, the Territorial Legislature enacted what was known as the "Bullion Tax Law." This law was founded on the principle of valuing a producing mine, for taxation purposes, "for an amount equal to 25% of its gross output annually." Under this law all of the producing mines in the state were valued at something like $20,000,000. This law remained in effect until 1912, being repealed by the Legislature that year. In 1913, the Legislature enacted a special mine-tax law based on the principle of valuing a mine for taxation purposes for an amount equal to four times the net plus 12½% of the gross output annually. Under this law all of the producing mines of the state were valued at approximately $110,000,000. Under the method adopted by the Tax Commission, all of the producing mines in the state were valued at approximately $172,000,000 for the 1916 assessment. This valuation does not include mining machinery, smelteries, nor improvements on mining property, which amount to nearly $39,000,000.
>
> It is exceedingly gratifying to the Tax Commission to make known to the people of Arizona that its efforts to value and assess this by far the greatest class of property in the state have met with such a large degree of success. That its efforts have proved successful is attested by the fact that only three minor hearings were called for to protest against the final valuations found by the commission when sitting as a board of equalization. In some of these cases slight adjustments were made, and nothing even resembling a lawsuit was brought about through this immense increase in taxable valuation on producing mines.

In 1915, the Tax Commission adopted a method of assessing the mining property in the state which, though a great improvement over the special mining law previously in force in Arizona, was ultimately found "not sufficiently elastic to meet all of the conditions that were encountered in valuing the many mining properties within the state." Consequently, in May, 1916, it was resolved that "in order to arrive at a just and equitable valuation of the productive patented and unpatented mines and mining claims and groups thereof," the following classification be adopted:

Class 1. Copper mines whose orebodies are found in veins, fissures and lenses and do not show evidence of exhaustion.
Class 2. Copper mines whose orebodies consist of porphyry deposits and large acreages of contiguous ground largely unexplored and undeveloped.
Class 3. Copper mines whose orebodies consist of developed low-grade porphyry deposits.
Class 4. Copper mines whose ore deposits show evidence of exhaustion.
Class 5. Gold and silver mines whose ore deposits show evidences of exhaustion.
Class 6. Gold and silver mines whose orebodies have not shown evidences of exhaustion.
Class 7. Zinc and lead mines.
Class 8. All producing mines of irregular output.

Later, it was resolved to add subdivisions as follows:

"A," which shall include all such properties as have entered the profitable productive stage during the year 1915.

"B," which shall include all properties that have suspended profitable production during the period under consideration, for reasons other than market or physical conditions.

"C," which shall include all such properties that have suspended profitable production when said properties could have been operated at a profit during the period under consideration.

The mines of each company or corporation were then assigned to the respective classes or subdivisions thereof to which by physical as well as other characteristics it was deemed they should be assigned.

CAPITALIZATION FACTORS DETERMINED

After all of this preliminary work had been attended to, the main question of a capitalization factor to be used in valuing each of the several classes of producing mines was given consideration. In order to arrive at a real net, it was decided not to allow items such as mine depletion, interest charges, new construction, acquisition of new real estate, and depreciation on personal property to be deducted. Owing to the fact that the several mining companies use different factors for depreciation, it was decided to make all uniform by disallowing every charge of this nature and taking care of it through the capitalizing factor employed.

The factors used in capitalizing the average annual net for a four-year period for mines were as follows: For Class 1 and subdivisions, 15%; Class 2 and subdivisions, 15; Class 3 and subdivisions, 15; Class 4 and subdivisions, 20; Class 5, 25; Class 6, 20; Class 7, 20 and Class 8, 33⅓ per cent.

The following valuations of producing mines, which show the amounts for 1917 and 1918, respectively, do not include personal property nor real estate:

ARIZONA MINE VALUATIONS FOR 1917 AND 1918

Property	Amount of Assessment for 1917	1918	Increase	Decrease
Cochise County:				
Arizona & Michigan Development Co	$22,823.00	....	....	$22,823.00
Arizona United Mining Co (owner), Cobriza Mines Development Corporation (lessee). ...	694,635.00	$694,383.00	....	252.00

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*Phoenix, Arizona.

ARIZONA MINE VALUATIONS FOR 1917 AND 1918
(Continued)

Cochise County: (continued)	Amount of Assessment for 1917	1918	Increase	Decrease
Calumet & Arizona Mining Co.	$37,265,751.59	$39,827,020.00	$2,561,268.41	....
Calumet & Arizona Mining Co. (Germania group)	20,000.00	88,145.00	68,145.00	....
Great Western Copper Co.	104,319.00	197,057.00	92,738.00	....
Higgins, Thomas (Higgins Tunnel)	406,764.00	389,184.00	....	$17,580.00
Leonard Copper Co.	105,060.00	93,040.00	....	12,020.00
Peabody Consolidated Copper Co.	49,219.00	....	....	49,219.00
Phelps Dodge Corp. (Copper Queen branch)	51,287,023.90	61,485,049.00	10,198,025.10	....
Shattuck-Arizona Copper Co.	8,212,787.00	7,396,667.00	....	816,120.00
Stein, Boericke, et al.	199,677.00	....	....	199,677.00
Tejon Mining Co.	31,222.00	....	....	31,222.00
Totals	$98,399,281.49	$110,170,545.00	$12,920,176.51	$1,148,913.00
Gila County:				
Arizona Commercial Mining Co.	$2,291,796.00	$2,445,367.00	$153,571.00	....
Bailey, Berry & Chapman (owners); Russell & Boys (lessees)	120,276.00	....	....	$120,276.00
Gibson Consolidated Copper Co.	181,046.00	140,600.00	....	40,446.00
Gila Copper Sulphide Co.	1,060,095.00	1,152,997.00	92,902.00	....
Inspiration Consolidated Copper Co.	74,168,898.00	76,439,572.00	2,270,674.00	....
Iron Cap Copper Co.	677,414.00	1,844,047.00	1,166,633.00	....
Miami Copper Co.	19,133,517.00	24,988,440.00	5,854,923.00	....
Old Dominion Copper Mining and Smelting Co. (including United Globe Mines)	12,700,561.00	15,109,243.00	2,408,682.00	....
Superior Arizona Copper Co.	....	66,530.00	66,530.00	....
Warrior Copper Co. (owner); Southwestern Leasing and Development Co. (lessee)	483,782.00	658,663.00	174,881.00	....
Totals	$110,817,385.00	$122,845,459.00	$12,188,796.00	$160,722.00
Greenlee County:				
Arizona Copper Co.	$16,892,715.00	$18,822,597.00	$1,929,882.00	....
Eagle Gold and Copper Co.	....	102,320.00	102,320.00	....
Keating Mines Co. (owner); Grant Leasing Co. (lessee)	....	57,413.00	57,413.00	....
Leszynsky, J. (owner); Christy & Bennie (lessees)	73,754.00	....	....	$73,754.00
Phelps Dodge Corp. (Morenci branch)	5,438,780.00	6,518,828.00	1,080,048.00	....
Shannon Copper Co.	1,337,930.00	443,198.00	....	894,732.00
Totals	$23,743,179.00	$25,944,356.00	$3,169,663.00	$968,486.00
Mohave County:				
Gold Road Mines Co.	$230,595.00	....	....	$230,595.00
Grand Gulch Mining Co.	104,131.00	$92,494.00	....	11,637.00
Needles Mining and Smelting Co.	692,875.00	....	....	692,875.00
Tom Reed Gold Mines Co.	1,171,846.80	1,071,818.00	....	100,028.80
Union Basin Mining Co.	316,051.00	....	....	316,051.00
United Eastern Mining Co.	....	4,215,504.00	$4,215,504.00	....
Totals	$2,515,498.80	$5,379,816.00	$4,215,504.00	$1,351,186.80
Pima County:				
Bush & Baxter (owners of Minnie Mine); A. S. & R. Co. (lessees)	$310,399.00	....	....	$310,399.00
Empire Zinc Co.	206,412.00	....	....	206,412.00
Helvetia Copper Co.	101,035.00	$74,517.00	....	26,518.00
Imperial Copper Co. (owner) A. S. & R. Co. (lessee)	510,403.47	918,521.00	$408,117.53	....
Mineral Hill Consolidated Copper Co.	214,225.00	....	....	214,225.00
Narragansett Mines Co.	268,545.00	238,215.00	....	30,330.00
New Cornelia Copper Co.	....	21,867,473.00	21,867,473.00	....
Rosemont Copper Co.	....	155,299.00	155,299.00	....
Twin Buttes Mining and Smelting Co. (owner Morgan Mine); A. S. & R. Co. (lessee)	22,242.00	....	....	22,242.00
Twin Buttes Mining and Smelting Co. (owner); Glance Mining Co. (lessee)	410,739.00	397,849.00	....	12,890.00
Vulcan Consolidated Mining Co.	144,067.00	86,559.00	....	57,508.00
Totals	$2,188,067.47	$23,738,433.00	$22,430,889.53	$880,524.00
Pinal County:				
Copper Butte Mines, Inc.	....	$136,915.00	$136,915.00	....
Magma Copper Co.	$3,718,858.00	4,613,384.00	894,526.00	....
Ray Consolidated Copper Co.	24,818,248.00	36,445,092.00	11,626,844.00	....
Totals	$28,537,106.00	$41,195,391.00	$12,658,285.00	....
Santa Cruz County:				
Duquesne Mining and Reduction Co., R. R. Richardson (owner)	....	$283,825.00	$283,825.00	....
Three R. Mining and Milling Co. (lessee)	$204,835.00	....	....	$204,835.00
Totals	$204,835.00	$283,825.00	$283,825.00	$204,835.00
Yavapai County:				
Arizona Binghampton Copper Co.	....	$316,692.00	$316,692.00	....
Commercial Mining Co.	$348,255.00	362,296.00	14,041.00	....
Consolidated Arizona Smelting Co.	2,296,746.00	2,995,366.00	698,620.00	....
Copper Chief Mining Co. (owner); Hayden Development Co. (lessee)	173,080.00	65,525.00	....	$107,555.00
Lookout Copper Co. (owner); J. F. Caspari (lessee)	23,934.00	....	....	23,934.00
Yavapai County (continued)				
United Verde Copper Co.	$31,536,944.00	$42,901,915.00	$11,364,971.00	....
United Verde Extension Mining Co.	27,551,329.00	39,259,336.00	11,708,007.00	....
Totals	$61,930,288.00	$85,901,130.00	$24,102,331.00	$131,489.00
Yuma County:				
Leighton, G. B. (Critic Mine)	....	$61,348.00	$61,348.00	....
New Planet Copper Mining Co. (owner); Northwestern Leasing and Development Co. (lessee)	$274,102.00	....	....	$274,102.00
Swansea Consolidated Gold and Copper Mining Co. (owner); Swansea Lease, Inc. (lessee)	610,886.00	451,237.00	....	159,649.00
Yucca Tungsten Co.	....	108,942.00	108,942.00	....
Totals	$884,988.00	$621,527.00	$170,290.00	$433,751.00

Summary

County	Total of Assessment for 1917	1918	Net Increase
Cochise	$98,399,281.49	$110,170,545.00	$11,771,263.51
Gila	110,817,385.00	122,845,459.00	12,028,074.00
Greenlee	23,743,179.00	25,944,356.00	2,201,177.00
Mohave	2,515,498.80	5,379,816.00	2,864,317.20
Pima	2,188,067.47	23,738,433.00	21,550,365.53
Pinal	28,537,106.00	41,195,391.00	12,658,285.00
Santa Cruz	204,835.00	283,825.00	78,990.00
Yavapai	61,930,288.00	85,901,130.00	23,970,842.00
	....	....	$87,123,314.24
Yuma	884,988.00	621,527.00	263,461.00
Totals	$329,220,628.76	$416,080,482.00	$86,859,853.24

The following are the totals of valuations of the producing mines for the six years (1913-1918) since admission of Arizona to statehood: 1913, $113,332,604.15; 1914, $110,393,989.53; 1915, $118,026,003.74; 1916, $171,888,616.19; 1917, $320,220,628.76, and 1918. $416,080,482. It is noteworthy that the total valuation for the current year is 26.04% higher than that for 1917, and 267% higher than that for 1913, the first year included in the foregoing record.

The valuations given are those of the producing mines only. In addition, there are those of the non-productive mines, improvements in both productive and non-productive mines, surface of certain mining claims, mining machinery and supplies, mill sites and improvements thereon, concentrators, smelteries and appurtenances, and sampling and other works, the valuation of all of which in 1917 was approximately $62,718,000. So it may be regarded as entirely probable that when the 1918 final figures for these are obtainable, it will be seen that the mining industry of the state represents a taxable value of about $500,000,000. This leaves out of account the railway, telegraph, and telephone systems of the various mining and smelting companies, so that the total value of all property directly and indirectly connected with the mining industry must be considerably in excess of half a billion dollars.

Sheet Zinc in Great Britain

Great Britain is expanding greatly its production of sheet zinc, especially in rolling thin sheets. One firm is producing zinc strip as thin as No. 4 gage, but the majority of the works engaged in rolling thin sheets are turning out only limited quantities, as their output of the thicker sizes is readily absorbed. It is interesting to note, says the *Ironmonger*, that this industry has almost entirely developed since the war, and that although the quality of the British-made article may not equal the finer brands of Continental and American sheets in use in pre-war days, the difference is largely in the surface finish, and the general quality of the British goods is creditable to the adaptability of the British manufacturer and workman.

Bureau of Mines Activities

The war situation has stimulated to greater activity the efforts of the U. S. Bureau of Mines, whose normal field covers the production of metals and minerals. Much of this increased activity has occurred in connection with the War Minerals Investigation branch of the Bureau, provided for by special Congressional appropriations.

In mining, milling and marketing problems numerous engineers have been active, and the policy has been adopted of affording immediate help in the way of needed advice with regard to suitable methods. Work along these lines has made principally for greater efficiency, and is not intended to form the subject of any special study or memoir.

In the various experiment stations, special problems of ore treatment have been and are under investigation. Experiments in the concentration of Western chrome ores have been made at Seattle; and preliminary work of the same kind on West Texas sulphur ores indicates that they are probably capable of successful treatment by the flotation method. Other investigations concern manganese, graphite, and minerals generally.

Laboratory investigations, with the view of increasing the supply of electrodes so as to make them available for Western electric furnaces, are under way in Colorado.

The subject of chromite production has been investigated by field parties; Bureau of Mines' engineers have also reported on the deposits in Newfoundland and Cuba.

The War Minerals Investigation organization has been concerned with the question of priorities, both of railroad transportation and of supplies and fuel, and a large number of applications have been handled. The Bureau has also had to act as adviser to the Railroad Administration as to the construction of short lines designed to facilitate shipments to and from certain mines, the problem being as to whether such construction was a war necessity or could be postponed.

The Bureau of Mines has acted as advisory engineer to the capital issues committee of the War Finance Corporation with reference to whether proposed issues of mining stock were essential to carrying on the war or could be postponed. It has also worked in coöperation with and acted as adviser to the War Industries Board, especially in matters such as the production of pyrite, sulphur, sulphuric acid and tungsten.

The Labor Section of the War Minerals Investigation is coöperating with the Department of Labor and with the War Department with regard to deferred classification for mining men, and with the man-power committee of the Department of Labor with the object of maintaining maximum production.

As a result of the investigations of the Bureau as to the dangers which threaten production of war minerals, Secretary Lane has written to Chairman Kitchin of the Ways and Means Committee recommending that the Excess Profits Tax be suspended in the case of those mines producing a war essential, until special installations put in for that purpose should be amortized, and this recommendation has been approved by those in possession of the facts.

The platinum situation has been closely studied by the Bureau; and, in coöperation with the War Industries Board, plans and regulations have been drawn up which it is believed will be satisfactory. These regulations will be put into effect through the War Industries Board.

Special committees have been formed to study special problems. The committee on gold, representing both the Bureau and the Geological Survey, has been appointed by the Secretary of the Interior, at the suggestion of the Bureau, with Hennen Jennings as chairman, and is investigating the problems. A committee on potash has also been appointed which has reported recommendations for further investigation by the Bureau of Mines. The tin problem has also been studied by a special committee, and recommendations to the other Government departments interested have been made.

Close coöperation has been maintained with the U. S. Geological Survey, which has been investigating the various questions from the geological standpoint.

Japanese Sulphur Situation

According to an investigation by the Japanese Department of Agriculture and Commerce, the production of sulphur in April, 1918, was 5878 tons, states a Canadian consular report. Compared with the corresponding period of last year, there was a decrease of 35%. The grand total from the beginning of 1918 to April was 22,035 tons, a decrease of 27% from the figures for the first four months of 1917.

The cause of this falling off is the tremendous advance in freight rates to Australia, the best customer for Japanese sulphur, purchasing about half of the quantity sold. The steamship companies have raised their freight rate to 95 yen (about $48) per ton, whereas they were charging 35 yen last year. Therefore the price, c.i.f. Australian port, of sulphur selling at 55 yen per ton net in Japan, would be more than 160 yen (including freight marine insurance, war risk, and other charges), which is prohibitive. The merchants of Australia will not give orders to Japan until the freight rates show some decrease. On the other hand, the customers of India, South Africa, and the South Sea Islands, having placed too many orders during last season, are not now active, and the market looks quiet. About 35,000 tons of previous orders are ready for shipment, lying at the manufacturers' warehouses, on account of the scarcity of bottoms. As a consequence of the conditions created by the difficulty in moving their product, some of the manufacturers are in a serious condition and some have even become bankrupt.

The Llallagua Mine of Bolivia

The wonderful profits which are being realized by the great Bolivian tin mines under current conditions, unhampered as they are by any excess-profits taxes, is strikingly shown in the report of the great Llallagua company, whose balance sheet was published in the *Diario* recently. We take this summary from the *Mining Journal* of London. The Llallagua was, perhaps, the largest single producer of tin in the world last year, though figures of Señor Patino's properties are not yet available. The total, at any rate, was 249,580 quintals, or 11,140 long tons, as against 165,534 quintals, or 7454 tons in 1916, showing a remarkable increase, the monthly output averaging 20,200 quintals. This total was equivalent to nearly one-quarter of the estimated output f barilla from Bolivia, which amounted to 46,000 tons st year.

The net profit for the year amounted to 18,760,633.92 esos of 18d., after writing off the sum of 761,411.61 esos to depreciation of plant and equipment, that is, 53,355 17s. 5d., a sum which represents 10% for the alue of the machinery, stock and buildings. The profit or the year 1916 amounted to 6,214,977.49 pesos of 8d.; the profit for the year 1917 exceeding that of 1916 y 12,545,656.43 pesos, that is £940,824 4s. 9d. Costs in 916 and 1917 per Spanish quintal were as follows:

1916.	Pesos of 18d
Exploitation	7.27
Smelting	3.56
Exploration and development	3.27
Other expenses	7.32
Total	21.42

1917.	Pesos of 18d.
Exploitation	5.45
Smelting	2.06
Exploration and development	1.95
Other expenses	9.55
Total	19.01

The average price abroad for tin in 1916 was 67.96 esos of 18d. per Spanish quintal, and in 1917 was 106.90 pesos. The profit per Spanish quintal increased from 37.54 pesos in 1916 to 75.18 pesos in 1917. The osts of remission and taxes increased to 12.72 pesos of 18d. per quintal. Net profits in 1917 amounted to 18,760,633.92 pesos of 18d. or £1,407,047 10s., which, added to the fund to provide for interests, dividends, and like charges, of 4,068,310.84 pesos, gives a total amount for distribution of 22,828,944.76 pesos of 19d., that is, £1,712,170 17s. 1d. This fund is dealt with as follows:

	£	s.	d.
To dividends 22, 23, 24, and 25 distributed during 1917	637,500	0	0
To exploitation fund	18,519	3	8
To fund for new works	20,483	1	7
To reserve fund	6,626	8	2
To fund for eventualities	10,000	0	0
To future dividends	850,000	0	0
To amortization funds	164,000	0	0
Gratifications to employees	5,042	3	8
Total	£1,712,170	17	1

Following the foregoing distribution, the capital and reserves of the company stand on the books as follows:

Capital	£425,000
Reserve fund	100,000
Interest and dividend fund	850,000
Fund for new works	153,000
Exploitation fund	93,000
Extraordinary reserve fund	70,000
Fund for eventualities	50,000
Total	£1,741,000

The tunnel Siglo XX arrived by the end of December at the limit fixed by the program drawn up in 1915, having been driven a distance of 857.70 meters during the year 1917, thus completing the tunnel for the length of 8420 meters. The total amount expended in this work was 1,394,364.60 bolivianos.

The stock of ore available in December, 1917, was 261,902.25 metric tons, of an average tin content of 14.33%—that is, 37,544.60 tons of fine tin.

Lead Acetate Substitute in Cyaniding*

By Thomas B. Stevens

The solutions in some cyanide plants require the addition of varying amounts of lead salts in order to maintain their efficiency as solvents of gold. Lead is also required to build up the zinc-lead couple in the extractor boxes so as to insure economical precipitation. The scarcity of lead acetate in Western Australia has caused metallurgists to direct more attention to the use of other compounds of lead. Litharge is an insoluble salt, but it may be dissolved in either caustic alkalis or acids. Caustic alkalis dissolve it to form plumbites ($CaPbO_2$); and a mixture of slaked lime and litharge has been largely used to precipitate soluble sulphides from working cyanide solutions. It is probable that the protective alkali usually present in cyanide solutions is in itself sufficient to cause finely ground litharge to act as a precipitant of soluble sulphides. At some plants an economy is affected by feeding used cupels from the assay office into the tube mills or other parts of the grinding plant; but at mills where concentration is practiced the litharge must be thoroughly dissolved before introduction into the plant circuit.

Solutions of lead in the form of plumbites are useless for the formation of the zinc-lead couple in extractor boxes, because the lead is contained in the positive radical and cannot be replaced by zinc. This may be readily proved in the laboratory by dissolving a little litharge in boiling caustic soda and then immersing zinc shavings in the solution, and it will be found that no deposition of spongy lead will take place. At the present time, for coating zinc shavings, litharge is usually dissolved in nitric acid just prior to use. The operation is easy to perform, and requires no heat; and the use of a steam-jacketed pan, such as is necessary when metallic lead is dissolved, is avoided. An earthenware jar to hold about 5 gal. is all the apparatus required. To make 10 lb. of nitrate, 7 lb. of litharge, ground to as fine a powder as possible, is added gradually to 1603 c.c. of 70% (sp.gr. 1.41) nitric acid which has previously been diluted with 6500 c.c. of water, and the whole is stirred with a wooden stick for about 10 min. I have given the weights and measures in this form, as they are those which are usually most easily available at cyanide plants. The solution warms; and when the reaction is completed any undissolved excess of litharge will readily settle to the bottom. The solution of lead nitrate, which will be neutral to litmus, can be readily decanted off. It is advisable to work with a slight excess of litharge, as it can be left in the bottom of the jar to form part of the next charge, so that the full strength of the nitric acid is utilized. It is also important to dilute the acid with water, as directed, before the addition of the litharge; otherwise some insoluble basic lead nitrate is likely to be formed. To make 100 lb. of lead nitrate, 67.4 lb. of litharge and 38.1 lb. (100%) of nitric acid are required. The small amount of nitrate consumed by Western Australian mines does not make it worth while for the acid manufacturer to install the necessary plant. Lead nitrate $Pb(NO_3)_2$ contains 62.5% of lead, as compared with 54.6% in the acetate ($Pb(C_2H_3O_2)_2$ — $3H_2O$); and, as it is the lead content only which is of use, 9 lb. of the nitrate is approximately equivalent to 10 of the acetate.

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*Excerpt from the Journal of the Chamber of Mines of Western Australia.

The British Columbian Gold Output is showing a serious decline. The value of the metal produced from lode mining in 1917 was $2,367,190, as compared with $4,587,334 in 1916—a decrease of nearly 50%. Placer gold won was valued at $496,000 in 1917, which was $84,500 less than the value of the 1916 output.

Tin Imports Increasing

Imports of tin ore into the United States continue to gain, according to *Commerce Reports*, 3499 long tons appearing in the July figures, as against 1932 tons in July, 1917. The increase is still more apparent from a comparison of the imports for the first seven months of 1918, which were 13,096 long tons, with the same period in 1917, when they were 4797 tons.

Though imports of pig tin during the month of July, amounting to 15,567,667 lb., show a considerable increase over the July, 1917, imports of only 10,348,323 lb., an importation of 88,452,232 lb. during the seven months ended July 31, 1918, shows a decrease as compared with 90,350,360 lb. during the first seven months of 1917. The following comparison of the imports of pig tin is interesting:

IMPORTS OF PIG TIN IN FIRST SEVEN MONTHS OF 1917 AND 1918

Country	January-July, 1917, Lb.	January-July, 1918, Lb.	Increase (+) or Decrease (—), Lb.	Increase or Decrease, %
United Kingdom......	26,044,967	14,215,407	—11,829,560	— 45
China................	4,517,958	3,088,514	— 1,429,444	— 32
Straits Settlements....	33,825,132	41,126,089	+ 7,300,957	+ 22
Dutch East Indies.....	18,522,083	10,750,553	— 7,771,530	— 42
Hongkong............	3,912,530	12,246,347	+ 8,333,817	+213
Australia.............	2,823,904	4,041,414	+ 1,217,510	+ 43
Other countries.......	703,786	2,983,908	+ 2,280,122	+324

The phenomenal increase of 324% in imports of pig tin from countries which have not heretofore been considered of importance as producers of this commodity is almost entirely traceable to increased shipments from Japan, which averaged 500,000 lb. monthly during June and July.

Total tin imports into the United States for the seven months, computing all ores as containing 60% of metal, were 106,053,256 lb., or at the rate of 81,163 long tons per annum, which squares nicely with the recent allocation to this country by the inter-allied tin conference, in London, of 80,000 tons per annum. Almost 17% of the total tin imports during the first seven months of 1918 came in the form of ores.

California Mining Claims

By A. L. H. Street*

Compliance with the California statute requiring notice of location of a lode claim to be posted at the "point of discovery" is essential to a valid location. But the District Court of Appeal of the state holds in the case of Batt *vs.* Stedman, *173 Pacific Reporter, 99*, that where it was proved that notice was posted on a lode where quartz showed, there was sufficient proof of posting at the point of discovery, although claimant previously testified that he posted the notice within 75 ft. of the point of discovery.

Incidentally, the court reaffirms the principle that location notices should be liberally construed in favor of claimants under them, and that their main purpose is to identify with reasonable certainty the land claimed.

Another point decided in the same case is that, in a suit to quiet title to a mining claim as between conflicting claims, the fact that particular land is valuable for placer mining is sufficiently established by proof that a claimant discovered gold therein and has since mined the claim more or less every year, and performed all required assessment work, although there is no proof as to the quantity of gold removed.

The Fourth Liberty Loan

The battlefront in Europe is not the only American front. There is a home front, and our people at home should be as patriotic as our men in uniform in foreign lands. Every American soldier who has fallen in France, every American sailor who has died for his country's cause, has *given* his life for his people. Surely we, their people, can *lend* our money to our nation, their country.

The Fourth Liberty Loan is the fighting loan. Its great success will bring comfort and encouragement and a deep sense of pride to our Army and our Navy, and to our Allies; it will bring discouragement to our enemies. Its success means American victory, Prussian defeat. Now is the time to fight harder.

The Fourth loan is the fighting loan, the soldiers' loan. Buy bonds to the limit.

Saturday, Oct. 12, the day on which this issue is sent to you, is the 426th anniversary of the discovery of America. President Wilson has proclaimed it Liberty Day, and requests the citizens of every community in the United States—city, town and countryside—to celebrate the day. The President, in his proclamation, says:

"Every day the great principles for which we are fighting take fresh hold upon our thought and purposes and make it clearer what the end must be and what we must do to achieve it. We now know more certainly than we ever knew before why free men brought the great Nation and Government we love into existence, because it grows clearer and clearer what supreme service it is to be America's privilege to render to the world."

Celebrate the day by buying a bond.

"The Stars and Stripes," the official newspaper published by the soldiers of the American Expeditionary Forces in France, says editorially about the enemy peace offensive:

"Let the weak-hearted who are dreaming of a compromise; let the pacifists who are talking a peace by agreement; let the side-liners who have had enough of war; let the secretly inclined pro-Germans who think this war should end without a decision—let them one and all know once and for all that for the American Expeditionary Force there is no such word as 'Peace' with the Huns unbeaten. The man who talks of peace today, except through victory, is a traitor."

The enemy peace offensive is likened to the action of German machine-gun crews in the Vesle fighting, when they fought and killed Americans until they were surrounded, then shouted "Kamerad!"

The mothers of the American soldiers in France want the same peace their sons demand. All the courage of the ancient Spartan mother is in the hearts of the women of America.

The object of the Fourth Liberty Loan is to bring that peace—a just peace, a righteous peace, an American peace. Answer the latest Hun peace note by buying another bond.

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The Arkansas Manganese Field

By DWIGHT E. WOODBRIDGE*

The Batesville manganese district in northern Arkansas has recently become prominent as a producer of high-grade manganese ores. Equipment of mines and the construction of ore washeries are rapidly taking place, but in the opinion of the writer there is great need for careful study of conditions before plant and equipment are selected. It is believed the district has a future. Land holders retard development.

THE north Arkansas manganese field has enjoyed more or less publicity this year, but it has been fragmentary; perhaps there is no general apreciation of what it is doing and of its prospects. Opinions differ widely; theorists consider it of no worth; practical engineers, recalling to mind the brown iron districts of the South, and, comparing the difference n value of manganese ore and residual limonites, and also recognizing the essential similarity of ore deposition and methods of mining and concentration, expect uccess; and miners who work skillfully with their hands and heads, rather than with their mouths, make high profits.

Situation and Extent

The district is situated to the north of the city of Batesville, which is a station on the line of the Missouri Pacific between Newport and Joplin, and it is reached direct either by way of St. Louis or from Kansas City. It has the advantage of being nearer Chicago than any of the Western manganese districts. Lying chiefly in Independence County, there are some 150 square miles of the southern Ozark uplift in which manganese occurs in a belt roughly 18 miles long and from six to eight miles wide. Throughout this area it is to be found as a residuum resulting from the decay of certain shales and limestones, wherever conditions were favorable for such decay and the deposition of the ores freed from those rocks. There is close similarity to the districts of central Alabama, northwestern Georgia, and elsewhere in the South where residual deposits of limonites occur.

Early in 1918 attention was drawn to the region, and speculators arrived in large numbers, attracted by the high prices for manganese and the low cost of land. They were naturally from the near-by oil regions of Oklahoma and the zinc district of the Southwest. Among them were operators, and, where there were but two concentrating plants at the beginning of the year, there are now nearly a score either built, building, or practically assured for early erection. But only three of these are at work. The production of the region will not be far from 18,000 tons this year; not much, but a help, especially as most of this is high grade.

The economically important rock succession is, at the base, a hard, close-grained bluish-white lime called Izard. This lies tilted slightly to the south and with comparatively little other evidence of disturbance, although its upper surface is undoubtedly exceedingly irregular on account of decay and erosion. Next is a dark, crystalline lime called Fernvale, and by local miners "gray rock" and often "granite." Above is the Cason shale, so-called. Above this is the St. Clair lime, and yet higher in the succession a chert. These rocks range from Ordovician (Izard) to Carboniferous (chert). The chert has been eroded over much of the area, and it is safe to say that where it remains in place and undisturbed, manganese will not be found below. Most of the St. Clair lime has gone. Throughout the greater portion of that part of the district of economic value the Cason shale and the Fernvale lime have been decayed into a series of siliceous clays, and in these clays is the manganese that has been freed from those rocks and left as a minable residuum. Frequently these clays rest directly on the Izard's pitted and roughened surfaces.

Deposits vary greatly in size. A clear conception of the origin and of the limitations it imposes is needed by the prospector and miner. But, strange to say, this understanding is not general. In consequence failures do, and will, result. It is not safe to say, as some do, that no man can tell what is beyond the end of his pick; neither is it safe to make any definite tonnage estimates, as do others, except after prolonged and scientific prospecting. If land owners appreciated this fact, they would be more just and considerate in the terms they demand, and would offer bona fide miners the opportunity to prove ground before requiring the payment of large sums for purchases of lands.

A recent report on the district by the U. S. Geological Survey had the temerity to state certain definite tonnage figures, although prefixing the estimate by the words "perhaps at least." It would have been as logical, considering the state of the field when this report was made, either to have added a cipher to the estimate or to have subtracted one from it.

Steam Shovels and Washeries Not Always Advisable

There has been a general feeling that steam-shovel mining was the proper thing, and that log washing was suitable everywhere. This idea is thoroughly imbedded in the minds of men who never saw a steam shovel, or would not know a log washer from a clothes horse. In point of fact, there are very few properties in the district sufficiently proved to indicate that steam-shovel mining is proper, while some on which shovels are to be placed are clearly not suited to the procedure, which can result only in failure. The same is true as to methods of concentration. Much of the ore is not suitable for washing in logs, or in anything else, for that matter, and should be mined by the old crude method of the pick and shovel and the manure fork. On the other hand, there are areas that are amenable to washing in logs, to jigging and table work. It is all a matter of individual study, and there is no foot-rule to follow, as many seem to think. That there will be steam shovels and washeries for sale cheap in due time, I have no doubt. And that there will be a few places requiring them, I have faith to believe, also.

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*Mining engineer, Duluth, Minnesota.

Not that there are no other methods of concentration to be tried out in the district; there are—several. One man is now setting up a horizontal trommel, running in water, with which he expects to solve all the problems of concentration. Others are using ordinary jigs from Joplin, but without gates, so that the material passing out through the opening above the hutch is mixed. Others have not enough water, or water under natural flow, for the logs and screens; and there are many other peculiar contrivances of more or less interest. All these things will come out right in time and with experience, I take it. Most of the logs in use or under construction have been brought from the Alabama and Georgia fields, and some are too old and worn to be efficient.

Despite the hindrances of various sorts and despite the fact that much is to be learned, this district has a future. Its chief drawback at this time is the attitude of many of the land owners and speculators, whose policy is reprehensible in that it does not permit due prospecting on the part of those who really intend to mine and produce concentrates in a workmanlike manner and on a business basis.

All ore must be hauled to one of the various railway points, and these hauls vary in length up to eight or nine miles. For this good roads are essential, and there are few good roads yet. However, the cost of hauling is remarkably low, under the circumstances. With the improvement of roads that will come when miners produce more material, and take road betterment into their own hands, and with the advent of truck or traction haulage, the cost of delivery at the station will be cut in two. The region is fortunate in that it has an abundance of excellent road building material everywhere at hand, but the county road funds are necessarily inadequate, while the road overseers are inexcusably incompetent.

A. I. M. E. Meets in Milwaukee

The Institute of Metals division of the American Institute of Mining Engineers and the iron and steel section of the Institute met in Milwaukee, Wis., on Oct. 8, 9 and 10, with the American Foundrymen's Association and the American Malleable Castings Association. Prominent in the program of the non-ferrous sessions was the symposium on tin conservation on Oct. 9, in which representatives of the Government and many of the country's largest firms took part. The public was urged to collect tin for the country's use, to substitute other metals for it where possible, and to discontinue the manufacture of non-essential products that consume tin.

Means were also discussed for increasing the byproducts of coke and the fuel supply in the United States. The statement was made that from certain coals it is now possible to secure nearly 20 gal. of gasoline or motor fuel of the same value per ton of coal mined. Among other things, a new type of coke, known as semi-coke, has been produced, which it is said has proved a satisfactory fuel for all general purposes. The advantages of using coal in pulverized form or of using briquets, or a new fuel known as carbocoal, were discussed, and in several instances statements were made showing that enormous sums have been spent in order to make these substitutes for coal available to the domestic and industrial consumer during the coming winter. The titles of the various papers presented at the non-ferrous sessions during the three days that the convention lasted have already been published on page 508 of the *Journal* of Sept. 14.

A substitute for radium, the world supply of which is only about three ounces of radium element, has been found, according to a statement made at the meeting on Oct. 10 by Dr. Richard B. Moore, of the U. S. Bureau of Mines. Mesothorium is the designation by which it is known, and, according to Dr. Moore, it can be used as efficiently as radium for luminous paint. It can also be used for cancer treatment, although the fact that it has a shorter life makes it much less desirable for this purpose. Paint made luminous with mesothorium will retain this property for four or five years which is as long as is required for cheap watches, push buttons, and like uses, and which will render unnecessary the use of radium for such purposes.

The Southwest Virginia Copper Region

By Marshall Haney*

The Southwest Virginia copper region is in Floyd Carroll, and Grayson counties, in the southwestern portion of the state. It is a noted region, being a part of the eroded Blue Ridge, generally known as the Floyd-Carroll-Grayson plateau. In the early '50s the region was actively worked, and the rich ores were shipped to Baltimore. During the year 1855 eigh mines in this region were shipping ore, shipments during one period of six months amounting to 770 tons averaging 25% copper.

The structure of the vein proves faulting, and the dip varies from 45 to 65°. The rocks on the hanging wall side of the vein are mica schist, cut in place with diorite; those on the foot-wall side are slightly different, being similar to the ocher rocks of the Southern Appalachians. The vein consists of a series of layers of pyrrhotite mixed with micaceous material also stringers of chalcopyrite, and varies in width from 20 ft. to 120 ft. At the Betty Baker mine a drill hole was put down, proving the deposit to a depth of 734 feet

The old mines that were most extensively worked are the Betty Baker, Cranberry, Kirkbridge, Vaughn and Chestnut Ridge. At one time a smeltery was in operation at the Cranberry, and some of the mines had small settlements around them.

This field presents favorable opportunity for rapid development and early production. Practically all the necessary prospecting has been done, and ore can be shipped at an early date and on a small initial investment. In common with many similar rich deposits it has remained idle owing to lack of enterprise, capita and competent management.

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Correspondence and Discussion

Mine Sampling and Mining Method

In the *Journal* of Sept. 21, C. T. R. suggests that examining engineers are too prone to sample an orebody without first having decided upon the method of mining that will be best suited to winning the ore. He expresses his belief that the "method of mining" should be decided upon before sampling begins, as unless the ore can be mined so as to obtain an approach to the grade indicated by the sampling, the results based upon the examination are of doubtful value.

There is no question regarding the importance of the principle expressed in C. T. R.'s suggestion. To convey the same idea in other words, it may be pointed out that an examining engineer should appreciate that the average value of a certain slab of ore in the mine, as indicated by a proper averaging of correct samples of this ore, may be entirely different from the average value of the material which is delivered at the surface as a result of the mining of this same slab of ore.

For example, one may have a fissure vein five feet wide, containing a pay streak with a width varying from 12 in. to 24 in., and an average assay value of, say, $20 per ton. The vein material may break freely from both walls, or it may be frozen to one or both walls. It may be possible to separate the pay streak from the rest of the vein filling on account of a difference in hardness and the use of stripping methods, or it may be utterly impossible to break the vein without a thorough mixing of the valuable and worthless constituents of the vein. Under such conditions it may be necessary not only to decide on the method of mining prior to the determination of the most reliable method of sampling, but, even after the method of mining has been definitely determined, the choice of a proper sampling width may have an influence on the accuracy of the valuation. The sampler may choose to cut samples across all the material which is sure to be broken down in mining the vein, and the sampling width would thus coincide with the stoping width.

The justification for this practice might be the uniform texture and hardness of the entire width of the vein, or perhaps the fact that the material outside the principal pay streak had a certain value too high to permit its classification as waste. The danger might lie in the fact that the different bands of material in the vein were not of the same hardness, a condition likely to result in false assays, due either to salting the sample with too much of the pay streak, or to diluting the sample with too much waste or low-grade material.

The sampler may choose to cut his samples across the pay streak only, assuming that the pay streak is easily distinguished from the remainder of the material. In this case the sampling width and stoping width may differ at each point sampled, and, if the material represented by the sampling width is certain to be diluted by the material outside the pay streak, the valuer may adjust the assay returns of his samples and compute a composite sample, including the proper quantity of waste, and such composite sample may be used in the calculation of the block value.

It is possible that various combinations of the extreme conditions mentioned may obtain in the same mine. Whatever the conditions may be, the important thing is to determine, as accurately as conditions permit, what the average value of the ore reserve is going to be after it has been mined and delivered at the collar of the shaft or the portal of the tunnel.

In reply to C. T. R.'s request for data showing how the grade of ore sent to the mill compared with the grade indicated by the sampling of the stope where different methods of mining were used, perhaps the following case will be of interest: A $15 pay streak in a fissure vein was sampled separately from the remainder of the vein, which was relatively low grade or worthless. The pay streak was usually narrower than the stoping width. For considerable distances the ore could be removed clean, by using stripping methods. In other parts of the mine stripping was impossible, and the vein was broken from wall to wall. Where the ore was stripped, the average grade sent to the mill compared favorably with the grade indicated by the sampling. Where the entire vein was broken down, and all the material known to be waste was picked out and left in the stope, the rest of the material, which was delivered to the mill, ranged in value from $6 to $8 a ton. Where the entire vein was broken, if the samples had been cut from wall to wall, or if a composite sample had been computed, the calculated average return would have compared favorably with the material delivered to the mill, but the property would have been uninteresting on the basis of such an average assay value. HARRY J. WOLF.

Denver, Colo., Sept. 26, 1918.

I cannot entirely agree with C. T. R. in his contribution, "Mine Sampling and Mining Method," which appears in the *Journal* of Sept. 21. In stating that "examining engineers are too prone to sample an orebody without first having decided upon the method of mining that will be best suited to winning the ore," it would appear that the criticism is ill advised, inasmuch as the method of mining in many cases is not predetermined, and is often subject to change even after one method has been attempted. Deciding upon the method of mining is, of course, customary practice, but few operators continue to use the initial method if a more economical one presents itself.

Furthermore, underground conditions and other factors often necessitate a change in mining methods. In either of these cases, that is to say, where the method is to be changed, it would appear from C. T. R.'s statement that a complete re-sampling would be necessary to conform to the new method of mining to be used, which hardly seems a fair inference, particularly if results have been productive under the old method of mining and the new "method of sampling" shows lower assays.

It is not to be expected that one method of mining will produce the same return as another, but it is to be assumed that, if the sampling is properly done in the first place, equivalent values can be obtained in the mining operation. If the method of mining contemplates the removal of ground not included in the area represented by the sampling, it can hardly be said that the sampling is at fault. It would seem that the relation that exists between the "ground removed" and the "ground sampled" is a closer one than that between the "sampling" and the "method of mining."

EDWARD A. THOMPSON.

New York, Sept. 25, 1918.

C. T. R. has exaggerated, in my opinion, the importance of mining method in relation to mine sampling. In the examination of a partly developed mine, the mining method is often obvious, and in sampling the workings a sufficient number of facts can be ascertained by the engineer to indicate how wide the stopes can be made. In the subsequent mining, stope widths may be greatly altered to meet varying conditions. This is usually under the control of the mine captain or superintendent.

New York, Oct. 3, 1918. MINING ENGINEER.

Grinding of Ore in Ball Mills

The discussion of the comparative efficiency of various balls mills, now appearing in the columns of the *Journal*, suggests that the development of the type of grate usually adopted in many mills deserves mention.

In early experiments with ball mills, the grate was constructed with the idea of *screening* the pulp, thus retaining in the body of the mill the unground particles of ore. This procedure was found impracticable other than in exceptional cases, although the actual working of the mill was not understood at the time; and it was not generally realized that, if the pulp had reached the discharge end of the mill without being ground to the required size, nothing would be gained by retaining it there, where no provision exists to crush any more than the normal flow. The size of the grate openings was then increased, and more reliance was placed on the efficient operation of the mechanical classifier, in closed circuit, to sort the discharged pulp and return the unground portion to the feed end of the mill. Successful ball-mill operation is largely dependent on external classification and return of unground product.

Mr. Del Mar remarks that rock is retained in the so-called quick-discharge mill until small enough to issue through the openings. This suggests screening in the mill, which, I venture to think, is impracticable in the simple type of mill under discussion. If any appreciable proportion of the pulp was unground when the screen was reached, an immediate accumulation would result. This is what probably happened in practice, and the difficulty in regulating the feed under these conditions led to the adoption of a grate with coarser holes in mills of this class, so that there would be no difficulty in passing the material that reached the discharge end of the mill, whether ground to the required size or only partly ground. This also permitted an increase in the tonnage in the ball-mill circuit, and tended to decrease the wear in lining to which Mr. Del Mar has alluded.

The importance of outside classification, as a means of bringing back to the feed end of the mill the partly ground ore, was not always realized, with the result that too much was sometimes expected of the machine. Facilities for the reduction of the ore must proportionately increase as reduction proceeds, or the smaller duty in the earlier stages of reduction must be counterbalanced by return feed. In common with all newly adopted apparatus, the ball mill was often expected to perform too much, and work was sometimes thrown upon it that could be more economically performed by a primary crusher. "ORE DRESSER."

New York, Sept. 5, 1918.

The Estimation of Zinc in Zinc Dust

The article by L. A. Wilson on estimating zinc in zinc dust, in the *Journal* of Aug. 24, was of much interest to me, as I have given considerable study to this subject, and to the similar problem of the estimation of metallic aluminum in aluminum dust. The method advocated, depending on the measurement of hydrogen liberated by acid, is similar to one I have occasionally used, and which is described in the *Journal* under dates May 6 and Aug. 12, 1916. The method detailed by Mr. Wilson, however, has the advantage of eliminating the correction for air expelled from the generating flask, and is to that degree an improvement. According to a few tests I have made, it is perfectly applicable to aluminum, at least in fairly coarse particles, if pure concentrated hydrochloric acid be substituted for the 1 to 1 sulphuric acid used in the Wilson process.

I may point out, however, that this process and similar gasometric methods do not really indicate the metallic zinc content of zinc dust, as all other metals which may be present that are capable of dissolving in the acid used, with evolution of hydrogen, will contribute their equivalent of that gas. In determinations for zinc-dust content, the result will be affected by iron, cadmium and, possibly, by aluminum; in tests for aluminum dust, by iron, zinc and, possibly, by copper. For some purposes the error would be negligible, and in some cases the hydrogen equivalent is a real measure of the efficiency of the product for a given purpose, but in using the method it is well to bear this point in mind.

Where a large number of tests have to be made daily, the manipulations and the unavoidable calculations would probably render the method too troublesome. Personally, I should prefer Wahl's ferric sulphate method, using the gasometric process for the purpose of fixing the standard of the permanganate solution on zinc dust of known composition. As Mr. Wilson correctly points out, the ferric sulphate method gives results lower than those calculated from the theoretical equation. The same is true of the analogous method adopted in our laboratory for the estimation of aluminum in aluminum dust, but either process will give extremely satisfactory results if the standard has been fixed as described. J. E. CLENNELL.

Charles Butters & Co., Oakland, Calif., Sept. 10, 1918.

Events and Economics of the War

The peace offensive of the Central Empires was enewed on Oct. 5, when Prince Maximilian of Baden, ewly appointed German Chancellor, proposed immeiate suspension of hostilities to the Reichstag, Austria aving previously attempted a move in the same direc- on through Dutch channels. Germany's request for an rmistice was countered by the President on Oct. 8; he sked that Berlin make its attitude clear. Lens, Armenères and La Basée were evacuated, and the British rew nearer to Lille; St. Quentin was captured by the 'rench, and their lines north of Rheims were advanced ight miles; heavy fighting occurred along the entire ront. In the Balkans, the Bulgarians are said to be ithdrawing from Serbian soil, according to their agree- ient; King Ferdinand has abdicated in favor of Boris, is eldest son. Durazzo, the Austrian naval base in lbania, was destroyed by the Allies. Damascus, the apital of Syria, was captured by the British under eneral Allenby, who so far has taken more than 70,000 risoners in the Palestine campaign. The Turkish abinet has resigned.

Washington announced on Oct. 2 that centralized con- rol of all economic forces of the Allied nations has at ast been effected. The War-Minerals Bill received the 'resident's signature on Oct. 5. Two disasters were hronicled during the week—the torpedoing of the S. S. "Tampa," a former coast guard cutter, off the nglish coast, with the loss of 118 lives, and the destruc- ion of a Government shell-loading plant at South Am- oy, N. J., by explosion on Oct. 5.

Uncovering Enemy Property

At the request of the Alien Property Custodian, A. Iitchell Palmer, the attention of the mining public is alled to that section of the Trading With the Enemy ct which provides that all money or other property eld by, for, or for the account of, or the benefit of, an nemy or the ally of an enemy should be immediately eported to the Alien Property Custodian's office, in Vashington. This refers also to patents, trade-marks, opyrights, prints, labels and designs. In connection ith the last named, the following persons are required o make report to the Alien Property Custodian:

All persons who are in any manner interested in ne use or operation of any enemy-owned patent, trade- ark, copyright, print, label, or design, including joint nventors, where one of the inventors is an enemy within he provisions of the Trading With the Enemy Act.

Assignees of an undivided part or share of an inven- ion, or right to carry on a process or operate under a rade-mark, copyright, print, label or design within nd throughout a specified portion of the United States, hen such patent or process is enemy owned.

Mortgagees and licensees of enemy-owned patents, rade-marks, copyrights, prints, labels or licenses.

The above include guardians, executors and administrators. Any information regarding the enemy interests in any patents, trade-marks, copyrights, prints, labels or designs should be forwarded immediately to Francis P. Garvan, director of the bureau of investigation, Alien Property Custodian's Office, Washington, D. C., even if the information is only gossip or rumor. Oftentimes a clue to important enemy interests is obtained in this way. The money of enemies thus uncovered is invested in Liberty bonds, and is made to fight for the country, instead of against it.

Acid Prices Agreed Upon

The price-fixing committee of the War Industries Board announced on Sept. 26 that, subject to the President's approval, the following maximum prices were agreed upon at a meeting between the manufacturers of sulphuric and nitric acid and the price-fixing committee, held on Sept. 26, these prices taking effect Sept. 30, 1918, and expiring Dec. 30, 1918:

> Sulphuric acid, 60° B., $16 per ton of 2000 lb.; sulphuric acid, 66° B., $25 per ton of 2000 lb.; sulphuric acid, 20% oleum, $28 per ton of 2000 lb. These prices are f.o.b. manufacturers' works in sellers' tank cars. All strengths less than 66° B. are to be calculated from the price for 60° B. All strengths above 66 B. (93.2% H_2SO_4) are to be calculated from the price for 66° B. In carboys, in carload lots, ½c. per lb. extra. In carboys, in less than carload lots, ¾c. per lb. extra. In drums, any quantity, ½c. per lb. extra.
>
> Nitric acid, 42° B., 8½c. per lb., f.o.b. manufacturers' works in carboys. In carboys in less than carload lots ½c. per lb. extra. There shall be no additional mixing charge for mixed acids, same being figured on the acidity content.

The above ruling was changed by the board on Oct. 4, when it made the following announcement:

> The price-fixing committee of the War Industries Board wishes to modify its ruling Sept. 26, so as to read "The maximum prices for acid below 92% H_2SO_4 shall be figured on the price for 60° B. sulphuric acid, and above 92% H_2SO_4 on the basis of 66° B. sulphuric acid."

Influenza Must Be Stamped Out

Appropriation by Congress of $1,000,000 to enable the U. S. Public Health Service to help combat influenza indicates how serious the present epidemic may become if it is not speedily put down, says *Engineering News-Record.* Engineers and contractors responsible for groups of men, large or small, should inform themselves immediately as to both precautionary and combative measures, which they can readily do by appealing to their local or state health authorities or to the U. S. Public Health Service. In some localities engineers may need to inquire whether their local health authorities are alive to the situation. At this crucial moment our armies and our war industries must not be crippled through any lack of ordinary, or, if need be, extraordinary, health precautions. A duty rests on each individual, as to himself, his immediate associates and his community.

Copper Imports Ruling Changed

The War Trade Board ruling affecting the importation of copper ore has been modified to permit the importation of copper concentrates containing 50% or over of copper from non-enemy countries, instead of 60% or over, as in the former ruling. The previous restriction prohibiting the importation of ore, except from Cuba, Canada, or Mexico, and of copper concentrates containing less than 50% of copper, except from the above countries, remains in force. There is no restriction upon the importation from any non-enemy country of copper matte, blister copper, or copper concentrates containing 50% or more of copper.

Garfield Starts Coal Drive

To avert a coal famine this winter and meet all the needs of the war program, Fuel Administrator Garfield launched a drive on Sept. 30 for coal production to continue until Apr. 1. In a proclamation Dr. Garfield calls upon operators and miners to produce 12,234,000 tons of bituminous coal and 2,030,000 tons of anthracite every week. This tonnage, he promises, will give the country all the coal needed this winter. It represents a weekly increase of 1,731,000 tons of bituminous and 121,000 tons of anthracite over the weekly production averages of the corresponding period of a year ago.

The increase in bituminous production called for is approximately 16½% and that in anthracite, 6⅓%. It will be seen that the more urgent demand is for the speeding up of bituminous production.

Would Confiscate German Profits

The enactment of a law by Congress to confiscate the German-owned industrial plants in the United States at the end of the war, as well as the profits earned by them, was urged by A. Mitchell Palmer, Alien Property Custodian, in a Liberty Loan address in Baltimore, Md., recently.

"I would divorce utterly and forever all German capital from American industry," said Mr. Palmer. "I have watched these great enemy corporations under my management earn enormous profits, growing out of the very war conditions for which their owners and their owners' friends in Germany are directly responsible, and I face the possibility of piling up these inordinate profits for distribution after the war to the very persons to whom under the circumstances it would be unmoral and unconscionable for them to go. The Government finds itself with a large organization at its own expense preserving property which was placed here originally as a hostile act, looking to the conquest of America."

After the War

Conditions after the war are discussed in a recent issue of *Financial America* by A. Barton Hepburn, chairman of the advisory board of the Chase National Bank, of New York. This may be done with safety now, according to Mr. Hepburn, because none of the nations now neutral would be a deciding factor should they join either side.

"When peace comes the work in all plants making guns, munitions or essential war goods of any kind will stop," says Mr. Hepburn. "The labor thus engaged will be thrown out of employment, and at a time when the high cost of living will be at the peak. The Government will cancel all contracts for the manufacture of war material, as it has a right to do. The manufacturers will, by the terms of their contracts, have a claim upon the Government because of such cancellations. They will have a claim not only by the terms of their bargain with the Government, but morally and equitably as well. Claims against the Government are proverbially slow in adjustment. In order to prevent such manufacturing concerns from going into bankruptcy, and in order to enable them to shift their line of manufacturing and seek new markets, in order to prevent the non-employment of labor at a crucial time, and in order to prevent a general business cataclysm, the Government should now prepare for that eventuality which is sure to come and be prepared speedily to adjust all contracts.

"In the light of this war's experience, there should be a revison of our tariff laws, our economic laws, especially with reference to credit, currency and banking, and our laws with reference to transportation both on land and sea."

Norway's Iron Industry Lags

Of a total of 191,500,000 crowns invested in new enterprises in Norway in 1917, according to a consular report, 10,150,000 crowns was invested in coal mines; 36,367,000 in the metal industry and mechanical works; 16,232,000 in metallurgy; 25,171,000 in chemical industries; and 5,500,000 crowns in the mining industry. One crown equals $0.268 at the normal rate of exchange. At the end of 1916, less than 67,000,000 crowns was invested in metal industries and mechanical works, so that in 1917 the capital increased 54%. Compared with these figures, the interest shown in the iron industry is not great, which has caused some concern and is being considered by a special committee.

Roads Operated Economically

Railroads under common management this year have hauled approximately the same amount of freight as last year, with less actual train movement, owing to rerouting and fuller loading of cars. This was shown in the Railroad Administration report on freight-train operation for the year up to June 1.

In the five months' period, the number of tons of freight hauled one mile was 154,000,000,000, as compared with 155,000,000,000 last year. The apparent reduction this year was caused partly by new methods of reporting. Reports showed the number of miles traveled by loaded freight cars, considering the movement of one car one mile as a unit, was 5,903,000,000, as compared with 6,456,000,000 last year. The hauling of empty freight cars was cut down 44,000,000 car miles.

Railroads had 30,791 locomotives in service on June 1, as compared with 30,321 a year before. This was in addition to 4555 locomotives awaiting repairs in shops. There were 2,418,000 freight cars in service, or 130,000 more than last year. A tendency to reduce the miles covered by trains in a day also was reflected in the administration's report.

Industrial News from Washington

By Paul Wooton, Special Correspondent

War-Minerals Bill Signed

The War-Minerals Bill was signed by President Wilson on Oct. 5. Thus, after more than a year of effort, a measure of Governmental control over certain minerals has been obtained. The signature which made the bill a law was affixed in the President's private study in the White House, in the presence of Senators Henderson and Walsh and the correspondent of the *Engineering and Mining Journal.* As he wrote his name the President said: "I am very glad indeed to sign this bill." Senators Henderson and Walsh took advantage of the opportunity to call the President's attention to the seriousness of the gold situation. The President was well informed on the subject, and several minutes were spent in discussing it.

To Control Price of Pig Tin

The Inter-Allied Tin Executive, which will carry out the terms and agreements of the Inter-Allied Pig Tin Pool recently arranged in London, will control the buying price of pig tin in each producing market, it is announced by the War Industries Board. The latter board will control the prices and terms under which the pig tin is to be sold to the domestic users and dealers.

Preliminary to the issuance of licenses to the users and dealers in pig tin, an inventory of stocks on hand and contracts unfilled by the 2000-odd individuals and plants affected is being made by the tin section of the War Industries Board. If necessary, there will be a redistribution of the stocks on hand to equalize them according to essential uses. Other details of the tin-control plan have already been announced in the *Journal* of Sept. 21 and of Sept. 28.

Mexican Mineral Statistics

According to data compiled by the Department of Industry, Commerce and Labor of Mexico for the year 1917, the production of Mexican mines was as follows: Gold, 5788 kilos; silver, 648,684; copper, 141,528; lead, 26,769; zinc, 3388 and antimony, 2140 kilos. The following data have also been published:

There are in Mexico 25,063 mining properties, totaling 330,641 pertenencias. The gold and silver mines are most numerous, numbering 9840. Silver mines number 5804; lead and silver, 4281; and gold 1800. One mine produces jacinth; nine mines produce opals; one mine produces bismuth; two properties produce rock salt; 53, sulphur; 39, manganese; two, molybdenum; one mine produces fluorspar and 119 mines produce mercury.

The State of Mexico occupied the first place in gold production in the last year, having produced 2124 kilos 737 grams of the metal; Hidalgo was next, with 1855 kilos; and, though in former times it was famous for its output of gold-bearing ores, Guanajuato produced only 9 kilos of gold. Hidalgo took first place in the production of silver, with 336,160 kilos in 1917; Aguascalientes is next, with 103,252 kilos.

In the production of lead the State of Nuevo Leon occupied first place, with 11,308 kilos, Durango following, with 6099 kilos. Zacatecas produced zinc in 1917 to the extent of 3888 kilos, and San Luis Potosi was the highest producer of antimony for the same year, with an output of 2140 kilos.

Chromite Output Meets Needs

The stimulation of domestic production of chromite, which was undertaken in order to provide domestic supplies to take the place of ores hitherto imported and which were cut off in order to save shipping for military purposes, has been successful beyond all expectation, and has demonstrated that there are abundant supplies of chromite in the United States, and that this country would be self-sufficient for several years in this respect, if need should arise. At the same time, measures for conserving chromite that were undertaken with great energy have likewise met with success, with the result that the estimated requirements of this mineral for 1919 fall short of those estimated for 1918. This stimulation is the result of campaigns carried on jointly by the Government departments, including the War Industries Board, the Shipping Board, and the Department of the Interior, and the commercial interests involved.

There is now no shortage whatever of chromite, and the question of the future market has begun to absorb the attention of domestic producers. The matter has been taken up vigorously by the Government departments interested and by consumers of chromite, with the purpose of securing the most satisfactory adjustment possible. As a result of conferences in Washington, the following announcement has been made by the War Industries Board in a telegram sent to San Francisco to Albert Burch, of the U. S. Bureau of Mines, who represented the Bureau in the conferences:

> It may be announced that it is the present intention of the War Industries Board to arrange for continued chromite production in the United States for the first half of 1919 at a rate proportionate to the 1918 production, and the trade will be asked to purchase chromite produced in the United States during the first half of the next year at this rate.

The industry on the Pacific Coast developed rapidly during the last summer, and the erection of concentrating plants and the building of roads assure a more economical production.

Remelters of secondary aluminum conferred recently with Pope Yeatman, the head of the non-ferrous section of the War Industries Board. They were unable to agree whether or not it is best to have a price fixed on their product. It was decided to appoint a war service committee to represent the industry and to report later to Mr. Yeatman. The latter has sent a questionnaire to the remelters and to dealers, which asks as to the volume and character of their business.

Help Wanted

Save your breath and help win the war! We are saving almost everything else; let us start in on the air. More action is wanted and less words—more givers to the Comfort Fund for the 27th Engineers. Send in your check and feel the *esprit de corps* trickle down your spine. There is a mining regiment on the map, and that map is France. Never heard of it and the Comfort Fund, you say, or else you'd have come through before? Your check will be ample apology. He gives twice who gives quickly.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$14,436.50
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	16.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Siebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marion J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61
H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	10.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	25.00
Richard McCarthy	100.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
A. F. Taggart	10.00
G. E. Farish	25.00
H. K. Sherry	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
F. M. Arnold	10.00
W. A. Wolf	5.00
Employees of Utah Leasing Co., Newhouse, Utah	20.50
Employees of Braden Copper Co.	112.50
Charles A. Mitke (second contribution)	10.00
G. M. Colvocoresses	25.00
Charles Le Vasseur (monthly)	5.00
A. H. Wethey	25.00
S. Ford Eaton	25.00
H. H. Hunner	5.00
N. G. Thomson	25.00
Members of the A.I.M.E. meeting in Colorado Springs, Sept. 4, 1918	215.00
Glen Miles	25.00
J. B. Wilmarth	25.00
Frederick MacCoy	5.00
Balance of a certain Joplin contribution received through Lieut.-Col. Gilmore	590.36
H. V. Croll	5.00
American Zinc Institute	1000.00
Thomas H. Leggett	15.00
W. F. Pope	10.00
Earl B. Crane	5.00
Hiram D. McCaskey	10.00
E. F. Salisbury	10.00
W. P. Ross	5.00
Edwin E. Chase	10.00
"Gum Tree," check for £20	94.80
Alex G. Keiller	10.00
H. Sontag	5.00
Total	$18,492.77

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Chronology of Mining, September, 1918

Sept. 1—Opening day of American Institute of Mining Engineers' meeting at Denver, Colo.—Mining and industrial machinery exempted from import duty in Mexico.

Sept. 2—War-Minerals Bill reported to the Senate.

Sept. 3—John D. Ryan resigned as president and director of the Anaconda Copper Mining Co., for the period of the war, to become Director of Air Service—Benedict C. Crowell, First Assistant Secretary of War, appointed Director of Munitions.

Sept. 5—International Gold Conference at Spokane, Washington.

Sept. 9—New list of preferred industries issued—Sale of gold, excepting to those holding priority orders, forbidden by the Director of the Mint.

Sept. 11—War-Minerals Bill passed by the Senate.

Sept. 12—Registration day for selective draft—Orenstein-Arthur Koppel Co. plant sold to Pressed Steel Car Company.

Sept. 16—Opening day of seventh annual meeting of National Safety Council at St. Louis, Missouri.

Sept. 17—First furnace of Anaconda's ferromanganese plant put in operation.

Sept. 18—Conference on iron and steel prices between general steel committee and War Industries Board at Washington.

Sept. 23—Opening day of Fourth National Exposition of Chemical Industries at Grand Central Palace, New York.

Sept. 24—Eight-hour day adopted by U. S. Steel Corporation, effective Oct. 1.

Sept. 28—Opening of Fourth Liberty Loan campaign.

Sept. 30—Regulations for licensing platinum issued.

Government To Make Sulphuric Acid

The Government will build and operate a sulphuric acid plant at Emporium, Penn., and another at Mount Union. The cost of the plants will aggregate $3,000,000. The Emporium plant will consist of eight units on a site selected on Driftwood Creek, close to the plants of the Aetna Explosives Co. and the Emporium Iron Co. In the event that sufficient power cannot be obtained from the plant of the iron company, a 1000-kw. power plant will be erected. The estimated cost of this plant is $2,000,000.

The Mount Union plant will be erected adjacent to the plant of the Aetna Explosives Co. Twenty acres of land has been purchased at $56 an acre. The contract has been awarded to the Leonard Construction Co. Preparation of all plans and specifications, in addition to the supervision of the work, will be under the direction of the construction division of the Ordnance Department.

Special Mining Industry Committee for the Liberty Loan

The names of the members of the special Mining Industry Committee for the Fourth Liberty Loan and the list of subscriptions received by them up to Oct. 1 were published in the *Journal* of Oct. 5. The total amount reported was $8,336,600. Since then the following subscriptions have been received up to and including Oct. 8, bringing the total to $22,042,850, or about 55% of the committee's quota of $40,000,000:

Kennecott Copper Corporation	$1,000,000
Canada Copper Corporation, Ltd	25,000
Willard S. Morse	15,000
Employees, United Metals Selling Co	13,700
C. L. Constant Co	10,000
Sidney J. Jennings	1,000
Justice Grugan	500
Homer L. Carr	500
Utah Copper Co	3,000,000
Nevada Consolidated Copper Co	1,000,000
Ray Consolidated Copper Co	1,000,000
Chino Copper Co	1,000.000
Butte Copper and Zinc Co	300,000
Cleveland H. Dodge	250.000
Howe Sound Co	200,000
El Potosi Mining Co	200,000
Utah Southern Mining Co	5,000
Benjamin B. Lawrence	1,000
Walter Douglas	30,000
Archer E. Wheeler	4,000
William Braden	25,000
N. Y. & Honduras Rosario Mining Co	100,000
Copper Canyon Mining Co	10.000
Robert E. Safford	1,000
Donald C. Brown	2,000
John Hays Hammond	25,000
W. B. Devereaux	2,000
Lewis N. Kramer	50,000
Robert Mulford	1,200
Pierce & Skogmark	4,000
John C. Montgomery	500
J. R. DeLamar	500,000
Guanajuato Consolidated Mining and Milling Co	5,000
Michigan Copper Mining Co	50,000
Wolverine Copper Mining Co	60,000
Mohawk Mining Co	150,000
Butte & Superior Mining Co	500,000
International Nickel Co	1,000,000
Ruhm Phosphate Mining Co	10,000
Metals Trading Corporation	200,000
Felix A. Vogel	5,000
Florence Iron Co	10,000
Bates Iron Co	10.000
Mrs. Sophie Bondy	1,000
Yukon Gold Co	50,000
Yukon Alaska Trust	100.000
R. M. Atwater, Jr	1,000
A. O. Schoonmaker & Co	2,000
A. D. Mackay	500
Lawrence Addicks	3,500
Rowland W. Cox	1,000
American Cyanamid Co	350.000
American Trona Co	60,000
T. H. France	1,000
Two anonymous subscribers	526,000
Tonopah Extension Mining Co.	50,000
Consolidated Interstate Callahan Mining Co.	50,000
Miss McMillan	500
St. Lawrence Pyrites Co.	5,000
New Jersey Zinc Co. (additional)	69,000
Guggenheim Brothers	1,000,000
Adolph Lewisohn & Sons (additional)	550,000
Consolidated Copper Mines Co.	70,000
Butte & Ely Copper Co.	30,000
Empire Smelting Co.	5,000
G. L. Carlisle, Jr.	3,000
Ten subscriptions of less than $500 each	1,350
Total previously reported	8,336,600
Grand Total to Oct. 8	$22,042,850

The committee covers the following classifications: Assayers and refiners; metals; mica; mining agents and brokers; mining companies; mining engineers; minerals; smelters; zinc.

Imperial Mineral Resources Bureau

At the imperial war conference last year it was agreed that it was desirable to take steps to set up an imperial mineral resources bureau, says *Iron and Coal Tr. Rev.*, which should be charged with the duties of collecting information from the appropriate departments of the governments concerned, and from other sources, regarding the mineral resources and metal requirements of the empire; and of advising from time to time what action, if any, may appear to be desirable to enable such resources to be developed and made available to meet the metal requirements of the empire. Accordingly a special committee, under the chairmanship of Sir James Stevenson, was appointed to examine this proposal and to report upon the duties and administrative responsibilities of the proposed bureau. The committee defined the duties of the bureau as follows:

1. To Collect, coördinate and disseminate information as to resources, production, treatment, consumption, and requirements of every mineral and metal of economic value.
2. To ascertain the scope of the existing agencies, with a view ultimately to avoid any unnecessary overlapping that may prevail.
3. To devise means whereby the existing agencies can, if necessary, be assisted and improved in the accomplishment of their respective tasks.
4. To supplement those agencies, if necessary, in order to obtain any information not now collected which may be required for the purposes of the bureau.
5. To advise on the development of the mineral resources of the empire or of particular parts thereof, in order that such resources may be made available for imperial defense or industry.

After consideration of the report of this committee, the government instructed the Minister of Reconstruction, in consultation with the Secretaries of State for the Colonies and India, to take the necessary action to give effect to the recommendations of the imperial conference and the findings of the committee. Detailed proposals were accordingly submitted to the Dominion and Indian governments, who nominated their representatives on the governing body of the bureau, and the general scheme of the bureau has now been finally ratified by the imperial conference.

The bureau will be incorporated by royal charter, and the governing body, which will be under the presidency of the Lord President of the Council, will consist of the following gentlemen:

Sir Richard Redmayne, chairman; Dr. Willet G. Miller (nominated by the Canadian government); W. S. Robinson (nominated by Australia); Thomas Hutchinson Hamer, of the High Commissioner's Office (nominated by New Zealand); W. P. Schreiner (nominated by South Africa); Lord Morris (nominated by Newfoundland); R. D. Oldham (nominated by India); and J. W. Evans (nominated by the Secretary of State for the Colonies).

The following were named by the Minister of Reconstruction, in consultation with the Institution of Mining and Metallurgy, the Institute of Metals, the Iron and Steel Institute, and the Institution of Mining Engineers: W. Forster Brown; Prof. H. C. Carpenter, president of the Institute of Metals; Dr. F. H. Hatch, member of mineral resources advisory committee of the Imperial Institute; Sir Lionel Phillips, lately director of the mineral resources development department, Ministry of Munitions; Edgar Taylor, ex-president of the Institute of Mining and Metallurgy; and Wallace Thorneycroft, president of the Institution of Mining Engineers.

Arnold D. McNair has been appointed secretary, and to him all communications regarding the bureau should be addressed, at the Imperial Mineral Resources Bureau, Holborn Viaduct Hotel, London, E. C., England.

Colorado Mining Districts—In 35 counties of Colorado, according to the U. S. Geological Survey, there are more than 132 mining districts. In five the predominant metal is unknown, in one zinc is the most important product; in one iron, in eight rare metals, in 60 gold, in 21 silver, in 20 copper, and in 16 lead.

Editorials

What After the War?

THE Great War is drawing toward its close; and a victorious close it will be. Every kind and honest heart is rejoicing that the suffering of Europe's people will not be prolonged much further. But with the prospect of peace within a year, our thoughts are bound to turn to the changes in economic conditions that are impending. The problem is so confused and complex that there is no one who is able clearly to forecast events. The best minds are almost as much in the dark as they were in August, 1914. We say "almost" rather than "quite," for without any doubt we have learned during the last four years to think more broadly and with better knowledge of fundamental factors than we used to.

We can see, for example, that the great underlying factor is labor. We have suffered from shortages of material, and concomitantly high prices, owing to lack of men enough to get it out of nature's stores; nor have we had sufficient time to provide adequate mechanical power to replace the deficit of man-power. We could not make the necessary war material and at the same time manufacture the former supply of peaceful material, and therefore we have had to forego the latter. Not only have we had to deprive ourselves of many very desirable things, but, also, we have had to deplete the stocks in warehouses and retail stores. When the War Industries Board boasts of saving leather, rubber and paint by reducing the number of sizes and shades that may be manufactured, it does not mean that it saves any consumption of those things, but simply that it reduces the stock that dealers previously had to carry. As soon as dealers can obtain supplies freely again, they will naturally stock up, and there will furthermore be a great demand for and consumption of all things for delayed work. Similar conditions will exist in Europe, besides which there will be the immense demand for material for reconstruction in devastated areas. These premises, which appear reasonably safe, indicate a strong demand for raw materials, and especially the metals.

But it does not follow that such a demand will develop immediately upon the coming of peace. On the contrary, we must inevitably contemplate a period of readjustment, and much will depend upon how things are handled during that period. The governments will undoubtedly possess large reserves of metals at the termination of the war. Will they resell those supplies, or will they reserve them for national use in reconstructions and improvements? How long will it take private contractors who have converted their machine shops into shell factories to get back to their ordinary industrial basis? What is going to become of the swollen, congested populations of Bridgeport and similar places when their present occupation ceases abruptly? It is easy to foresee that such necessary changes will produce dislocations that will curtail temporarily the consumption of raw materials. Manifestly such dislocations will be irregular.

We are not among those who look for the arrogance of labor to continue unabated. Labor supply will continue to be short, considering the broad needs of the world, but there will no longer be the pressing need of granting labor's every demand lest the great cause be jeopardized. We shall continue to build ships, locomotives and other things in great quantities, but when on a commercial basis, and when time is not so vital, the employer may talk more upholdingly to his men, and the day will come when 15 will not have to be hired to do the work of 10. This will in itself ease the labor supply, as will the migration of thousands from the munition factories. Even if basic commodity prices undergo no alteration, there is a large lost-motion between the increase in the cost of living, measured by the factor of about 1.5, and the increase in the rate of wages, measured by the factor of about 2. In other words, wages should go down faster than commodity prices. We may look, moreover, for the abolition of Governmental price-fixing to let play once more natural factors that will be salutary.

Many changes of these kinds will institute themselves before the troops begin to come home. Their return will introduce new conditions that as yet nobody can well forecast. It is certain that many of these men will have experienced such alterations of habit and thought during their life in the field and in the trenches that they will not be willing to return to their former occupations. They will be far more used to mechanical work, and their whole outlook upon life will have been changed. In such ways did the men of this country become different after the Civil War. Who will venture to prognosticate what the veterans of the Great War will do?

But there seems to us to be a fundamental, far-reaching economic condition ahead of us that will eventually dominate everything else, and that is the net loss of man-power. The world will have more work than ever to do and will have fewer men to do it with. Every country of Europe and North America will be staggering under a tremendous load of debt; some more than others. How are they going to carry and discharge those loads except by increasing the efficiency of their depleted man-power by means of mechanical power? For examples, imagine the national electrification of Great Britain and the more extensive use of hydroelectric power in the United States, which would release men from the collieries, from transportation, and so on down the line, and set them free to build houses, to make machinery for Siberia and China, etc. Whence would come the capital for such colossal undertakings? By national provision. It is hardly conceivable that nations that have been spending many billions annually in destruction would boggle over a few billions for construction.

Thoughts of this nature cause us to be optimistic respecting the position of the metals after the war, barring the probabilty of a depression, perhaps a sharp one, during the period of readjustment. All of the metals should be regarded favorably in this view, but not all just alike. Copper is probably in the best position, for the reason that natural demand has been most severely repressed during the last year, and lead probably stands next to copper, for a similar reason. Iron and steel may be slower in responding, and zinc is likely to lag last. Indeed, the zinc producers will probably have to do something to promote their market. So long as we are unwilling to let gold go to the Orient, and until we can exchange goods freely with that quarter of the world, silver ought to keep high.

Chilean Nitrate Technology

THE importance of the Chilean nitrate industry, from the point of view of the United States as well as of Chile, is indicated by the volume of the imports of the salt into this country since the outbreak of the Great War. The urgent need of nitrate for the manufacture of munitions has been evident; and Chilean natural resources have been drawn upon as far as stocks and available shipping permitted.

The plants which are under construction in the South for the production of synthetic nitrate are now nearing completion; and, as soon as they are producing, the country will be independent of foreign supplies. This latter fact will be patent to all who realize that the production of nitrate from the air has passed the experimental stage. Germany is reported to have manufactured 1,600,000 tons of nitrogen products by synthetic processes during 1917; and recent events have shown that what German chemists can do well American chemists can do better.

In the meantime there is increased activity among chemical engineers interested in the Chilean deposits; and the imminence of the output of the synthetic product in the United States has stimulated research in an effort to formulate more efficient and more economical methods of treatment of the caliche, or nitrate-bearing rock, which is found in such large quantities in the southern republic.

A few months ago we published an account of the Gibbs process—an entirely new method of treatment, which, although evolved in English laboratories, has utilized, in its fundamental features, apparatus invented and manufactured in America.

An extensive amount of experimentation is under way in various oficinas, and the American revolving drum filter may also become standard apparatus in some phase of one or more of the new schemes of treatment under consideration. The results of these efforts must be a general improvement in the extraction; and the retreatment of many of the dumps of residue, some of which contain a considerable percentage of nitrate, may be feasible. An alternative and more successful scheme of treatment will inevitably involve consideration of the practicability of operating with higher tonnage in each individual plant; and various economies would result from the centralization of effort in those districts where important deposits are contiguous. New and improved methods of beneficiation will insure lower costs; and this will lead to the treatment of large tonnages of low-grade material now considered unprofitable, and not included among payable reserves.

There has been a remarkable analogy between the recent history of Chilean nitrate treatment and the metallurgy of gold. In both cases the bugbear was slime at first, on account of the difficulty of effectively removing the water-dissolved nitrate in the one case, and the cyanide-dissolved gold in the other. The chemical engineers of the nitrate pampa evaded the problem. Caliche was collected by expensive methods of handling, which insured that the minimum amount of fine material, often exceedingly rich in nitrate, was rejected in the first instance as untreatable. The slime, or "borra," as it is called, liberated during crushing, was then a considerable source of loss. The crude method of leaching adopted involved a high absorption and retention of rich nitrate solution by the "borra," whereas a proportion of the rock material, being insufficiently ground, was sent to the dump containing unleached crystals. Under these conditions, efficient sampling was almost impossible without an inordinate expense, as the "borra" was discharged in a sloppy condition, and in amount difficult to determine. The coarser product from the leaching vats consisted of material of varying sizes and widely varying nitrate content, so that it was difficult to obtain a true average sample.

The correctness of the final calculations as to the net result of operations at many oficinas was nullified by the fact that the estimate of nitrate in discharged residue was based on determinations of samples which could only be representative by the merest fluke. This being the case, it was often considered a work of supererogation to follow exact methods for computing nitrate content in the final samples, when it was obvious that the samples themselves were not truly representative. The general result was that there was a tendency toward approximations rather than more exact estimates; and technological progress was, therefore, adversely affected.

The cyanide process encountered much the same drawbacks, but all these were speedily overcome; and the treatment of slime has been mechanically perfected to the degree that finely ground, or naturally fine material, is no longer troublesome.

Both industries had their special problems, so that it is, perhaps, not entirely fair to make comparisons, but it is permissible to say that the success attending the combination of chemical, metallurgical, and mechanical improvements in the cyanide process has resulted in what may justly be termed amazing results. These are due in no small measure to the fact that efficient sampling is feasible by simple and inexpensive methods; and that assaying, as carried out in daily routine work, is as nearly accurate as it is possible to conceive. The result is that the brief history of the comparatively new industry is largely an account of difficulties overcome, and of new apparatus invented and perfected to simplify operations and to insure efficient and consistent results.

One instance aptly illustrates the perfection to which modern wet methods of ore treatment may be carried in the gold-mining industry; and we quote from a report of operations at a well-known plant this year indicating an actual recovery by cyanidation, in bullion form, of nearly 93% of gold from an ore after amalgamation treatment carrying 0.00021%. After cyanidation the residue contained only 0.000015% of the precious metal.

The research and invention of cyanide engineers has benefited a wide circle of technical workers. Apparatus primarily designed for cyanidation work is in extensive operation in the chemical industry. Automatic filters have been adopted for use in a number of plants unconnected in any way with the industry for which they were originally designed. What was known only a few years ago as typical cyanide plant equipment is now being utilized to recover nitrate from Chilean caliche.

In addition to the adoption of such apparatus, it is interesting to note that intensive research in connection with the estimation of nitrate in caliche and other products is being carried on by a metallurgical chemist—J. E. Clennell—whose treatise "The Chemistry of Cyanide Solutions" is the most exhaustive and at the same time the most informative textbook published on the subject. What is more, it is safe to say that it is unlikely to be superseded by any other similar publication. Few other technical authors deserve such a monopoly. In this issue we print an article by Mr. Clennell on "Determination of Nitrate in Caliche and Its Products," which indicates the same thoroughness and is presented with the same clarity of expression which characterized his contributions to the technology of gold and silver.

We feel sure that the results of his work will be beneficial to the Chilean nitrate industry, and we welcome his contribution as a further evidence of the fact that a successful research chemist can effectually diversify his experimentation.

Progress in Lead Smelting

THE article by C. T. Rice in this issue is of special interest to metallurgists who have kept in touch with the development of lead-smelting plants. There is a great difference between the Grant smeltery, which was in operation a quarter of a century ago, and the Idaho smeltery described. Roasting was performed at the Grant installation in hand roasting furnaces, to which were attached fusion boxes. The semi-fused roasted ore was scraped into conical pots and allowed to cool, and then broken up for the charge for the blast furnace. All the charge was handled in small hand buggies, which were wheeled up to the throat of the furnace and their contents tipped in. The charging floor was a busy place, thoroughly filled with thick fumes and sulphur smoke. One left the plant with the thought that although the work was well systematized, a relatively large amount of muscular effort was needed in smelting operations.

We recall the growth in the size of the blast furnace, the introduction of mechanical charging apparatus, the gradual disappearance of the Brückner roasting cylinders, the introduction of Huntington-Heberlein blast roasting, and the replacement of blast roasting by the Dwight & Lloyd sintering machines. In the last 18 years, the lead smeltery has been perfected until we may compare the modern plant to a machine the parts of which have been correlated and the whole of which moves surely and in synchronism. Manual labor has been greatly reduced, and what is necessary requires less exertion than was needed in the older works. As in the case of modern copper smelting, good mechanical engineering ability, coupled with experience in metallurgical practice, is responsible for the result.

The War-Minerals Bill

THE War-Minerals Bill, which has been under consideration for nearly a year, was signed by the President last week and is now a law. The delay has been immaterial, for the conditions in those minerals whereof there were shortages that it was sought to correct have steadily improved without any Governmental interference. Indeed, the experience of the last six months has proved that no legislation of this kind was necessary, and probably the authorization that has just been given to the Executive will not be used to any great extent, anyhow.

The bill that was introduced in the Senate by Senator Henderson was a great improvement upon that which had previously been passed by the House. Certain amendments that were made on the floor of the Senate, however, did much to muss it up. One of these forbids reselling by the Government at anything less than the purchase price or cost of production. The other limits salaries to the rates commonly paid in the executive departments. The idea of an ordinary executive department going into the markets, inflated as they are at present, to buy ores with the restriction that they may not sell at less than cost provokes a smile. The guiding principle of "safety first" would indicate that the only safety in these circumstances would be not to buy or contract for anything.

BY THE WAY

The following parable is reprinted from the *Wall Street Journal:*

> Now it came to pass in the latter days that William the Butcher made war upon civilization. Then Woodrow, ruler of Columbia, summoned his exchequer, called Congress, and said: "Behold, war is here. See to it that I have the sinews. Make sequins as plentiful as the sands of the sea." Then Congress looked abroad upon the land and saw a beautiful grove of palms, and the owner was called Industry. Then Congress said: "Here is where I get the sequins," and he laid upon Industry a tax equal to almost half the product of the grove. Then Industry bowed his face to the ground and said: "Allah be with thee. If Columbia needs it, take all. Yet peradventure the need may be supplied without my ruin. As the fruit ripens I will take it to the market and offer it to those who buy. Do thou be there and exact a moiety from each purchaser, which none will feel and the aggregate will be more than is demanded of me."
>
> But Congress said: "Not so. There is a quicker way."
>
> Then he hewed down all the trees, and plucked therefrom so many of the dates as he thought were necessary, and more for good measure. Then said the wise man of the village, called Economist: "How long, think ye, this war will last?" "I know not," answered Congress, "but peradventure it may take years." "And will you come for more sequins?" "Yea, twice every year," replied Congress. "Thou hast cut down the trees," answered Economist, "how then canst gather more fruit?"
>
> "Besmillah take me," yelled Congress, "I never thought of that."

Personals

Have You Contributed to the Association the 27th Engineers?

E. Maltby Shipp has been examining mica operties in New Hampshire.

John W. Mercer sailed for Europe on ept. 25, to engage in Red Cross work.

George P. MacKenzie, gold commissioner Yukon Territory, is in Nova Scotia.

E. L. S. Wrampelmeier has legally hanged his name to Ernest Lee Swift.

G. D. Van Arsdale has left for the South-est to carry on metallurgical work in hich he is interested.

C. R. Miller, of the Tonopah Mining Co., as returned from a visit to the Mandy opper mine, Schist Lake, Manitoba.

Donald MacArthur, formerly of St. Louis, o., is the manager of the Seaboard By-roduct Coke Co., Jersey City, New Jersey.

P. A. Robbins, managing director of the ollinger Consolidated Gold Mines, Ltd., f Porcupine, Ont., has joined the forces f the United States for service overseas.

M. H. Newman is studying the geological ondition of the Otisse property of the ntario & Colorado Development Co. in the atachewan gold area of northern Ontario.

Lee O. Kellogg, mining engineer with he South American Development Co., has eturned from Ecuador to New York, and xpects to remain here about six months.

Martin Burrell, Minister of Mines in the ominion government, is visiting British olumbia, where he will first investigate he question of the production of zinc and ead at Nelson.

Maj. A. S. Dwight, 11th Engineers, is absent from his regiment on leave, having been detailed to engage in metallurgical work in the lead smelting plant at Marseilles, France.

A. P. Watt has been appointed a consulting engineer to the U. S. Bureau of Mines. His special work at present will be in reference to the concentration of pyrite for producing sulphuric acid.

L. R. Thompson, secretary of the Canadian Advisory Council on Scientific and Industrial Research, has resigned that position to become secretary of the Lignite Coal Board, which is being organized to establish a plant in Saskatchewan for briquetting lignite.

Howard Waldo Kitson, who recently left the "Journal" staff to accept a commission as ensign, has completed a three-months' course of training at Annapolis and has been assigned to active service. Ensign Kitson stopped in New York while on the way to take up his new duties.

W. D. Matthews, president of the Consolidated Mining and Smelting Co. of Canada, accompanied by C. B. Hosmer, a director of the Bank of Montreal, and Walter O. Miller, district superintendent of the Canadian Pacific Ry., recently visited the smeltery at Trail, British Columbia.

Dr. F. W. Farrier, representing the Munition Resources Commission of Canada, and **R. Graham**, assistant professor of mineralogy at McGill University, are making a trip into the heart of the Cascade Range, British Columbia, to inspect mica deposits, discovered by **William Schmock**, who accompanies them.

H. B. Wolcott, of Joplin, Mo., until recently superintendent of the Little Martha mine at Chitwood, in the Joplin district, and **W. A. Stewart**, of the firm of Ruhl & Stewart, of Joplin, have received commissions as lieutenants in the coast artillery after attending the officers' training camp at Newport News, Virginia.

H. R. Van Wagenen, newly appointed general manager of the Canada Copper Corporation, has arrived in Princeton, B. C., from Denver, Colo., and is taking up his residence at the scene of the company's operations at Copper Mountain. **Oscar Lachmund,** the retiring general manager, will spend the winter in Spokane.

Prof. Arthur L. Walker is now back at Columbia University, having been absent on ordnance work since early last June. He has been acting in a supervising capacity for the metallurgical section, inspection division, and during the last four months has visited many munition plants from the Mississippi Valley to the East. He has now been ordered to Columbia by the Ordnance Department, in the capacity of consulting metallurgist, so that he can serve the department whenever called upon.

Obituary

Col. Thomas Ewing, a well-known mining operator of the Pacific Coast, died suddenly in San Francisco recently, aged 80 years.

Eugene L. Steindler, general manager of the Dominion Reduction Co., Ltd., at Cobalt, Ont., died of pneumonia on Oct. 2, in New York, aged 32 years. Mr. Steindler was also a director of the Bluestone Mining and Smelting Co., Yerington, Nev. He was a graduate of Columbia University and a member of the American Institute of Mining Engineers as well as of the Bankers' Club of America.

Societies

Engineers' Club of Northern Minnesota held its regular monthly meeting at Eveleth, Minn., on September 28.

American Institute of Mining Engineers, New York section, met on Oct. 4 at Machinery Club, New York. Those present were addressed by Mark L. Requa on "Gasoline Conservation." A dinner preceded the meeting.

Institution of Mining Engineers (British) held its annual meeting at Nottingham on Sept. 13. The Institution medal for 1917-18 was presented to C. E. Rhodes. The following papers were among those read: "A Method of Determining the Magnetic Meridian as a Basis for Mining Surveys," by T. Lindsay Galloway; "Digest of the First Report of the Mine-Rescue Apparatus Research Committee," by D. Penman; and "The Chance Acetylene Safety Lamp," by W. Maurice.

Industrial News

Hoover Steel Ball Co., of Ann Arbor, Mich., announces the death of its president, Leander J. Hoover on September 22.

Mogi & Co., importers and exporters of New York, have moved their export department to 291 Broadway, under the management of Keizo Nagao. The firm's general office will remain at 118-120 East 25th Street.

Lakewood Engineering Co., Cleveland, Ohio, has opened new offices in Chicago in the Lumber Exchange Bldg. The announcement is also made that the Charles T. Topping Machinery Co. has merged its interests with the Pittsburgh office of the Lakewood company and solicits the continuance of its customers' patronage through the office of the latter company.

Enamel for Mine Equipment. The Enameling and Stamping Corporation, at Second and Webster Avs., Long Island City, N. Y., is equipped for the work of applying coatings of baked-on enamel to mine equipment. Such coatings may be of all kinds of enamel up to 400-600 deg., including transparent rust-proofing, acid-proofing, etc. The company confines its work to finishing or refinishing articles made by other manufacturers.

National Tube Co., Pittsburgh, Penn., calls the attention of engineers to the paper entitled "Preservation of Hot Water Supply Pipe in Theory and Practice," by F. N. Speller, metallurgical engineer, National Tube Co., and R. G. Knowland, of the department of applied chemistry, Massachusetts Institute of Technology. This paper was presented at the annual meeting of the American Society of Heating and Ventilating Engineers in New York in January, 1918, and has been reprinted in pamphlet form from the Journal of the society.

McGraw-Hill Book Co., Inc., 239 West 39th St., New York, has taken over all the publications of the Clark Book Co., Inc., 27 William St., New York. To insure prompt attention, orders for the following titles should be addressed to the McGraw-Hill company, and not to the Clark company, in New York, nor to the Myron C. Clark Publishing Co., 608 South Dearborn St., Chicago, Ill.: Berg, "Timber Test Record, 50c.; Dana and Trimble, "Trackman's Helper" (new edition of Kindelan's "Trackman's Helper"), $2; Gillette, "Cost Data," $5; "Economics of Road Construction," $1; "Clearing and Grubbing," $2.50; "Earthwork," $2; "Hand Book of Rock Excavation," $5; Gillette and Dana, "Cost Keeping and Management Engineering," $3.50; Haring, "Law of Contracts," $4; Robinson, "Military Preparedness and the Engineer," $2; Taylor, "Backbone of Perspective," $1; "Surveyors' Handbook," $2.

Trade Catalogs

Worm Gearing. Fawcus Machine Co., Pittsburgh, Penn. Pamphlet; 7 x 10; pp 8; illustrated.

Riley Underfeed Stokers. Sanford Riley Stoker Co., Worcester, Mass. Publication No. 31; 8½ x 11; pp. 4; illustrated.

Crayons. Zelnicker Crayon Works, St Louis, Mo. Folder; 3½ x 5½; pp. 4, illustrated. Crayons for marking lumber, hot metal, etc.

Rolled Zinc. New Jersey Zinc Co., 55 Wall St., New York. Pamphlet; 3⅝ x 6¼; pp. 4. Describes rolled zinc of ordinary and "Horse Head" grades.

Sand Blast Principles and Data. Pangborn Corporation, Hagerstown, Md. Bulletin No 50; 8½ x 10¾; pp. 8; illustrated. A treatise on sand blasting.

Equipment and Machine Tools. Walter A. Zelnicker Supply Co., St. Louis, Mo Bulletin No. 247; 3⅝ x 8½; pp. 16; illustrated. New and second-hand.

Fawcus Herringbone Gears. Fawcus Machine Co., Pittsburgh. Catalog; 9¼ x 12¼; pp. 16; describes various types of gears and gear drives and flexible couplings.

Steam Shovels, Cars, Locomotives. Walter A. Zelnicker Supply Co., St. Louis, Mo Bulletin No. 249, September; 8½ x 11; pp 4; illustrated. New and second-hand equipment.

Shoveling Machines, Myers-Whaley Co., Inc., Knoxville, Tenn. Bulletin; 10¼ x 8¼; 20 pp.; illustrated. Describes automatic shoveling machines, operated by one man and run either by electricity or compressed air.

Filter Presses for All Purposes. T. Shriver & Co., Harrison, N. J. Catalog; 8¾ x 11¼; pp. 44; illustrated. Covers all kinds of filter presses for all purposes as well as filter paper, filter cloth and pumps.

Zinc Metals. New Jersey Zinc Co., 55 Wall St., New York. Pamphlet; 3⅝ x 6¼; pp. 4. Describes the qualities and uses of "Horse Head," "Bertha," "Sterling," "Franklin," "White Bronze" and "Nassau" brands of spelter, as well as spiegeleisen and silver-lead bullion.

Zinc Dust. New Jersey Zinc Co., 55 Wall St., New York. Pamphlet; 3⅝ x 6¼; pp. 4. Describes zinc dust of its manufacture, dividing it into two classes according to the method of production. These classes or brands are the "Standard" (or fumed) and "Atomized Zinc" dust.

Zinc Pigments. New Jersey Zinc Co., 55 Wall St., New York. Pamphlet; 3⅝ x 6¼; pp. 12. Describes and classifies the various brands of zinc oxide of its manufacture under three heads, namely, pharmaceutical zinc oxide; French or indirect process zinc oxide; and American or direct process zinc oxide. It also describes lithopone and ocher.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Manganese Dioxide, Process of Separating From Its Ore. Leroy E. Sowers and Preston S. Phillips, Livermore, Calif. (U. S. No. 1,277,144-145; Aug. 27, 1918.)

Metallurgy—Method of Reducing Metallic Compounds. John J. Boericke, Merion, Penn. (U. S. No. 1,277,034-035; Aug. 27, 1918.)

Metallurgy—Process of Obtaining Metals from Metallic Oxides. Oliver B. Dawson, El Paso, Tex., assignor to Dawson Metallurgical Furnace Co. (U. S. No. 1,277,047; Aug. 27, 1918.)

Oil Shales—Apparatus and Process for the Extraction of Hydrocarbon Materials. Alexander M. Boyle, Reno, Nev., assignor to Crane Shale Oil Corp., Reno, Nev. (U. S. No. 1,276,866-879; Aug. 27, 1918.)

Steel, Method and Means for Annealing. James George Rapid Munday, Kingston-Upon-Hull, England. (U. S. No. 1,277,244; Aug. 27, 1918.)

Tunnel, Method of Constructing Shield-Driven. John F. O'Rourke, New York, N. Y. (U. S. No. 1,277,107; Aug. 27, 1918.)

Tunnel Mold Form. Christian Brynoldt, Pittsburgh, Penn., assignor to Blaw Steel Construction Co. (U. S. No. 1,277,186; Aug. 27, 1918.)

Editorial Correspondence

SAN FRANCISCO—Oct. 1

The Gold Output of various Alaskan camps and Yukon Valley for this year is estimated at 50% below normal, according to a dispatch from Dawson, which quotes Valney Richmond, superintendent of the Northern Commercial Co. His estimate includes the following figures, which have been gathered from various sources. Iditarod, $1,500,000; Fairbanks, $1,000,000; Televana, $900,000; Ruby, $250,000; Marshal, $200,000; Hot Springs, $150,000; Keyukuk, $140,000; Circle, $100,000; Rampart, $30,000. Decline in output is said to be due to lack of men and the fact that much of the ground is of such low grade that it does not pay to work it during a period of high costs.

DENVER—Oct. 2

Yule Marble has for many years been regarded as one of Colorado's choice products and it has won first place in many competitions. The Lincoln Memorial in Washington, the new postoffice building in Denver, and many prominent and beautiful structures throughout the country have been built of this fine stone. Large sums have been expended in the equipment of the quarries in Gunnison County, and the dressing plant at Marble is capable of turning out massive blocks and great columns for monuments or decorative purposes. Engineers and mining men will regret to hear that the property has been sold for taxes, and is about to be dismantled. In view of the present high metal prices, it is probable that much valuable equipment will be removed and sold at a sacrifice, and that rails, wire, and special machinery will go to the junk men. The passing of Yule Marble represents the loss of one of the best advertisements Colorado has had for the last 20 years.

Boards of Advisors in each metal-mining state have been appointed to assist Director Manning in investigating and certifying to appeals for invocation of the furlough privilege. The board of advisors for Colorado includes Fred Carroll, state commissioner of mines, Denver, chairman; Hugh C. Watson, district representative, Leadville; Charles N. Bell, district representative, Telluride; and D. C. Wanamaker, district representative, Cripple Creek. The object of the furlough boards is to protect the metal and non-metallic mineral industries from depletion of man-power, in so far as deferred classification and furloughing of necessary men is possible. In each case where a furlough is requested, the evidence will be investigated, and its justice and correctness attested by the district advisory officer, who will submit the case to the chairman of the board for the state. If the claims are found satisfactory, the chairman will certify to the evidence and forward it to Director Manning, chief certifying officer, for final disposal. George J. Salmon, chairman of the labor committee of the Bureau of Mines, in coöperation with J. E.. Spurr, of the man-power conservation committee, will promulgate instructions and rulings for the guidance of the advisory boards.

Metal-Mine Operators of Colorado are giving their labor supply careful study at this time, in view of the danger of indiscriminate recruiting of labor in the state for industries elsewhere. In addition to the loss of several thousand men per month, which is now going on, the draft will probably take a greater number unless definite steps are taken to alleviate the situation. Mining men of the state, especially those who are employers of labor in producing mines, are gathering information, which will be forwarded to the authorities at Washington with the view of impressing upon the administration the imperative necessity of giving deferred classification to all men now subject to draft employed in metal mining and to prepare the way for the importation of Mexican miners to the state. The leaders in Washington who appreciate the gravity of the situation will make a concerted effort to avoid the absolute disaster which now threatens the metal-mining industry by reason of the labor shortage. All mine operators are urged to place specific information regarding their labor conditions in the hands of their representatives as soon as possible, and to use all personal influence for the protection of an industry which is among the most essential for the winning of the war.

SALT LAKE CITY—Oct. 3

The Salt Lake Office of the Federal employment service states that an effort is being made to keep the mines of this section supplied with as much labor as possible. This effort has already helped in a number of cases. Though the Government makes no effort to control the price of labor in the mines and unions have no mine wage scale enforced in the majority of the mines of the state, the market has established the following scale of wages in a natural way, as stated by the Government employment authorities: Leyner machine men, $5.50 per day; machine miners, $5.25; hand or single jacks, $5, and muckers, $4.75 per day. The prevailing scale for mill and smeltery hands of the common labor class in the mills and smelteries is as follows: Arthur, $4.25 per day; Magna, $4.25; Garfield, $3.65; Murray, $3.55, and Midvale, $3.55 per day. Other than common labor is paid for more along the salary line, although it is often figured by the day according to the value of each employee in the particular position in which he acquires skill.

A Committee of Three has been appointed to investigate labor conditions in Utah under the draft law. One of these, J. C. Lynch, was appointed by the Department of Labor at Washington; another member, Charles F. Adams, by the district board of Utah, and the third, A. W. Ivins, represents the Department of Agriculture. The functions of the board will be to investigate the different labor conditions throughout the state brought about by the draft, and the committee will act independently of the district board, but may be called upon to assist in the operation of the draft, giving special reference to industrial and occupational claims for exemption or deferred classification when they are necessary. The committee will visit different industrial managers of the state, and find out their needs and requirements, to prevent, if possible, the taking of valuable industrial men for military service. The committee will also aid in keeping the industries of the state supplied with labor.

Attention of Utah Mining Men is being actively directed toward the proposed amendment to Section 4, Article 13 of the state constitution relating to the taxation of mines and mining property, to be voted upon at the coming election in November. The Utah Legislature at its last session showed undue hostility to the mining industry of the state by passing the joint resolution calling for the amendment through both houses under pressure, without referring it to the Committee on Mines and Mining, and practically without debate. If this measure should become a law, the mines, which are now assessed on their net proceeds, on their surface ground and on their improvements, plus an occupation tax of 3% on their net proceeds will be at the mercy of the state board of equalization, an appointive body, which will have power to tax mines at a value based on some multiple or submultiple of their net annual proceeds; that is, the power of taxation would pass from the regularly elected representatives of the people. Arguments for and against the proposed amendment were filed with the Secretary of State, Sept. 27, and will be prepared in pamphlet form and submitted to the voters. The affirmative argument was presented by Francis W. Kirkham, and claims that mines are taxed at only 20 to 30% of full value, because the net proceeds, which about equal net gains, are taxed, and not the value of the mine. This assertion cannot be proved and merely is an assertion. Also, attention might be called to the fact that mining claims in Utah are assessed at an average of $21.21 per acre, as against $13.11 per acre for agricultural acreage, according to the last published report of the state board of equalization. The negative argument was presented by Jesse Knight, of Provo. Among other things, it affirms that the method of taxing mines proposed in the amendment is wrong in principle, contrary to the theory of American government and should be defeated by voters regardless of political affiliation. To delegate such powers to a board chosen by a partisan Governor, and responsible to him only, would take away the rights of the people, be extremely dangerous, and might result in confiscation of property. The amendment places no limitation on the board of equalization in assessing net proceeds of metal mines. The proposed amendment was not introduced until the last day of the Legislature, and was passed without hearing and without due consideration. It is designed to replace constitutional provisions on taxation framed after due deliberation by a non-partisan convention chosen by the people. Mine owners and operators desire to pay their proportion of all additional revenue necessary to meet the requirements of the state. The proposed amendment would retard development, and would be the beginning of class legislation in the state. "Reduced to plain language, it means constantly increased powers to the board of equalization, who can therefore favor their personal friends and penalize their political enemies. It is taxation without representation in its worst form and invites graft and blackmail." If the proposed method of taxation should be adopted in regard to mines, it would probably set a precedent for taxing other Utah industries, such as sugar manufacture, and it is thought that the people interested in industries other than mining, including the dominant church here, will also oppose the amendment on this account. Every one connected directly or indirectly with mining is being strenuously urged to vote against the measure.

WALLACE, IDAHO—Sept. 28

Chromite Deposits of Eastern Oregon have been investigated by Sidney L. Shonts, mining engineer, of Wallace, Idaho, who visited the district as the representative of the Government. His observations were confined to Grant, Baker and Willowa counties. The principal producers are in Grant County in the vicinity of Canyon City, Prairie City and John Day. Promising discoveries have been made in the other two counties, but as profitable production depends upon the war demand, which is uncertain as to its duration, little is being done in the way of new development and prospecting. The section visited by Mr. Shonts has produced about 11,000 tons of chromite this year and it is estimated that during the remaining three months of the year this will be increased to 18,000 tons. Mr. Shonts is of the opinion that the Government should fix the price of chrome ore for a definite period, as has been done in connection with other war minerals, as a means of encouraging production. Practically no chrome was produced in eastern Oregon before the war, as the price was about the same as the freight rate, and unless some protection is provided by the Government it is expected that the same condition will prevail after the war.

Hecla Mining Co. paid a dividend of 15c on Sept. 28, the disbursement being the first since last January, when dividends were suspended in anticipation of the payment of a heavy excess-profits tax. The company is capitalized for $250,000, having 1,000,000 shares of the par value of 25c. During 1917 Hecla paid in dividends $1,-600,000. In spite of the labor shortage which has materially reduced the lead production of the Coeur d'Alene district, the Hecla company has maintained normal production. In announcing the current dividend, stockholders were advised that dividends hereafter would be paid quarterly instead of monthly, on the 28th of March, June, September and December, to stockholders of record on the first of the dividend month. Last April the company tendered the Government $128,000 in payment of its war tax, claiming classification under section 210 of the war Excess-Profits Tax Law. Up to this time the Treasury Department has taken no action on the tender, and Hecla is therefore still "up in the air" regarding the Government's construction of the law and the actual amount that will be demanded under its provisions. In the annual report for 1917 James F. McCarthy, manager of the Hecla, estimated the ore serves in the mine at 1,326,399 tons, and is probable that these figures represent fair estimate at this time. The shaft as recently been completed to the 2000 vel, and a large station is being cut eparatory to crosscutting to the orebody. he present lowest level is the 1600, and e new level will therefore add 400 ft. of rgin ground, which is expected to be lly as productive as the workings above.

HELENA, MONT.—Sept. 28

Butte Mine Operators were informed by e district exemption board that claims r exemption would be considered indi-dually and not as a class. In making s rulings on various cases, the board ated that it would follow the regula-ons prescribed by the Provost Marshal nd that miners would be considered in-ividually, the same as in other occupa-ons regarded essential and described as necessary."

JOPLIN, MO.—Sept. 28

Power Shovels to take the place of hovelers in the zinc mines of the district re to be given a trial. The Golden Rod ining and Smelting Co. and the Vinegar ill Zinc Co. both have purchased shovels, nd in each case power is to be furnished y electric motors operating underground. he shortage of shovelers is becoming more cute, and companies other than the two entioned are planning the installation of ower shovels should these prove to be ccessful.

High-Grade Zinc Concentrates have at-ained a new record for the district at the uebec mine, which was recently placed in peration near Douthat, Okla. The first ve cars of ore were sold to the Fort Smith pelter Co. and assays for each car were 4.8%, 64.9, 64.9, 65.0 and 65.7% zinc, r an average of 65% metallic zinc for the ve cars. This is considered particularly ood, on account of its being the first pro-uction made at a new concentrator. More-ver, in addition to the high metallic zinc ontent of the concentrate, it is free of lime nd iron and carries only a trace of lead. With only four shovelers working, 156 tons f ore was produced during the last week, e dirt showing a recovery ranging from 1 to 22 per cent.

CALUMET, MICH.—Oct. 5

The Recent Increase in Wages raises the mounts paid to copper miners to the quivalent of what is paid in the muni-ions and war materials plants. This fact as induced a small number of the old-time miners and trammers to return to the dis-rict, but the labor problem is still far rom solved, and copper companies are eriously considering appealing to the Gov-rnment for assistance. At both the Allouez nd Isle Royale mines additional battery ocomotive tramming equipment is being nstalled, Calumet & Hecla and Mohawk re planning on further increase of similar quipment, but deliveries by the manufac-urers are slow. It is understood that the mining companies will have no difficulty in ecuring the exemption from the military raft of their skilled or necessary men. Exemptions will be asked for all classes of abor, as it is estimated already 5000 men ave left to enter the armies and navies of his country and the Allies. Because of the high cost and delays in delivery of electrical equipment for tramming, it is probable that some of the companies will install more rope haulage. The Franklin has an excellent system of rope haulage, and this, in addition to its method of intensive mining, has gained wide attention as a reduction factor in both mining and tramming costs. The Ahmeek is the only mine in the district which is using mules for tramming, and the company has few animals. The crooked drifts at most of the properties make impossible the use of the rope haulage system entirely. Copper Range, particularly at the Champion mine, has had good success with trolley locomotives, but they are to be found in few other mines of the district.

TORONTO—Oct. 5

Gold Mining Operators are encouraged in the hope that the government will afford them some measure of assistance, by the recent visit of several officials from the Ottawa mint to Porcupine. The party included J. Bonar, B. Pearson, Gordon F. Dickson, and E. N. Entwhistle, and it is understood that their purpose was to obtain first-hand information as to the actual situation at the mines. No official announcement has been made, but the general impression is that any relief granted may take the form of placing gold mines in the preferred class as regards delivery of supplies and perhaps a reduction in taxation.

VICTORIA, B. C.—Oct. 1

The Dominion of Canada Assay Office at Vancouver is now ready for the treatment of platinum and other minerals. The equipment is the only one of its kind in Canada, and includes an electric still, four fume cupboards which are used in the wet process of refining; three balances set on concrete bases, two concussion pulverizers, an electric furnace, and an oxy-acetylene torch.

The Removal of the Present Royalty on the gold output of Yukon Territory is being demanded by companies and placer miners of that district. Consequently Dr. Alfred Thompson, member of the Dominion Parliament for the Yukon, has announced that at the next session he will ask that, as a war measure, the royalty be removed. He thinks that this can be done easily by introducing an amendment to the Yukon Placer Mining Act. Dr. Thompson asserts that his constituents are not requesting too much, in view of the increased cost of mining and the desirability of encouraging the output of gold.

The Establishment of an Analytical Laboratory at some central point in the province is desired by mining men of British Columbia, and an agitation to this end has been in progress for some time. In the hope that his action may induce the authorities to take this step, M. S. Davys, of Kaslo, has offered, through the Kaslo Board of Trade, to furnish a building for such a mill, and it is understood that the municipal authorities will furnish the necessary electrical power. It is admitted that a laboratory of the kind would be of material service to the operators of the southern interior of the province.

Investigation of the Schedule of Charges and the general policy of the Consolidated Mining and Smelting Co. of Canada toward the operators of British Columbia will probably begin soon. Messrs. Fowler, DeLashmut and Anderson, three prominent mining men of the province, who were nominated by the Associated Boards of Trade as being the proper persons to conduct such an investigation, have accepted their appointment by the dominion government, the latter, apparently, having met their wishes in regard to empowering them to take evidence on oath and also as to providing the finances necessary to enable them to make their work thorough and complete.

The Production of Gasoline in commercial quantities from gas wells in Alberta is possible as the result of investigations of Dr. D. B. Dowling, of the Dominion Geological Survey. At one large gas well, south of Calgary, a plant is already in course of erection for the extraction of gasoline from the gas. It is asserted that tests of the gas after the extraction of the gasoline revealed the fact that the only difference made was a reduction of less than 12% in the heat units. Though the flow of gas at the wells in question is sufficient to meet any ordinary commercial demand, Calgary is supplied from other wells, and, as there is little chance of another franchise being granted, the owners of the former are turning their attention to the production of gasoline. Because of the scarcity of this fuel, the dominion government is conducting a thorough survey of the natural-gas district with a view to increasing Canada's available supply of gasoline.

The Mining Industry of the Kootenay District, with the exception of gold mining, has never been more prosperous, according to Fred A. Starkey, president of the Associated Boards of Trade of Eastern British Columbia. Commenting upon conditions, he said: "Since the outbreak of the war, the silver-lead properties of the Slocan district have been reopened and without exception are doing well. Properties which had been closed down and did not expect to operate for a long time are producing more metal than ever before. Clarence Cunningham is now building a concentrator at Three Forks to serve the properties on the Sandon side of the range. He first obtained the Queen Bess Mine, which, with little work, was made a consistent producer, and now he also controls the Sovereign, Wonderful, Van Roi, Alamo-Idaho, and Wakefield, all of which are producing silver and lead. The Van Roi and Hewitt have their own mills, and the new one will serve the other properties. The plant is to cost about $150,000. The Rosebery-Surprise Co., at Sandon, has just taken over the Ivanhoe and the Canadian, which are old mines. The Slocan Star is another good property, and work is being continued on a nine-foot vein in the old workings under the management of R. H. Stewart. C. F. Coldwell is working on the old Utica mine, which is now shipping. The Cork-Province is working to full capacity, and development in this section is greater than ever before. In East Kootenay the Sullivan mine, owned by the Consolidated Mining and Smelting Co. of Canada, is the biggest shipper. Another big producer is the Paradise, at Wilmer."

The Mining News

ARIZONA

Cochise County

DENN-ARIZONA (Warren)—Shaft to be sunk to 1800 level.

Coconino County

KAIBAB SMELTING COMPANY (Fredonia)—Organized by Cyrus A. Phelps and John J. Kamm, of Los Angeles, for the establishment of a smeltery at a point north of the Grand Canyon.

Gila County

MIAMI COPPER (Miami)—Copper production during September was 5,012,865 pounds.

Mohave County

HACKBERRY (Hackberry)—Shaft down 900 ft. and station being cut. To crosscut to vein.

ANTLER (Kingman)—Shipping copper ore to United Verde Extension smeltery. Property owned by Commercial Copper Co., but has been closed down.

STANDARD MINERALS (Kingman)—Machinery being hauled for new mill.

TWINS (Kingman)—Shaft being sunk to 300 level, where crosscutting will be started to cut vein that faulted below the 100 level.

McCRACKEN (Signal)—Erecting 100-ton mill for lead-silver ores. Long tunnel has cut orebody.

Pima County

BLACK BESS (Ajo)—Small mill in operation, handling gold and tungsten ore

NEW CORNELIA (Ajo)—Opening sulphide body and shipping. Drift nearly completed from 250 level of shaft to gloryhole, where four steam shovels are operating. Large additions being made to leaching plant. Nearly 1000 men employed.

Pinal County

SILVER KING (Superior)—Started Marcy mill that is handling 35 tons a day from a 1000-ton dump. Extraction claimed to be 90%, mainly silver. Richer ore is being shipped.

Yavapai County

HIDDEN TREASURE (Clarkdale)—Operations will start as soon as machinery can be procured. C. W. Bennett is president and general manager.

VERDE SQUAW (Jerome)—Shaft down 66 ft., bottomed in schist and quartz that show chalcopyrite and bornite. Crosscutting will begin on the 250 level.

Yuma County

RED CLOUD (Yuma)—Mill recently destroyed by fire at a loss of $100,000

CALIFORNIA

Calaveras County

UTICA (Angels Camp)—Storage reservoirs have been sold to Pacific Gas and Electric Co. Has been supplying power, light and water to the town for several years, but since chief mining activities have been restricted to the Gold Cliff mine, the large power and light plant has not been so essential.

GWIN (Paloma)—Recent storms caused shaft collar to cave and carry steel headframe into the depression. Plant is being dismantled to be soid as scrap iron and steel, greater part having been already removed.

Eldorado County

A FEDERAL SMELTERY, to be built near Sacramento for the treatment of ores in Eldorado and Placer counties, will be asked for by mining men. It is claimed that the development of surface ores carrying copper, gold, silver and other minerals would be aided through such an installation.

CHROME MINERS employed by Fisher & McCurdy have asked the courts for the attachment of a carload of ore in payment of wages. The court turned the matter over to State Council of Defense, which decided that the men will get their wages.

SILICA DEPOSIT at Latrobe developed by W. E. Beck, of Placerville, for shipment to San Francisco, to be used in manufacture of plaster and other surface building material. This is the first silica ordered from this region.

NOONDAY COPPER (Placerville)—To be reopened and developed by E. N. Wilkenson and associates.

ROCKY BAR (Placerville)—Old machinery dismantled and sold to Union Iron Works, San Francisco. Mine now operating with new installation.

CHROME SHIPMENTS from Taylor deposits by W. H. Smith, and amounting to six cars, encourage the development of sulphide ores and the contemplated installation of a treatment plant.

Inyo County

SILVER REEF CAMP, three miles south of Yellow Jacket Springs, is active, and several lessees are mining silver-lead ore. The Blind Springs Hill, Mountain View, and other properties are making good showing. Joe Main, Thomas Dennison, John Meyers, William Welsh, C. O. Clark, Lee Currie, Frank Arcularius, McLean & Cooper and A. B. Davis are all developing high-grade ores.

Kern County

AMERICAN DEVELOPMENT (Brown)—Developing low-grade gold veins. Power to be developed from south fork of Kern River. Situation is about 30 miles northwest of Randsburg.

Shasta County

MAMMOTH (Kennett)—Smeltery production during September is estimated at 1,400,000 lb. of copper.

COLORADO

Teller County

ALPHA AND OMEGA (Cripple Creek)—Sinking to be resumed soon by the Dig Gold Mining Co. Shaft has been sunk to 270 ft. and is to be put down another lift of 100 ft. A supply of shaft timbers is now being shipped to the porperty. Company contemplates considerable development work from the bottom of the shaft. David Burke is superintendent.

EMMA AIMEE (Cripple Creek)—Mine of Victory Gold Mining Co. leased to John B. Barnes and associates, of Casper, Wyo. Work started on new adit tunnel below the old dump.

REX (Cripple Creek)—Manganese ore has been exposed in several surface openings, and a vein has been opened in a tunnel at a depth 75 ft. below the surface. Crosscutting is in progress from the tunnel to determine the width of the vein. Property of the Rex Gold Mining and Milling Co. is leased to the Lincoln Mines and Reduction Co. Property under option includes the Ironclad, Pard, Magna Charta, Quartzite, and Annex claims, comprising about 35 acres. Leasing company plans the erection of a mill, and ground will be broken soon for the foundation of the first unit. It is stated that machinery for the plant has been ordered. This discovery of manganese in the Cripple Creek district is not the first, for 12 or 15 years ago manganese minerals were found in the Chicago Tunnel, entering Globe Hill from Poverty Gulch; in the Albany Tunnel, on the northwestern slope of Bull Hill, and in the Dexter mine. The present discovery is the first prominent find of manganese on Iron Clad Hill.

DEERHORN (Victor)—Payable ore opened on Clifford-Green lease, and trial shipment has been made to Golden Cycle Mining and Reduction Company.

GOLD SOVEREIGN (Victor)—New orebody recently opened on the fourth level by lessees working through the Jackson shaft. Shipments being made to Golden Cycle Mining and Reduction Co. at Colorado Springs.

ZENOBIA (Victor)—West & Co. have leased property and are reopening. Payable ore has been cut by new development work, and shipments are being made.

IDAHO

Shoshone County

NABOB CONSOLIDATED (Kellogg)—Completed winze from Nabob tunnel that provides outlet from two levels.

OLD HICKORY (Mullan)—To develop Hickory mine. Early workings consist of three shafts and a number of open cuts. Oscar Nordquist is president and manager.

KENNAN MINING (Wallace)—Control has been taken over by John A. Percival, of New York, and development is to begin at once.

MICHIGAN

Copper District

SENECA (Calumet)—Diamond drill from 1054-ft. point in shaft shows shot copper in Kearsarge lode rock at a depth of 480 feet.

HANCOCK (Hancock)—High-grade rock still showing in two new eastern lodes.

ISLE ROYALE (Houghton)—Richest rock being hoisted from ground tributary to No. 4 shaft on Isle Royale lode. Twenty tram locomotives are in use at three shafts.

AHMEEK (Kearsarge)—During September produced 93,460 tons of copper rock from three shafts.

MASS CONSOLIDATED (Mass)—Considerable mass copper being mined.

OSCEOLA (Osceola)—During September 90,000 tons of copper rock was mined.

WINONA (Winona)—Has four new openings in the excellent grade of rock. Mill continues to handle product of Winona and Michigan.

UTAH

Piute County

FLORENCE MINING AND MILLING (Marysvale)—New roasting and leaching plant which has been under construction at the mine is nearly completed. Several trial runs have been made on the alunite ore.

MINERAL PRODUCTS (Marysvale)—Mill treating 200 tons of alunite daily and producing up to 40 tons of potassium sulphate. Finished product sold largely to Armour Fertilizer Co. under contract.

Salt Lake County

MONTANA-BINGHAM (Bingham)—During September shipped eight cars of ore, largely low-grade copper carrying some silver and gold, from the Keystone tunnel of the former Fortuna workings. Two cars of lead-silver ore was also shipped. Development done on main tunnel level. Some shortage of labor.

OHIO COPPER (Lark)—Rebuilding of part of mill recently damaged by fire in progress. Considerable activity at Lark. More men wanted for various work.

CARDIFF (Salt Lake)—Thirty-ton mill at foot of second-class ore dumps being operated by M. J. Dailey, lessee, is producing concentrates. Enough ore available to operate till the first of the year.

CANADA

British Columbia

DRUM LUMMON (Douglass Channel)—Building concentrating mill of Gibson type.

MAPLE LEAF GROUP (Franklin Camp)—Has been leased. Considerable development has been done. The Union and Pathfinder mines, of the same district, may also be leased

GRANBY CONSOLIDATED (Graves Point)—Byproducts plant, now under construction, will be ready for operation in January.

SILVER BELL (Kaslo)—Equipment and supplies being shipped in. R. F. and S. Green are owners

WOOLSEY GROUP (Revelstoke)—Claims on Silver Creek have been lease and development is to start immediatel Ore is silver-lead.

DONOHOE MINES (Stump Lake)—Re opened. New machinery and equipment be installed, including air compressor an drills, with additions to the hoisting plan John D. Leedy, of Seattle, Wash., is man ager.

CONSOLIDATED MINING AN SMELTING (Trail)—Recent fire destroye Dwight & Lloyd roaster building an resulted in damage amounting to $40,00

MINING AND PROSPECTING for pla tinum on the Tulameen River is activ having been materially stimulated by th interest that representatives of the Geo logical Survey Branch are taking in th work. The Church Co., of Tacoma, Wash is extensively developing property on th Tulameen above Bear Creek, having put a big dam and a 200-yd. flume. Twent men with three large centrifugal pump are working the bed of the river over distance of 700 ft., and recovering platinu and gold. Several smaller outfits are work, and the government, having esta lished camps at Slate Creek, is sinkin test holes on the bars and benches to d termine the value of the ground.

Manitoba

MANDY (Schist Lake)—Contract ha been let for the hauling of 10,000 tons copper ore from the mine during the winte

Ontario

ASSOCIATED GOLD FIELDS (Lard Lake)—Has made a rich discovery of go at the 500 level.

HURONIA (Larder Lake) — Arrang ments have been made to resume minin

DAVIDSON (Porcupine) — New ma working shaft down 400 feet.

McINTYRE (Porcupine)—Opening new main haulage level at depth of 14 feet.

SHUMACHER (Porcupine)—Annual r port to be issued soon will cover peri from Mar. 31, 1917, to July 31, 1918, duri which operations showed small deficit, a counted for by property being closed pa of time.

WHELPDALE (Porcupine)—Will resum work.

ADANAC (Cobalt)—Several good silv veins and stringers have been cut at t 310 level.

FOSTER (Cobalt)—Leased by C. Campbell and F. Fairburn, and undergrou work will soon be started. Ten carloa of ore have been shipped from the o dumps, which contain about 13,000 tons, i cluding some of high grade.

KERR LAKE (Cobalt)—Annual repo for year ended Aug. 31 shows output 2,582,933 oz. silver with ore reserves e timated at 1,637,000 oz. Net earnings we $1,899,804, and surplus was $1,022,317.

LA ROSE (Cobalt)—Operating sorti plant at the Violet property for recovery high grade from the new discovery. Shi ping mill ore to the concentrator.

MINING CORPORATION (Cobalt)—I vestigating properties in British Columb near Hope; also has an option on the E gineer Gold Mines, in the Atlin distric Northern British Columbia.

NIPISSING (Cobalt)—Has cancelled o tions on Matachewan properties.

OPHIR (Cobalt)—The Mining Corpor tion has sunk a 125-ft. winze 15 or 20 from the contact.

SAVAGE (Cobalt) — Shipping daily McKinley-Darragh mill.

ONTARIO-KIRKLAND (Kirkland Lak —Has installed an electric plant, and w sink main shaft from 100 to 300 level.

ORR GOLD MINES (Kirkland Lake)—Injunction issued in favor of the minori interests, restraining the completion of t deal for control with the Kirkland-Porphy Co., has been extended until October 7.

TECK HUGHES (Kirkland Lake)—Wo has been resumed.

BOSTON CREEK (Boston Creek)—Su brought by John Papassimaker, of the A. P. Syndicate, against this company ha ing been amicably settled, work on t property will be resumed soon. Negoti tions between the company and the R. A. Syndicate for the amalgamation of the co pany are understood to be progressing.

BOSTON GOLD LEAF (Boston Creek)—No. 5 vein, showing free gold, has be stripped for several hundred feet.

PATRICIA (Boston Creek)—Mill clos down on account of fuel shortage.

The Market Report

SILVER AND STERLING EXCHANGE

		Silver				Silver	
t.	Sterling Exchange	New York, Cents	London, Pence	Oct.	Sterling Exchange	New York, Cents	London, Pence
[illegible]	4.7550	101⅛	49½	7	4.7550	101⅛	49½
[illegible]	4 7550	101⅛	49½	8	4.7550	101⅛	49½
5	4.7550	101⅛	49½	9	4.7550	101⅛	49½

New York quotations are as reported by Handy &Harman and are in cents per troy ounce of bar er, 999 fine. London quotations are in pence per ty ounce of sterling silver, 925 fine.

ILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
t.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
3	*26	†	8.05	7.75	8.65@8.75
4	*26	†	8.05	7.75	8.55@8.65
5	*26	†	8.05	7.75	8.55@8.65
7	*26	†	8.05	7.75	8.40@8.50
8	*26	†	8.05	7.75	8.30@8.40
9	*26	†	8.05	7.75	8.25@8.35

* Price fixed by agreement between American pper producers and the U. S. Government, accordg to official statement for publication on Friday, ptember 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the ice for which has been fixed by agreement between nerican copper producers and the U. S. Governent, wherein there is no free market) are our praisal of the average of the major markets based nerally on sales as made and reported by producers d agencies, and represent to the best of our judgent the prevailing values of the metals for the liveries constituting the major markets, reduced to sis of New York, cash, except where St. Louis is e normal basing point.

The quotations for electrolytic copper are for cakes, gots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c low the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime estern brands. We quote New York price at 35c. r 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
ct.	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
3	122	122	137	337½	337½	29½	28½	54
4	122	122	137	337½	337½	29½	28½	54
5	...	...	...	...	...	..	..	..
7	122	122	137	337½	337½	29½	28½	54
8	122	122	137	337½	337½	29½	28½	54
9	122	122	137	337½	337½	29½	28½	54

The above table gives the closing quotations on ndon Metal Exchange. All prices are in pounds erling per ton of 2240 lb. For convenience in mparison of London prices, in pounds sterling per 40 lb., with American prices in cents per pound e following approximate ratios are given, reckoning change at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; 10 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; 80 = 59.3937c.; £300 = 63.6362c. Variations, £1 0.2121205c.

Metal Markets

NEW YORK—Oct. 9, 1918

In such markets as are free, and therere reflect economic factors, the overadowing influence this week was the ospect of an early peace.

Copper—The situation is even more acute, ving to increased Governmental demands, nile, on the other hand, the production of fined copper each month falls below exctations. The production this month will be diminished, possibly to the extent of 10 million pounds, by the explosion of an ammunition plant near Perth Amboy on Oct. 5. Some trifling damage was done to the Raritan works, but both Maurer and Chrome escaped injury. However, at each of these plants the men failed to appear for work on Saturday, Sunday and Monday, and the diminished production will be on that account.

Advices from Japan indicate that stocks of copper are accumulating in that country, where the producers are unwilling to sell for delivery to Europe or America at the prices fixed by the United States and Allied countries.

The matter of copper price after Nov. 1 is to be discussed by producers and the price-fixing committee of the War Industries Board on Oct. 23.

Copper Sheets—The base price of copper sheets remains at 35¾c. per lb. Copper wire is quoted at 29½ to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Tin—There is no longer any market of any kind. The American Steel Products Co. is now the sole importer for all kinds of tin, Chinese and Banka included. Import licenses for Chinese and Banka tins will not be granted on any other conditions. The Steel Products Co. will attend to the distribution of all lots of tin in excess of 10 tons through the American Iron and Steel Institute. The price and terms will be regulated by the War Industries Board. This eliminates everybody except the Steel Products Co. and the jobbers and dealers in small lots.

An Allied Purchasing Executive.—The following notification was issued on Sept. 5 by the British authorities.

"An Inter-Allied Tin Executive has been established to sit in London to control the price and distribution of tin for the Allies.

The following are the names of the executives and the countries they represent:

"Great Britain: Sir Leonard W. Llewelyn, controller of raw materials department, Ministry of Munitions; W. A. Tennant, tin controller, Ministry of Munitions.

"United States: George M. Armsby, chief of the tin section of the War Industries Board; John Hughes, chairman of the American Steel Institute.

"France: Lieutenant Sauvage.

"Italy—Colonel Riggi.

"The secretarial duties will be carried out by H. A. Buck, the secretary of the London Metal Exchange, who is also a member of the British Tin Control Committee."

Lead—The situation is easier. Production is being maintained, but the easier tendency is due mainly to the success of the Lead Producers' Committee in checking some kinds of consumption.

The Lead Producers' Committee for War Service is now allotting and clearing all carload shipments of virgin lead, both domestic and bonded, refined and antimonial. In order to distribute most equitably the supply of lead remaining after provision has been made for U. S. Government orders, the Lead Producers' Committee for War Service requests information relative to all purchases made during 1915, 1916 and 1917. A card that is to be so filled out as to provide this information has been sent to all buyers.

Following is a list of "chief uses" of lead. Buyers are asked to name one only in the place provided on the card for that purpose: Batteries, brass, bullets and shot, car seals, cable, foil, locomotives, mixed metals, paints and colors, railroad equipment (other than locomotive), retail sales, shrapnel, sheets, pipes, bends, etc., steel mills.

Zinc—The market went off rather sharply from day to day. October spelter is not very plentiful, but there were offers to sell November-December, which was offered freely from a good many quarters. At the close October spelter was freely offered at 8⅜ and November-December at 8¼, and it was doubtful whether those prices could be realized.

There were some large sales of high-grade spelter at something less than the maximum price.

The American Metal Co. found, owing to the great increase in the cost of smelting, that it was advantageous to itself to surrender its share holdings in the Consolidated Interstate Callahan Mining Co. in consideration of the cancellation of its smelting contract with that company, which was made on ante-bellum terms.

Zinc Sheets—Unchanged at $15 per 100 lb. less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—The market was dull and a little weaker. We quote spot at 14@14½c. October shipments from the Orient were quoted at 13⅛@13¼c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50 @2 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Strong at $125@130. San Francisco reports, by telegraph, $120, steady.

The matter of quicksilver price is to be discussed at a meeting on Oct. 25, between the producers and representatives of the War Industries Board.

Silver and Platinum

Silver—Based on fixed prices, London 49½d. and New York $1.01⅛ for 999 fine, considerable business has been done according to Federal Reserve Bank terms and regulations. Shipments to London for the week ending Oct. 5, 1,933,000 ounces.

Pixley & Abell's circular states that the Indian currency returns for Aug. 15 and 22 show a substantial increase in silver coin and bullion. The total amount now held, in and out of India, is 2429 lacs, as against 1044 lacs on Apr. 7 last. On Aug. 24 there were in Shanghai 24,500,000 taels of sycee and 14,300,000 Mexican dollars.

Mepican dollars at New York: Oct. 3, 78; Oct. 4, 78; Oct. 5, 78; Oct. 7, 78; Oct. 8, 78; Oct. 9, 78.

Platinum, Palladium and Iridium—Prices fixed at $105, $135 and $175, respectively.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 5—Blende, per ton, high, $77.90; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $55@50; calamine, basis 40% zinc, $40@35. Average selling prices: blende, $53.73; calamine, $34.45; all zinc ores, $52.84.

Lead, high, $105.25; basis 80% lead, $103@100; average selling price, all grades of lead, $101.40 per ton.

Shipments the week: Blende, 10,541; calamine, 459; lead, 1742 tons. Value, all ores the week, $779,890.

Though some blende was sold early in the week at $55 basis, on Friday only $52 50 was bid, and some ore was purchased on $50 basis today. All night work has been suspended at the Eagle-Picher company's mines, which made it possible for several new ones to start and for at least one mine to resume double-shift work. The general tendency is toward a lowering output, owing to the large number of men that have been called from the district, and production will be further restricted as men are called into the service by the draft.

Platteville, Wis., Oct. 5.—Blende, basis 60% zinc, highest price reported, $75.60; base price for premium grade, $75; base price for high-lead blende, $52. Lead ore, basis 80% lead, $97.50 per ton. Shipments reported for the week were 2074 tons blende, 73 tons galena, and 611 tons sulphur ore. For the year to date the totals are 98,752 tons blende, 6001 tons galena and 36,362 tons sulphur ore. During the week 3087 tons blende was shipped to separating plants

Other Ores

Chrome Ore—Reported unsalable.

Manganese Ore—Unchanged.

Molybdenum Ore—No business reported.

Pyrites—Prices of domestic pyrites are determined by negotiation between buyer and seller. Prices range between 28 and 34c. per unit according to location.

Tungsten—The activity in this ore has decreased, although the higher-grade ores are still in demand. High-grade scheelite has sold for $25 to $26 per unit and high-grade wolframite for $25.50 per unit. Low-grade ores are dull, and are quoted at $19 to $24 per unit, according to amount and kind of impurity.

Iron Trade Review

PITTSBURGH—Oct. 8

It is believed that October will prove a record-breaking month in steel production. September is known to have shown a substantial gain over August, although the precise figures are not available. The sharp increase in output is attributable in part to the progress of the season, October being always a month of favorable weather, and in part to improvement in the quality of coke furnished the blast furnaces.

No further restrictions have been announced as to the production of any finished steel lines, and the chief conservation work of the War Industries Board is in the direction of reaching agreements with consumers whereby they will use less iron and steel. These agreements are made chiefly with those who are entitled to priorities or have a high place in the preference list, as other consumers would not receive material in any event. Thus the makers of talking machines are advised to discontinue such manufacture entirely by the end of the year. Makers of agricultural implements, who are entitled to B-2 priority, are to consume no more than 75% as much iron and steel in the twelvemonth beginning Oct. 1, 1918, as in the preceding twelvemonth, and this curtailment is expected to save 500,000 tons, the major part being pig iron, which will be reflected in a still greater steel output, as the supply of pig iron has been limiting steel production.

The latest indications are that the economies arranged in the use of steel will be approximately balanced by the additional war requirements that have been coming up, so that it will be impossible to reduce the estimate that fully 23,000,000 net tons of finished rolled steel is needed for the current half year. With production at about 9,000,000 tons in the last three months, and promising to be materially heavier in the current quarter, there will still be a considerable deficit, and the priority system will have to take care of that.

Pig Iron—Blast furnaces report some improvement in the quality of coke received, conducing to heavier outputs, but average quality is still far below former standards. Output in the first half of the year is officially reported at 18,227,730 gross tons, showing a loss of over a million tons from the output in either half of 1917, this being due to the railroad blockade early in the year. Output in the second quarter was at the rate of more than 20,000,000 tons for a half year, and production at present is still heavier. There are practically no market transactions, distribution being in the hands of the pig-iron committee, and new wants arising cannot be satisfied except by securing an allocation from the committee. The market remains quotable as follows: Bessemer, $35.20; basic, $33; No. 2 foundry, $34; malleable, $34.50; forge, $33, f.o.b. furnace, freight to Pittsburgh from the Valleys being $1.40 and from six detached furnaces somewhat less.

Steel—The recent order that unfinished steel may not be sold to a buyer who will resell without advancing the stage of manufacture cuts out the usual merchant operation of middlemen, but it does not appear that it would prevent the middleman acting as a broker, the contract being direct between producer and consumer and the broker's receiving a commission from the producer. Scarcely any steel is available in any event. We quote: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; wire rods, $57.

Ferroalloys—Ferromanganese continues fairly active for first half delivery, but consumers [illegible] as to their being fully supplied. We quote 70% ferromanganese at $250 delivered, with $3.50 per unit for higher manganese content, and 16% spiegeleisen at $75 furnace, with chance of a little shading.

Coke—Coke production continues at a good rate as regards tonnage, and quality is said to be improving. Distribution is now proceeding smoothly. We quote Connellsville at $6 for furnace, $7 for foundry, $7.30 for crushed, over ¾-in., and clean screenings from old dumps, over ½-in., at $5.50, per net ton at ovens, these being Government limits, with no shading.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept.	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	.....	32.361	44.324	.....
Nov.	71.604	85.891	.....	34.192	43.584	.....
Dec.	75.765	85.960	.....	36.410	43.052	.....
Year	65.661	81.417	.....	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	.....	110.000	.....	125.000	.....
Nov.	23.500	.....	110.000	.....	125.000	.....
Dec.	23.500	.....	110.000	.....	125.000	.....
Year	27.180	.....	124.892	.....	138.401	.....

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(*a*)	207.443	318.875
April	55.910	(*a*)	220.171	329.905
May	63.173	(*a*)	245.114	364.217
June	62.053	(*a*)	242.083	331.925
July	62.570	(*a*)	242.181	360.347
August	62.681	(*a*)	243.978	380.900
September	61.542	(*a*)	244.038	343.905
October	61.851	.....	247.467	.....
November	74.740	.....	274.943	.....
December	87.120	.....	298.556	.....
Av. year	61.802	.....	237.563	.....

(*a*) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	.....	6.650	.....	30.500	.....
November	6.249	.....	6.187	.....	30.500	.....
December	6.375	.....	6.312	.....	30.500	.....
Year	8.787	.....	8.721	.....	30.500	.....

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	.....	7.813		54.000	.....
November	7.847	.....	7.672		54.000	.....
December	7.685		7.510		54.000	.....
Year	8.901		8.813		52.413	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.81	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.10	36.60	42.24	33.40	48.5	34.40
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct. 8
Alaska Gold M.	3¼
Alaska Juneau	1¾
Am. Sm. & Ref., com.	77⅛
Am. Sm. & Ref., pf.	104⅛
Am. Sm. Sec., pf., A.	89
Am. Zinc	15¼
Am. Zinc, pf.	51¼
Anaconda	69
Batopilas Min.	1⅛
Bethlehem Steel	72⅝
Butte & Superior	24
Butte Cop. & Zinc	10¼
Cerro de Pasco	35
Chile Cop.	18¾
Chino	39½
Colo. Fuel & Iron	43
Crucible Steel	55½
Crucible Steel, pf.	89
Dome Mines	10¼
Federal M. & S.	10
Federal M. & S., pf.	38
Great Nor., ore ctf.	29¾
Greene Cananea	49⅞
Gulf States Steel	71
Homestake	89
Inspiration Con.	55⅛
International Nickel	30⅛
Kennecott	33⅞
Lackawanna Steel	75
Mexican Petrol	117½
Miami Copper	28¾
Nat'l Lead, com.	57½
National Lead, pf.	103
Nev. Consol.	19⅝
Ontario Min.	7⅝
Ray Con.	24⅛
Republic I. & S., com.	87
Republic I. & S., pf.	99½
Sloss-Sheffield	52
Tennessee C. & C.	16⅝
U. S. Steel, com.	107½
U. S. Steel, pf.	110½
Utah Copper	83
Va. Iron C. & C.	70

BOSTON CURB*	Oct. 8
Alaska Mines Corp.	‡.12
Boston Ely	.75
Boston & Mont.	.44
Butte & Lon'n Dev.	.14
Calaveras	.50
Chief Con.	3
Contact	‡.15
Corbin	.25
Cortez	.10
Crown Reserve	.15
Crystal Cop.	.45
Eagle & Blue Bell	2¼
First Nat. Cop.	1⅛
Houghton Copper	.35
Intermountain	‡.05
Iron Cap	18½
Mexican Metals	.26
Mines of America	.90
Mojave Tungsten	.07
Nat. Zinc & Lead	.10
Nevada-Douglas	.35
New Baltic	.75
New Cornelia	17
Oneco	.15
Pacific Mines	‡.35
Rex Cons.	.06
Yukon Gold	.87

SAN FRAN.*	Oct. 8
Alta	.03
Andes	.03
Best & Belcher	.01
Caledonia	.01
Challenge Con.	.03
Confidence	.07
Con. Virginia	.07
Gould & Curry	‡.01
Hale & Norcross	.01
Jacket-Cr. Pt.	.06
Mexican	‡.05
Occidental	.40
Ophir	.10
Overman	.01
Savage	‡.02
Sierra Nevada	.08
Union Con.	.07
Utah Con.	.01
Belmont	2.00
Jim Butler	.45
MacNamara	.24
Midway	.07
Mont.-Tonopah	.09
North Star	.03
Rescue Eula	.07
West End Con.	.97
Atlanta	.02
Booth	.02
Comb. Frac.	‡.02
Florence	.10
Jumbo Extension	.09
Kewanas	.02
Nevada Hills	.02
Nevada Packard	.20
Round Mountain	.16
Silver Pick	.02
White Caps	.10
Big Jim	‡.75
United Eastern	3.75

COLO. SPRINGS*	Oct.
Cresson Con.	4.75
Doctor Jack Pot	.03½
Elkton Con.	‡.04
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.53
Granite	.15
Isabella	.04
Mary McKinney	.07
Portland	.80
United Gold M.	.10
Vindicator	.37

BOSTON EXCH.*	Oct. 8
Adventure	.60
Ahmeek	76
Algomah	‡.15
Allouez	49
Ariz. Com., ctfs.	15
Arnold	.20
Bingham Mines	9½
Bonanza	.16
Butte-Balaklava	.25
Calumet & Ariz.	67
Calumet & Hecla	450
Centennial	11¾
Copper Range	47
Daly West	2¼
Davis-Daly	5
East Butte	10½
Franklin	4
Granby	79
Hancock	5½
Hedley	‡12
Helvetia	20
Indiana	.60
Isle Royale	25
Keweenaw	.70
Lake	5½
La Salle	3
Mason Valley	3½
Mass	4¼
Mayflower	2
Michigan	2½
Mohawk	55½
New Arcadian	1½
New Idria	13
North Butte	13½
North Lake	.40
Ojibway	75
Old Dominion	40
Osceola	55¼
Quincy	65
St. Mary's M. L.	50
Santa Fe	.60
Seneca	12½
Shannon	3½
Shattuck-Ariz.	‡14
So. Lake	1
So. Utah	.12
Superior	4½
Superior & Bost.	3¼
Trinity	2½
Tuolumne	.94
U. S. Smelting	43
U. S. Smelt'g, pf.	44
Utah Apex	1¾
Utah Con.	9½
Utah Metal	2
Victoria	2¼
Winona	1
Wolverine	21½
Wyandot	.50

N. Y. CURB†	Oct.
Big Ledge	
Butte & N. Y.	‡.75
Butte Detroit	‡.07
Caledonia	.47
Calumet & Jerome	
Can. Cop. Corpn.	‡2
Carlisle	‡2
Cashboy	.03
Con. Ariz. Sm.	1
Con. Coppermines	‡5
Emma Con.	‡.03½
Goldfield Con.	‡.20
Goldfield Merger	‡.01½
Greenmonster	‡
Hecla Min.	5
Howe Sound	‡4
Jerome Verde	
Louisiana	‡
Magma	‡32
Majestic	‡.18
Marsh	‡.03
McKinley-Dar-Sa.	.41
Milford	‡.75
Mother Lode	.34
Nixon Nevada	.35
Ohio Cop.	
Rawley	‡2
Ray Hercules	4
Richmond	‡.56
Rochester Mines	‡.33
St. Joseph Lead	‡14
Standard S. L.	.25
Stewart	.13
Success	.12
Tonopah	‡2
Tonopah Ex.	1
Tribullion	
Troy Arizona	.09
United Verde Ext.	‡37
United Zinc	‡1
Utica Mines	‡.08

TORONTO*	Oct.
Adanac	.09
Bailey	.03
Beaver Con.	.28
Chambers Ferland	.08
Coniagas	2.50
Hargraves	.02
Kerr Lake	5.75
La Rose	.43
Min. Corp. of Can.	2.25
Nipissing	8.37
Peterson Lake	.08
Temiskaming	.29
Wettlaufer-Lor.	‡.03
Davidson	‡.30
Dome Exten.	.17
Dome Lake	.10
Hollinger	4.75
McIntyre	1.37
Newray	.10
Porcu. Crown	.13
Teck-Hughes	.20
Vipond	.13
West Dome	.09

* Bid prices. † Closing prices. ‡ Last quotations.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	4 25	5 52	5 52	6 50	5 495	9 50
No. 12	4 30	5 57	5 57	6 55	5 545	9 55
No. 14	4.35	5.62	5.62	6.60	5.595	9 60
Black						
Nos. 18 and 20	4 80	6.32	6 32	7 40	6 295	9 80
Nos. 22 and 24	4.85	6.37	6.37	7.45	6.345	9 85
No. 26	4.90	6.42	6.43	7.50	6.395	9.90
No. 28	5.00	6.52	6.52	7.60	6.595	10 00
Galvanized:						
No. 10	5.25	6.97	6.97	....	6.845	....
No. 12	5.35	6.97	6.97	7.95	6.795	
No. 14	5 35	6 97	6 97	8 10	6 945	
Nos. 18 and 20	5.65	7.17	7.17	8.25	7.245	11 40
Nos. 22 and 24	5.80	7.32	7.32	8.40	7.295	11.55
No. 26	5.95	7.47	7.47	8.55	7.445	11 70
No. 28	6.25	7.77	7.77	8.85	7.745	12 00

STEEL RAILS—The following quotations are per gross ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$55.00	$38.00	$65.00	$38.00
Standard openhearth rails	57.00	40.00	67.00	40.00
Light rails, 8 to 10 lb	3.13½*	83.00	3.13½*	68.00
Light rails, 12 to 14 lb	3.09*	82.00	3.09*	67.00
Light rails, 25 to 45 lb	3.00*	75.00	3.00*	65.00

* Government price per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, 9/16-in. and larger	$3.90	$5 00	$4.50	$5,30	$6 70
Track bolts	4.90	6.25	5.50	Premium	8 00
Standard section angle bars	3.25	3.65	4.45	Premium	5 15

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$4.245	$5 25	$4.27	$4.27	$5 25	$5.50
Channels, 3 to 15 in.	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Angles, 3 to 6 in. ¼ in. thick	3.00	4.245	5 25	4.27	4.27	5.25	5.50
Tees, 3 in. and larger	3.00	4 245	5 30	4 27	4.27	2.55	5 50
Plates	3.25	4.495	9.00	4.52	4.52	5.50	6.50

STEEL SHEET PILING—The following price is base per 100 lb. f. o b Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4–5	$4.50

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
¾-in. and larger	$4.65	$5 65	$7.00	$5.57	$5.55	$7 15	$8.00
CONE HEAD BOILER							
¾ in. and larger	4 75	5 75	7 10	5 67	5 65	7 25	8 00
⅝ and 11/16	4 90	5 90	7 25	5 82	5 80	7 40	8 15
½ and 9/16	5 25	6 25	7 60	6 17	6.05	7.75	8 50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	List + 20%
Galvanized cast steel rigging	Net List
Bright plow steel	30%
Bright cast steel	17½%
Bright iron and iron tiller	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$5.75	$7 00	$7–7 25	$6.25	$8 00	$7 25
Assorted	5.90	7 00	7 15	6.40	8.25	7 50

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh

Iron bars	3.5c.	Steel bars	2.90c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
$0 12	$0 16½	$0 18	$0 18	$0 17	$0 16.

DRILL STEEL—Warehouse price per pound

	New York	St. Louis	Birmingham	Denver
Solid	16c.	14c.	15c.	15c.
Hollow.	24c.	25c.	.	26c.

PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Butt Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	44%	17%	¾ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

Lap Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

Butt Weld. Extra Strong Plain Ends

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

Lap Weld. Extra Strong Plain Heads

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
¾ to 3 in. butt welded	33%	43%	41 1%
3½ to 6 in. lap welded	15%	39%	37 1%

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
¾ to 3 in. butt welded	16%	28%	26.1%
3½ to 6 in. lap welded	3%	25%	23.1%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 5 and 5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$2 50*	List	$1 20	$1 65	$1 05	$3 00
Hot pressed hexagon	2.50*	List	1 00	1 50	85	3 00
Cold punched square	2 50*	List	75	1 25	1 00	2 00
Cold punched hexagon	2.50*	List	75	1.25	1.00	1.60

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	30%	45%	37%
Larger and longer up to 1 in. by 30 in.	15%	37%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York........ $2 50 Cleveland....... $3.00 Chicago......... $2 50

For cast-iron washers the base price per 100 lb. is as follows:

New York........ $5.00 Cleveland....... $4 00 Chicago......... $3 50

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tarfelt (14 lb. per square of 100 sq. ft.)	$64	$65
Tar pitch (in 400-lb. bbl.)	21	22
Asphalt pitch (in barrels)	40	45.50
Asphalt felt	72 50	77 20

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1 35	$1 60	$1 70	$1 95	$2 [illegible]5	$2 30
No. 2 grade	1 20	1 45	1 50	1 75	1 80	2 05

Asbestos asphalt-saturated felt (14 lb. per square) costs $5.35 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.20 per roll in carload lots and $2.45 for smaller quantities.

Shingles, red and green slate finish, cost $5.30 per square in carloads, $5.57 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul	$ 055	$0 11	$0 162
Cincinnati	.07275	.1361	.1834
Chicago	.07	.12	....
Kansas City	0786	.15	205
Seattle	09	17½	30
Los Angeles	074	139	213
New Orleans	15	19	29

LUMBER—Price per M in carload lots

	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Y. P.	Fir	Hemlock	Spruce	Y.P.	Fir
Boston	Gov't Prices plus Freight					
Cincinnati	$39 00	......	$38 00		$43.00	$42.00
Kansas City	38 00	40 50	$40.50	$38.50	43.00	42.50
Seattle	24 50	24 50	24.50	24.50	24.50	24.50
New Orleans	55.00			.	60.00	.....
St. Paul		52 00	48.00	48.00	...	60.00
Denver	43.00	35.50		.	......	40 00
Los Angeles	.....	40 00	...	....	......	45.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y.P.	Fir	Hemlock	Y P.	Fir
Boston	Gov't Prices plus Freight				
Cincinnati	$45 00		$41.00	$44.00	$40.00
Kansas City	45 50	$54 75	54.75	52.25	60 00
Seattle	24 50	24.50	24 50	24 50	24.50
New Orleans	49 00	.		65 00	......
St. Paul	62 50	45 00	43 00	....	48.50
Denver	43 25	34 50	34 50	35.00	33.00

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.50	$4.50	$4.75	$4.32	$5 75
Cut	4 00	5.40	....	4.47	6.40

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Current	One Month Ago	One Year Ago
New York	$3.35	$3.35	$2.22
Jersey City	2.99	2 99	2.16
Boston	3.59	3.00	2.77
Chicago	2.45	2 45	2.21
Pittsburgh	2.55	2.55	2.31
Cleveland	2.72	2.72	2.44
Denver	3.67	3.07	....

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.50	$13 50	$2.70	$2.45
Kansas City	22 00	20 00	2.20*	2 10*
Chicago	18 00	17.50	1.80	1.10
St. Louis	22 00	16.00	...	1.75
Boston	22 50	18.00	3.50	3.15
Dallas	16 50	.	....	.
San Francisco	20 00		.	2.15
St. Paul	24 00	18.00	1.50*	1.40*
New Orleans	20 00	..	.....	3 30
Cincinnati	14 20	.	.....	11.95‡
Denver	26 25	13.20	.....	2.40*
Los Angeles	25.00	..	.....	2 50†
Seattle	25.00		.....	2.50†

* 200-lb. barrels. † Per 180-lb. barrel. ‡ Per ton.

Note—Refund of 10c. per cloth bag, amounting to $2 per ton.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$1 91	$1 26	$2 10	$1.30	$2 05	$1 20
5-gal. cans	2.01	1.36	2.25	1.40	2.25	1.30

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14.00	14.50	13 25	13.50	14 00	13 00
25- and 50-lb. kegs	14.25	14.75	13 50	13.75	14.25	13.25
12½-lb. keg	14.50	15 00	13.75	14 00	14.50	13 50
5-lb. cans			15 75	15.50	16 00	15.50
1-lb. cans	.....			.	17.00	.....

MINING AND MILLING SUPPLIES

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2½-in	75c. per ft.
Common, 2½-in	40⅓ %

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0 60	$0.35	$0.30

Steam—Discounts from List

First grade 25% Second grade 30% Third grade.......40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	40+5%	35%
Chicago	45%	40+5%
Birmingham	35%	35%
Denver	40%	30%
Cincinnati	40–10%	40%

RAWHIDE LACING—40—5% off list

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft., ⅝-in., 6; ¾-in., 4⅓; 1-in., 3⅓; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200 ft. coils:

Boston	$0 34½	Denver	$0 35½
New York	36	Kansas City	34
Cincinnati	33¼	San Francisco	.32
Chicago	33	Seattle	.34
St. Paul	34	St. Louis	34

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	[illegible]
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	75

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Chrome brick	net ton	$175.00
Chrome cement	net ton	75.00
Clay brick, 1st quality fireclay	per 1000	50.00—$55.00
Clay brick, 2nd quality	per 1000	35.00— 40.00
Magnesite, raw	ton	30.00— 35 00
Magnesite, calcined	ton	32.00— 35.00
Magnesite, dead burned	net ton	32.00— 35 00
Magnesite brick, 9 x 4½ x 2½ in.	net ton	110.00—125 00
Silica brick	per 1000	50.00— 60 00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade, $55; St. Louis grade, $40.
Birmingham—Fire clay, $55–60; silica, $55–60.
Chicago—Second quality, $25 per ton.
Denver—Silica, $35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	1.33	1 18
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2 70	1.92

Prices per tie at Missour mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Red Oak Treated A Grade 6x8x8	
No. 1	$0.59	No. 1	$0.36
No. 2	.77	No. 2	.53
No. 3	.90	No. 3	.72

7x9x8 treated white oak	1.05
7x9x8 treated red oak	.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	$0.58	$0.65	$0.30	$0.27
Pure destructively distilled pine oil	.58	.52	.30	.....
Pine tar oil	.35	.34	.24½	.19
Crude turpentine	.45	.60	.44	.38
*Hardwood creosote, sp. gr. 0.96-0.99	.23	.....	.34½	.31

* F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13 00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	$52.00	$58 00
Chicago	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder*
New York	......	$0.28½	$0.35½	....	$2.50
Boston	$0.25¾	.28¼	.35¼	.42¾	2.50
Cincinnati	.19¾	.23¾	.29¾	....	2.45
Kansas City	.21½	.27¾	.34¾	.44¾	2.55
Seattle	......	.25½	.32½	....	....
Chicago	.19¾	.23¾	.34	.44	2.45
St. Paul	.20	.27¾	.34¾	....	2.45
St. Louis	.20	.27½	.34½	.44½	2.35
Denver	.18¾	.26	.33	.43	2.55
Dallas	.24	.31¼	.38¼	.48¼	....

CHEMICALS

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 44c.; Chicago, .31½c.; St. Louis, 35c.

SODIUM SULPHIDE—In New York the price per pound is 8½c. for concentrated, 4½c. for crystals. The St. Louis price is 9½c. for concentrated, 20c. for fused; the Chicago price is 7½c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb.; Chicago 16c.; Denver, 14c. f.o.b. Pueblo; St. Louis, 16c.

ALUMINUM DUST—Chicago price is $1.65 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drums Per Drum
East of the Mississippi, North of Chattanooga	$106 00	$101.00	$1.52
Southeastern portion U. S. A.	115 50	110.50	1.63
Texas (except El Paso)	124 00	119.00	1.74
El Paso, Texas	126 00	121 00	1 77
Denver, Colo.	124 00	119 00	1 74
West Coast	129.00	124 00	1 81

Engineering and Mining Journal

October 19, 1918

Volume 106

Number 16

GENERAL VIEW OF UNITED VERDE EXTENSION PLANT

The United Verde Extension Mining Company's Smeltery and Converter Plant

BY F. E. NICHOLS*

A description of a notable Arizona plant of modern design and recent construction. The blast-furnace has a capacity of 600 tons per day, and the plant includes reverberatory furnaces, roasting furnaces, and converters. Pulverized coal was introduced into Arizona at this installation. Converter and blast-furnace gases are discharged into dust chambers, and provision is made so that the Cottrell process can be installed later if a material increase in plant capacity is desirable.

THE starting of the new smeltery of the United Verde Extension Mining Co. supplies further proof, if such were needed, of Arizona's undoubted copper supremacy. The new plant is not at present one of the largest copper smelteries, but, in carrying out the design, careful provision has been made to permit future extension.

The major units of the plant comprise one 48 in. x 26 ft. 8-in. blast furnace; two 25 ft. x 120 ft. reverberatory furnaces; six 21 ft. 6-in. six-hearth Wedge roasting furnaces, and three 12-ft. converters of the Great Falls type. Around these units have been grouped various items of structural, mechanical and electrical equipment designed to produce high efficiency in handling the materials to be treated. The smeltery is in the Verde Valley about 3½ miles from Clarkdale, Ariz., and a town site has been laid out near by to accommodate the employees.

The ore from the mine is dumped into receiving bins of 1500 tons' total capacity. These are of bunker type and constructed of steel. A 30-in belt conveyor takes the ore to the crushing and sampling plant, a flow sheet of which is shown in Fig. 1. It will be noted that a secondary unit is installed to sample the fines separately. After sampling, a 24-in. belt conveyor takes the coarse material to the coarse bedding bin, and a 20-in. belt conveyor carries the fine material to the fines bedding bin. These bins are of reinforced concrete construction. The capacity of the fines bin is 5000 tons, and that of the coarse bin 5300 tons, the latter figure including space for about 850 tons of silica. A 30-in inclined conveyor take the coarse ore from the bedding bin into the blast-furnace building. A 24-in. conveyor on eac side of the furnace receives the ore and drops it int bins, from which it is drawn into charge cars. Th gates under the blast-furnace bins are operate pneumatically. A charge car, similar to the cars use by the Calumet & Arizona Mining Co., at Douglas, Ariz. serves each side of the furnace. The bottoms of the cars are at an angle of 45°, thus allowing the materi to slide into the furnace by lifting the door of the ca The cars rest upon track scales while receiving the charge of ore or coke. Coke bins are placed adjace

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*With A. G. McGregor, constructing engineer, Warren, Arizona.

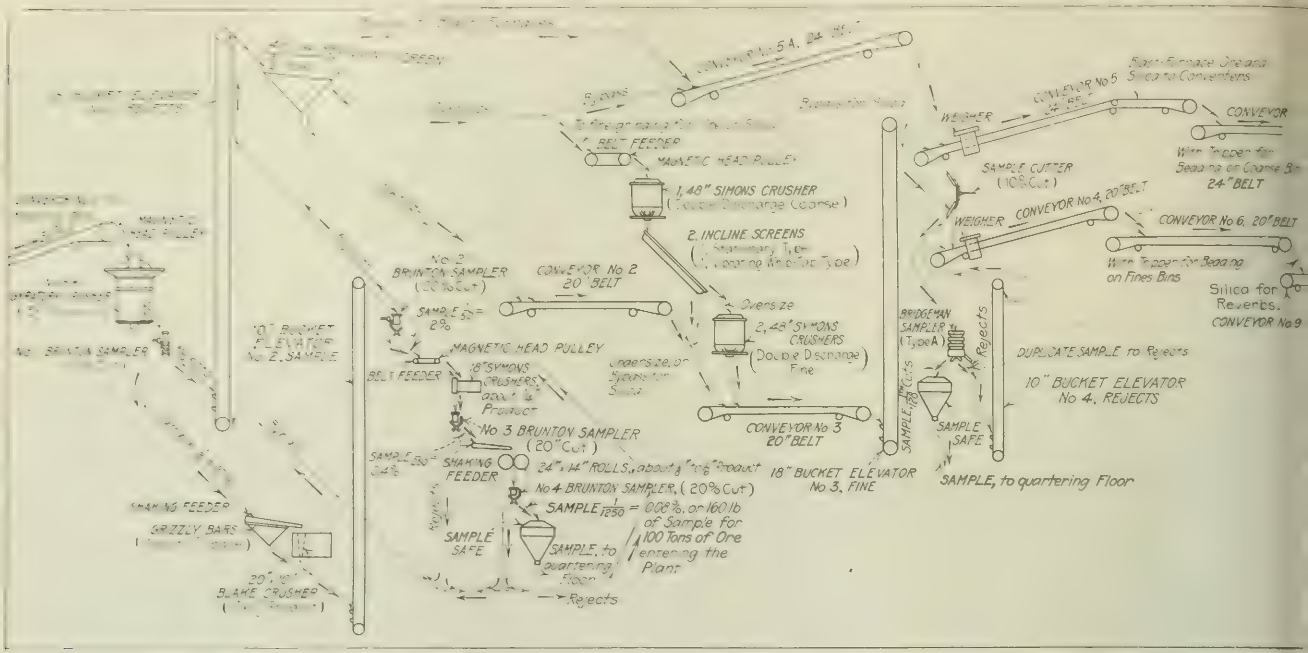
CONVEYOR No 5A, 24" BELT
Blast-Furnace Ore and Silica to Converters
CONVEYOR No 5 24" BELT
WEIGHER
CONVEYOR
With Tripper for Bedding on Coarse Bin 24" BELT
SAMPLE CUTTER (10% Cut)
BELT FEEDER
MAGNETIC HEAD PULLEY
1, 48" SIMONS CRUSHER (Double Discharge Coarse)
2, INCLINE SCREENS
WEIGHER
CONVEYOR No 4, 20" BELT
CONVEYOR No 6, 20" BELT
With Tripper for Bedding on Fines Bins
Silica for Reverbs.
CONVEYOR No 9
No 2 BRUNTON SAMPLER (20% Cut)
CONVEYOR No 2 20" BELT
SAMPLE 1/50 = 2%
Oversize
2, 48" SYMONS CRUSHERS (Double Discharge) Fine
BRIDGEMAN SAMPLER (Type A)
Rejects
DUPLICATE SAMPLE to Rejects
10" BUCKET ELEVATOR No 2, SAMPLE
BRUNTON SAMPLER
MAGNETIC HEAD PULLEY
BELT FEEDER
18" SYMONS CRUSHERS
Product
No 3 BRUNTON SAMPLER (20" Cut)
CONVEYOR No 3 20" BELT
10" BUCKET ELEVATOR No 4, REJECTS
SAMPLE SAFE
SAMPLE 1/250 = 0.4%
SHAKING FEEDER
24" x 14" ROLLS
18" BUCKET ELEVATOR No 3, FINE
SAMPLE, to quartering Floor
No 4 BRUNTON SAMPLER, (20% Cut)
SAMPLE 1/1250 = 0.08%, or 160 lb of Sample for 100 Tons of Ore entering the Plant
SHAKING FEEDER
GRIZZLY BARS
SAMPLE SAFE
SAMPLE, to quartering Floor
Rejects
BLAKE CRUSHER

FIG. 1. FLOW SHEET OF CRUSHING, CONVEYING, AND SAMPLING OPERATIONS

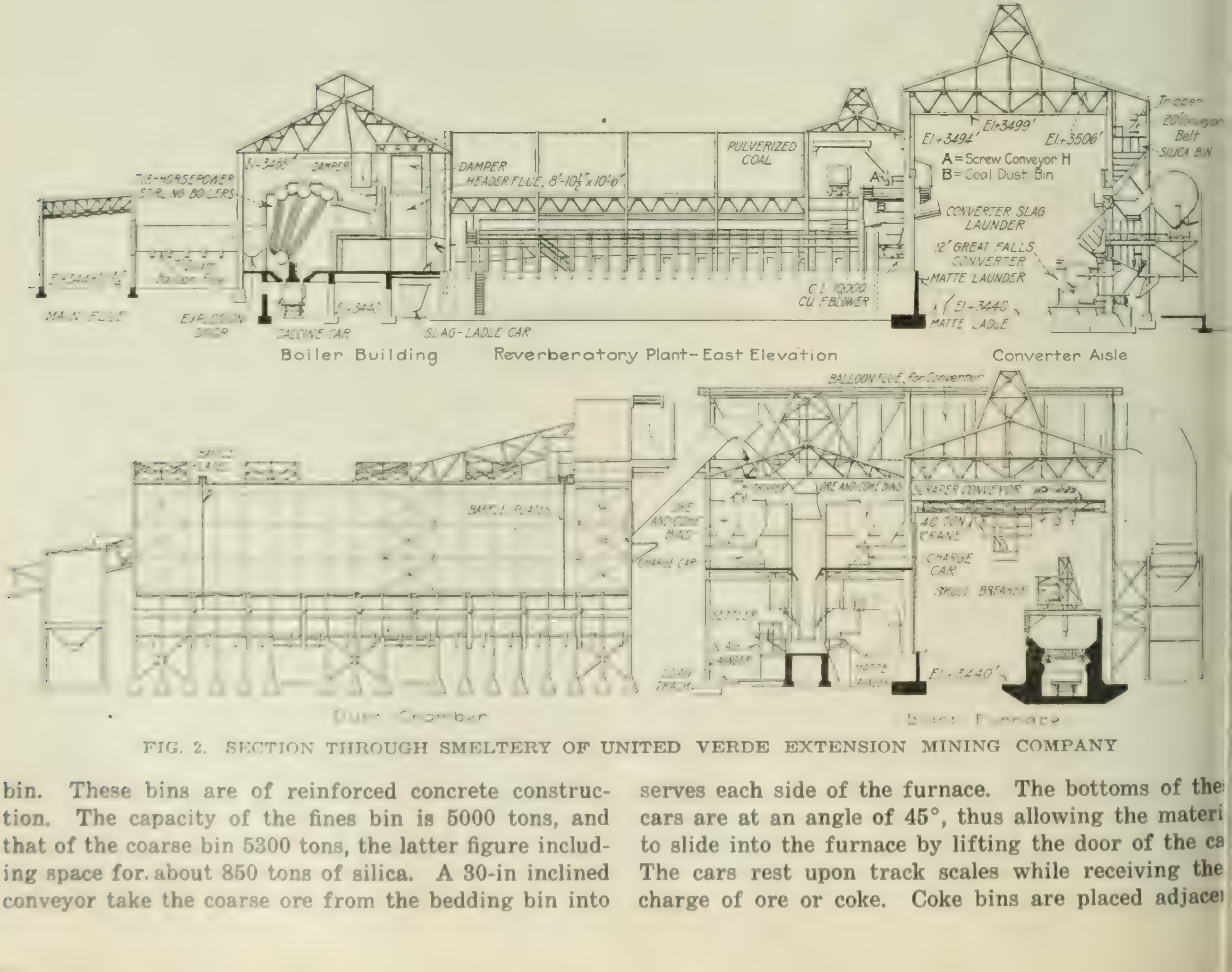

FIG. 2. SECTION THROUGH SMELTERY OF UNITED VERDE EXTENSION MINING COMPANY

o the ore bins, and the coke is brought to them by he same conveyor system used for the ore.

The blast furnace is 48 in. x 26 ft. 8 in., and its ormal capacity is 600 tons per day. The molten prodct is tapped into one of two settlers at each end of he furnace. The slag is handled by electrically tilted ars of 225 cu.ft. capacity, drawn by 24-ton electric ocomotives. A 24-in. belt conveyor takes the fines to he roasting plant from the bedding bins. After being alcined, electric calcine cars of 15 tons' capacity take hem to the reverberatories. These cars, similar to hose used by the International Smelting Co., at Miami, Ariz., are fitted with a special intake sleeve, hand operated, insuring a dust-tight connection with the spout from the roaster calcine bin. A similar mechanism is fitted to the charge hoppers serving the reverberatory furnaces, so that the fine calcines are transferred from roasters to reverberatories without loss.

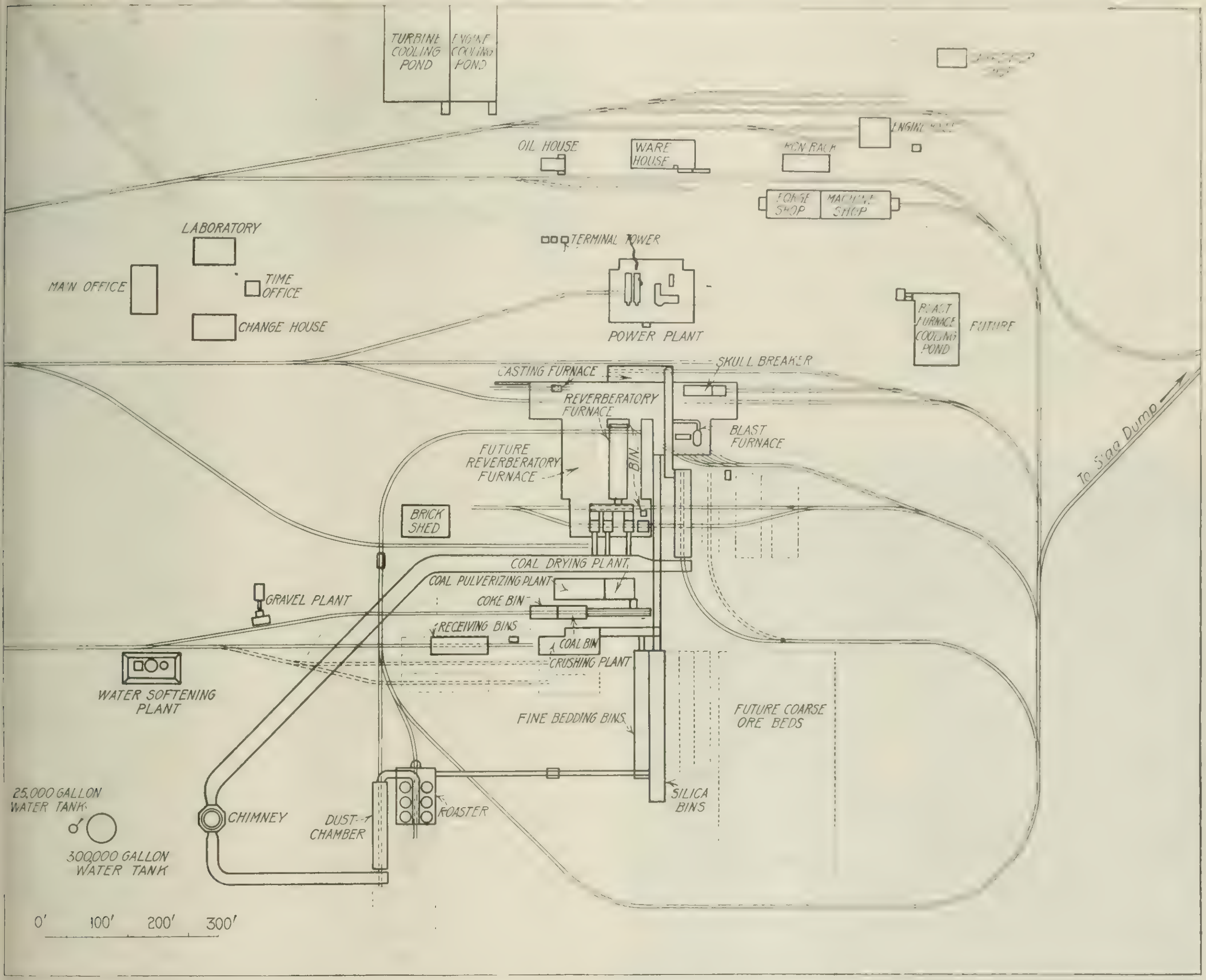

FIG. 3. GENERAL LAYOUT OF PLANT AND AUXILIARY EQUIPMENT

Each reverberatory furnace has a nominal capacity of 500 to 600 tons per day. The slag is handled in the same manner as the blast-furnace slag. The reverberatories are similar to the International Smelting Co.'s furnaces, except that they are coal-dust fired, thus introducing this method of firing into Arizona, where fuel oil has of late years been used exclusively. The coal-crushing and -pulverizing equipment consists of a 24-in. Jeffrey single-roll crusher, a Fuller-Lehigh indirect-fired rotating drier, and a battery of four 42-in. Fuller-Lehigh ball pulverizing mills. From the coal crusher to the reverberatories the coal is conveyed by spiral-screw conveyors, the first three being 16 in. and the rest 14 in. Three bucket elevators are also used.

In the converter plant, a 40-ton electric traveling crane, with two auxiliary hoists, serves the converters and the copper-casting machine. The cross-sectional drawing (Fig. 2) shows the overhead silica bins, with their convenient spouts. A straight-line copper-casting machine will be a feature of the equipment. The McGregor skullbreaker that has been installed is about the same as that described on p. 762, Vol. 97, of the *Engineering and Mining Journal.*

The converter and blast-furnace gases are discharged into a dust chamber, 1400 sq.ft. in section and 144 ft. long, elevated above the ground to permit the accumulated dust to be drawn directly into cars. From here the gases enter the main flue (brick), which is 16 ft. x 20 ft. at that point. The flue enlarges to 25 ft. x 20 ft., and is joined by the flues from the waste-heat boilers and reverberatory furnaces. The total length of the main flue is 976 ft. 6 in. The roaster gases are treated in a separate dust chamber, 1000 sq.ft. in section and 144 ft. long, and then discharge through a

16 ft. x 16-ft. brick flue 360 ft. long, leading to the stack. The latter is of brick construction, 425 ft. high and 30 ft. inside diameter at the top, and stands on a hill behind the plant which is 110 ft. higher than the main building floor. No Cottrell dust-collecting systems have been employed in the initial installation, for the reason that it was thought best to equip the plant with large flues to permit ample future extension should it become desirable. For the present smelting capacity, the large flues provide ample dust-settling facilities. The plant is laid out so that when it becomes expedient materially to increase its capacity Cottrell dust-collecting systems can be readily installed.

As is now usual, the reverberatory waste heat is utilized in generating steam. Three Stirling waste-heat boilers, of 713 rated hp. each, have been installed. In addition to these there are two Stirling direct-fired boilers of 439 rated hp. These are fired with pulverized coal. The steam from the boilers is taken to the power plant through a 10-in. steam loop. The power plant building, which is of brick and steel construction and 104 ft. x 234 ft. in plan, contains the following main units: Two 2200-volt turbo generators for power for the mine and smeltery—one of 1000 kw., the other of 1500 kw. capacity; two 200 kw. motor-generator sets for direct current for the plant; two units, each consisting of a Roots 400 cu.ft. blower, direct connected to a tandem compound Allis-Chalmers engine, for the blast-furnace air; and two Allis-Chalmers 18,000 cu.ft. blowing engines for the converter air. Surface condensers with Volz heaters are used throughout. The engine spray cooling pond, 78 ft. x 160 ft., is separate from the turbine cooling pond, which is 110 ft. x 160 ft. Water is obtained on the site from wells at a depth of 100 ft. and is pumped into a 300,000-gal. concrete tank on the hill above the works. That used for power plant and cooling ponds is treated to reduce hardness.

CONVERTER AISLE

The plant has a brick and steel shop building, at one end of which are erected the machine shop tools, which consist of a 30-in. x 24-ft. lathe, 14-in. x 8-ft. lathe, 24-in. Aurora drill press, 6-ft. radial drill press, 30-in. open-side planer, 20-in. back-geared shaper, 58-in. 150-ton wheel press, a large and a small pipe machine, and a bolt cutter. The plate shop at the other end of the building contains a slip-roll former, a 30-in. punch and shear, and a 1100-lb. steam hammer. The carpenter's shop is in a separate building and is equipped with wood-working machinery. There is also a warehouse 50 ft. x 112 ft. in dimension. A separate structure contains the lubricating-oil tanks. The locomotive shed has two pits and is 50 ft. x 50 ft. A shed for storing brick has been built near the reverberatory plant. The administration buildings are of brick construction and comprise a general office, 44 ft. x 80 ft.; a laboratory, 44 ft. x 70 ft.; a change house, 44 ft. x 70 ft.; and a check or time-card office, 24 by 24 feet.

BEDDING BINS

A. G. McGregor and his staff, of Warren, Ariz., designed the plant. T. A. Stiles was superintendent of construction, assisted by R. W. Kerns. Barry Hogarty is the smeltery superintendent, and George Kingdon is general manager for the company.

Crude Petroleum in 1917

The world's production of crude petroleum in 1917 is given in the following table, which has been prepared by J. D. Northrop, of the U. S. Geological Survey:

WORLD'S OUTPUT OF CRUDE PETROLEUM IN 1917

Country	Production		
	Barrels of 42 Gal.	Metric Tons	Per Cent of Total
United States	(a) 335,315,601	44,708,747	66.98
Russia	(b) 69,000,000	9,418,509	13.78
Mexico	55,292,770	8,264,266	11.04
Dutch East Indies	(c) 12,928,955	1,778,495	2.58
India	(b) 8,500,000	1,133,333	1.70
Galicia	5,965,447	(d) 829,629	1.19
Japan and Formosa	2,898,654	386,487	0.58
Rumania	2,681,870	(b) 373,000	0.54
Peru	2,533,417	337,789	0.51
Trinidad	1,599,455	222,456	0.32
Argentina	1,144,737	168,340	0.23
Egypt	1,008,750	134,500	0.20
Germany	995,764	(b) 140,000	0.20
Canada	205,332	27,378	0.04
Italy	50,334	(b) 7,000	0.11
Other countries	(b e) 530,000	70,667	
Total	500,651,086	68,000,596	100.00

(a) Quantity marketed. (b) Estimated. (c) Includes British Borneo. (d) Estimated in part. (e) Includes 19,167 bbl. produced in Cuba.

Remember the Comfort Fund of the 27th Engineers.

The Dangers of Paternalism in Government*

THE qualities, conduct and achievements of our Army are the just admiration of our comrades in arms, as they are the just pride of America. Wherever American troops have fought thus far, they have either held the line or advanced, but never gone back. Our young Army has been tested in many a battle, and wherever it has fought it has proved itself a worthy custodian of American honor and a zealous artisan of American glory.

Now, gentlemen, what is the underlying cause for the phenomenon that our boys, taken from the most diversified walks of life, brought up in surroundings and in a spirit which are the very negation of martial disposition, became in an incredibly short space of time soldiers of first-rate efficiency; that our business men, farmers, mechanics, college boys are making competent, indeed excellent, officers; that our West Pointers, taken from small Army posts or office positions in Washington, were found qualified generally not only to command large bodies of troops, but that among them were discovered men fitted, when the emergency arose, to plan and execute the business undertakings of war on a stupendous scale with a high degree of organizing and administrative ability (even though these men would be the last to dispute that a considerable share of the credit for the results accomplished is due to those who, at the very start of the war, eagerly volunteered from civil life)?

I have heard this debated a good many times lately both in England and France, and the consensus of replies is this: "You in America have always been a nation of private enterprise and individual initiative. You have had no caste, or fixed class, either aristocratic or bureaucratic. You have given almost unlimited, perhaps too unlimited, scope to ambition, ability, force, imagination, hard work. You had a healthy skepticism of governmental capacity to do things well.

"Under the stimulus of these conditions, you have produced a race—daring, keen, quick-witted, adaptable, self-reliant. The American of today, as we see him in the officers and men of your forces and in the business men we have met, is the product of generations of sturdy individualism."

The Frenchman would point out that France has had experience of bureaucracy, governmental centralization and paternalism for several generations. That system had lamed enterprise, atrophied commercial daring, retarded the development of the country.

In Russia, bureaucracy and paternalism, plus weak, corrupt and inefficient autocracy, had led to revolution, chaos and anarchy.

In Germany, bureaucracy and paternalism, plus militarism and junkerism, had resulted in bringing untold misery upon the world at large and inevitable disaster in the end to the German people.

In short, my French interlocutors would coincide that whenever, wherever and however the system of governmental omnipotence had been tried, it had failed in a greater or lesser degree; that France had given it a sufficiently long test to be weary of it, and that after the war the tendency of the French people would be to turn more toward individual effort and to stimulate personal initiative.

On the other hand, it cannot be gainsaid that there are a good many persons in France, as in Great Britain and America, who firmly believe that the era of individualism, or, as they prefer to call it, capitalism, has come to an end, and that an entirely new kind of social structure will be reared after the war. They are very active, zealous and eager, these militant preachers of a new day. They possess the fervor of the prophet allied often to the plausibility and cunning of the demagogue. They pour the vials of scorn and contempt upon those benighted ones who still tie their boat to the old moorings of the teachings of history and of common sense appraisal of human nature. And being vociferous and plausible, they are unquestionably making converts. They are offering the vista of a catching program to the popularity-seeking politician. They are perturbing the minds of a good many who honestly seek—as every right-minded man should—to bring about a better and more justly ordained world. They have not been without producing a certain effect even in high places.

Nothing is easier than to start, nothing moves faster when once started, than economic fallacies. Nothing is harder than for sober, unvarnished truth, loaded down with the weight of the realities of existence, to catch up with those fallacies. It invariably does in the end, but meanwhile the fallacies, on their long start and rapid flight, may have wrought vast harm, as we have recently seen exemplified in Russia. We hear a good deal nowadays of "the war after the war." That discussion, to an extent, it seems to me, is premature.

A REAL "WAR" AFTER THE WAR

But there is one "war after the war" for which the lines are now being drawn, and which, indeed, the attacking party has already started, although it was the country's general understanding that, until the war against our external enemy is won, internal conflicts should be postponed: That is the war of the motley army—ranging from the American variety of destructive Bolsheviks in various gradations to self-seeking demagogues, well-meaning utopianists, intolerant and impetuous young writers strong in the assured consciousness of their mental and moral superiority, iconoclast theorists, and, alas! too often, overworked, underpaid and consequently somewhat acidified college professors and other teachers—against those who believe that the accumulated wisdom of centuries of human experience is wisdom still, and who see in individualism, ordered, enlightened, progressive, sympathetic and adjusted to the changing needs and social conceptions of the age, the soundest and most effective instrument for the advancement and the happiness of humanity.

When I speak of individualism, I do not mean the harsh doctrine of the so-called Manchester school of the nineteenth century, which, with a somewhat naïve faith in the automatic and beneficent self-regulation of human forces, bade the individual to exploit his opportunities to the unrestrained limit of his strength, and the devil take the hindmost. The individualism to which I adhere spells neither reaction nor greed, selfishness, class feeling or callousness. No less than those who carry their hearts visibly aching for the people and aflame against their oppressors, into magazine articles, political assemblies and upon lecture platforms—no less than they are we desirous for the well-being and contentment of the masses of the people.

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*An address, very slightly condensed, delivered before the convention of the American Bankers' Association, at Chicago, Sept. 27, 1918, by Otto H. Kahn, of the firm of Kuhn, Loeb & Co., of New York.

INCENTIVE TO EFFORT

The individualism we believe in gives incentive to every man to put forth his best effort, while at the same time it recognizes fully the right and the duty of the state to impose upon business reasonable supervision, restraints, and regulations; to take measures destined to raise the general level of popular well-being; to protect particularly those least able to protect themselves; to prevent exploitation and oppression of the weak by the strong, and to debar privilege and unfair or socially harmful practices. And we further believe that in addition to and over and above the limitations imposed by the state there are restraints which a man's conscience should impose upon his actions in affairs. It is not enough to be "law-honest" or "money-honest."

I am far from saying that material reward is the only incentive to business effort, but experience has shown and common sense observation confirms that, excepting such callings as men take up because of an "inner urge," from a natural bent or altruistic motives, or because they desire primarily position, public office, or political power, the vast majority of people require, in order to put forth the maximum of effort and of venturing, an incentive largely, though not solely, of a tangible kind. In an emergency, of course, at the call of the country, every right-thinking man will not only forget all thought of reward, but will be ready for every sacrifice. He will work and strive fully as hard as and far harder than he would for his personal advantage, and spend himself without limit, from motives of patriotism or public spirit.

CONFISCATION OF BIG INCOMES WILL NOT SUPPORT THE WAR

Individualism frankly denies that the world can be run on a theory which presupposes the existence of mental, moral and physical equality between men. Equality before the law, equality of political rights, —equality of opportunity, as far as humanly possible—yes. But an inscrutable Providence has bestowed upon His creatures, animate as well as inanimate, inequality of natural endowment, and from that springs and must necessarily spring inequality of results.

Do you realize that if all incomes above $100,000 were confiscated, as has been urged by some, the resulting sum would barely cover our war expenditures for one month? Do you know that if all incomes above even $10,000 were taken and distributed among those earning less than $10,000, the result, as far as I can figure out, would be that the aggregate income of those receiving that distribution would be increased barely 6 per cent.?

I have complete confidence in the sober common sense of the American people. I believe that when they have been placed in possession of adequate information, when the pros and cons of a proposition have been fully discussed before them and by them, they can always be relied upon to reach sound conclusions. The menace which I see is not in the deliberate will of the people, but in the fact that under the emotional stress of war, under the patriotic impulse of the time, under the actual or fancied necessity of the war situation, tendencies are tolerated and modes of thought and action permitted to gain a footing unopposed, which are apt to create very serious problems upon the return of normal conditions.

In what I am going to say I wish very distinctly and earnestly to disclaim any intention of criticizing our present Government. It would be most unbecoming and improper to do so before this non-partisan gathering, in which politics can have no place. What I mean to bring out is not any sins of omission or commission of the present Administration, but unavoidable frailties and shortcomings which are inherent in the very essence of all government and which emphasize the need, particularly in a democracy, of confining the business functions of government to activities which private enterprise cannot undertake equally as well as or better than the state, or which, in the interest of the maintenance of free institutions, private enterprise should not be permitted to undertake.

Liberty necessarily limits governmental efficiency. That is part of the price which we pay for freedom. We do not begrudge the price. We are prepared to pay any price for the supreme blessing of being free men—if necessary, even the price of our very lives, as many of those did who procured for us the great legacy of liberty. But why unnecessarily bid up the price against ourselves by extending the scope of governmental activities beyond the field which naturally belongs to them?

GOVERNMENT THE NEGATION OF COMPETITION

Government, in its very essence, is the negation of competition. It is, by the very fact of its being, whatever its name or kind, the monopoly of monopolies. It cannot but be affected with those shortcomings which spring from the absence of competition and the exercise of monopoly. Why, then, should a people which rightly discountenances monopoly and rightly believes in the principles of competition, enlarge the operations of governmental agencies further than is required for the recognized purposes which a free government is meant to serve?

I do not fail to recognize that, certainly during the period of reconstruction, and probably more or less permanently, both here and in Europe, the scope of state activities is bound to increase and must concern itself with and intercede in matters which heretofore were left entirely to private enterprise. But this concern and intercession should be such as not to eliminate or lame private enterprise, but to make it more effective. Nor do I fail to recognize, but, on the contrary, I welcome unreservedly—as I am sure we all do—the prospect that in the times which will follow the profound pheaval of the war, the standard by which men will e judged and rewarded will be, more strictly, exactingly nd far-reachingly than heretofore, that of work done, uty performed, services rendered. The world will have o place for idlers and social slackers. Rank will reside ot in birth or wealth—neither, I trust, will it reside in n office-holding caste—but in useful achievement.

From governmental paternalism to socialism is not very long step. The menace, however, of bureaucratism and socialistic paternalism, with their insidious ffect upon the very fiber and marrow of the race, onfronts us now. While bureaucracy and efficiency can o together under an autocratic regime, it is impossible n the very nature of things for bureaucracy to go ogether with efficiency in a democracy. Nor, indeed, an paternalism and liberty exist side by side. Bureaucracy is either wasteful, stagnant and inefficient, or it is, as in Germany, ruthless in its methods, oppresive in its spirit and poisonous in its effect. It resents rogress, vision and innovation because these are disurbing and antagonistic to the very essence of its being —routine.

In our own case the soil for the growth of the noxious weeds which spring from the seed of bureaucracy is particularly fertile, for a variety of reasons. Washington is heavy with the atmosphere of politics, and is pervaded, as no other capital I know, with the pirit and the very flavor of things governmental. Fatal o the attainment of governmental efficiency of a high order is the custom of changing officials with a change of administration.

The Railroads

Individual enterprise has given us what is admittedly the most efficient railroad system in the world. It has done so while making our average capitalization per mile of road less, the scale of wages higher, the average rates lower, the service and conveniences offered to the shipper and the traveler greater, than in any other of the principal countries. It is true that in the pioneer period of railroad development, and for some years thereafter, numerous things were done, and although generally known to be done, were tolerated by the Government and the public, which should never have been permitted. But during the second administration and upon the courageous initiative of President Roosevelt these evils and abuses were resolutely tackled, and a definite and effective stop was put to most of them. Means were provided by salutary legislation, fortified by decisions of the Supreme Court, for adequate supervision and regulation of railroads. The law enacted under President Roosevelt's administration was not allowed to stand for a sufficient length of time to test its effects. The enactment of new railroad legislation in 1909, established, for the first time in America, paternalistic control over the railroads.

Hampered, confined, harassed by multifarious, minute, narrow, and sometimes flatly contradictory regulations and restrictions, state and Federal, that great industry began to fall away. Initiative on the part of those in charge became chilled; the free flow of investment capital was halted; creative ability was stopped; growth was stifled; credit was crippled.

The theory of governmental regulation and supervision was entirely all right. No fair-minded man would quarrel with that. But the practical application of that theory was wholly at fault and in defiance of both economic law and common sense. It was bound to lead to a crisis. It is not the railroads that have broken down—it is our railroad legislation and commissions which have broken down. The Government, in the emergency of war, probably wisely, and, in view of the prevailing circumstances, necessarily, has assumed the operation of the railroads. The Director General of Railroads, rightly and courageously, proceeded to do immediately that which the railroads for years had again and again asked in vain to be permitted to do—only more so. Freight rates were raised 25%, passenger rates 50%, many wasteful and needless practices heretofore compulsorily imposed were done away with. The whole theory under which intelligent, effective and systematic coöperation between the different railways had formerly been made impossible was thrown into the scrap heap.

The question of the disposition to be made of the railroads after the war is one of the most important and far-reaching of the post-bellum problems which will confront us. My concern is not for the stock and bond holders. They will, I have no doubt, be properly and fairly taken care of in case the Government were definitely to acquire the railroads. Nor do I speak as one who believes that the railroad situation can be restored just as it was before the war. The function, responsibility and obligation of the railroads as a whole are primarily to serve the interests and economic requirements of the nation. The disjointed operation of the railroads, each one considering merely its own system (and being under the law practically prevented from doing otherwise), will, I am sure, not be permitted again.

The American System

The relinquishment of certain features of our existing legislation, the addition of others, a more clearly defined and purposeful relationship of the nation to the railroads, involving among other things possibly some financial interest of the Government in the results of railroad operations, are certain to come from our experiences under Government operation and from a fresh study of the subject, in case the railroads, as I hope, are returned to private management. Personally I believe that in its underlying principle, the system gradually evolved in America, but never as yet given a fair chance for adequate translation into practical execution, is an almost ideal one. It preserves for the country, in the conduct of its railroads, the inestimable advantage of private initiative, efficiency, resourcefulness and financial responsibility, while at the same time, through governmental regulations and supervision, it emphasizes the semi-public character and duties of railroads, protects the community's rights and just claims, and guards against those evils and excesses of unrestrained individualism which experience has indicated.

It is, I am profoundly convinced, a far better system than government ownership of railroads, which, wherever tested, has proved its inferiority, except, to an extent, in the Germany on which the Prussian Junker planted his heel and of which he made a scourge and a horrible example to the world; and the very reasons which have made state railways measurably successful in that Germany are the reasons which would make Government ownership and operation in America a menace to our free institutions, a detriment to our racial characteristics and a grave economic disservice.

I have spoken of the treatment of our railroads in the past 10 years as "punitive paternalism." In some respects this same term may be applied to our existing and proposed war taxation. It penalizes success. It penalizes thrift practiced in the past and discourages it for the present. It penalizes certain callings and sections of the country and favors others. In some provisions it may be said almost to bear the earmarks of vindictiveness.

My criticism does not refer to the proposed 80% war profits tax. Indeed, I have from the very beginning advocated a high tax on war profits.

The Principles of Taxation

Among the principles of correct and effective taxation, which are axiomatic, are these:

1. No tax should be so burdensome as to extinguish or seriously jeopardize the source from which it derives its productivity.

2. In war time, when the practice of thrift is of more vital importance than ever to the nation, one of the most valuable byproducts which taxation should aim to secure is to compel reduction in individual expenditures.

3. Taxation should be as widely diffused as possible, at however small a rate the minimum contribution may be fixed, if only to give the greatest possible number of citizens an interest to watch governmental expenditure and an incentive to curb governmental extravagance.

It may safely be asserted that our war taxation runs counter to every one of these (and several other) tested principles. While in the case of the rich we discourage saving by the very hugeness of our taxation, or make it impossible, we reach the same undesirable result by opposite means in the case of those with more moderate incomes. The enormous preponderance of saving which could and should be effected does not lie within the possibilities of the relatively small number of rich people, but of the huge number of people with moderate incomes. Moreover, while the rich, in consequence of taxation, limitation of profits, etc., have become less able to spend freely since our entrance into the war, workingmen and farmers, through increased wages, steadier employment and higher prices of crops, respectively, have become able to spend more freely. Workingmen are in receipt of wages never approached in pre-war times, many of them making incomes a good deal higher than the average professional man, while the profits of business, generally speaking, are on a declining scale and certain branches of business have been brought virtually or even completely to a standstill.

The Distribution of Incomes

Of our total national income, estimated at, say $40,000,000,000 annually, it is safe to say that not more than $2,000,000,000 goes to those with incomes of, say $15,000 and above, while $38,000,000,000 goes to those with lower incomes. Yet we decline to employ one of the most effective means to compel saving, namely, consumption and similar taxes such as every other belligerent nation without exception has imposed. I know it is not popular to say things in criticism of war burdens of a financial nature. One's motives are liable to be misunderstood or misinterpreted, and he is very apt to have it scornfully pointed out to him how small relatively is the sacrifice asked of him, compared with the sacrifice of position, prospects, and life itself, so willingly and proudly offered by the young manhood of the land. It is a natural and effective rejoinder, but it is not a sound or logical one.

Heaven knows, my heart goes out to our splendid boys, and my admiration for their conduct and achievements and my reverence for the spirit which animates them knows no bounds. But I am acquainted with hundreds of business men who bemoan their gray hair and their responsibilities, which prevent them from having the privilege of fighting our foe arms in hand. And I know no American business man worthy of the name who would not willingly give his life and all his possessions if the country's safety and honor required that sacrifice.

But to win the war and to deal with the problems incident to and resulting from it, bravery and patriotic devotion alone are not sufficient. Reason must check emotion, reflection must curb impulse. The effort of sober thought is called for, and the moral courage to speak one's convictions, provided they are those of a loyal American. It is easy to float with the prevailing surface currents of the day, and tempting to attune one's utterances to sentiments which are sure to meet with popular applause. But the value of an exchange of opinions lies in the difference of views honestly held and presented. It is through free discussion, through the meeting of conflicting opinions in the public forum, that the truth is sought and ascertained in a republic.

Paternalism a Real Danger

The picture of bureaucratic paternalism fastening its shackles upon a nation which went to war to preserve liberty is not a fanciful one. Through the accident of war, paternalism at present rules supreme. That is inevitable in war time. The one and supreme task before the nation is to win the war. No personal or business consideration must be permitted to stand in the way of the necessities of that task, and no one must for one moment hesitate to submit to them.

We are not criticising or complaining of the present facts; we are thinking of the future. Officialdom is in possession. It is entrenched in power beyond what it dared to hope for in its fondest dreams. And power is sweet. Officialdom and those who feed at its table will not easily give it up. It is but human nature that they should come really to believe and endeavor to induce the people to believe that it is for the best to leave in the Government's charge permanently much of that which has been confided to it in the stress of the emergency of war.

Bureaucracy has, and will have, an array of plausible arguments to support its plea. Paternalism, under a variety of names and disguises, will have the support of the vast army of these who live or hope to live on its huge patronage. It will have the support of the popularity seeker, the opportunist and the demagogue, and of many who are rightly desirous to further social justice, but do not go to the effort of painstakingly studying and critically examining, in the light of reason and experience, the ways and means which are available to that end "without doing more harm than good."

The movement will be countenanced by many who do not sufficiently appreciate, in the face of the lessons of all history, ancient and modern, that the only free government which ever has lasted, or ever can last, was and is a government which gives the broadest scope to the individual, limited only by equally broad but wisely conceived regard for the general welfare.

Liberty means neither uniformity nor the rule of mediocrity. Liberty is strong enough and conscious enough of its strength not to fear but to foster individual capacity. If political liberty is not the sum of individual liberties, fairly ordered and reasonably restrained, it is not liberty at all.

It would be a tragedy if it were to be permitted that while our boys are fighting for liberty, the great and splendid structure of ordered and enlightened freedom and convenanted individual rights which was handed down to all Americans should be invaded by that most insidious foe of liberty, paternalism, with its allies and close relatives, bureaucracy and socialism. It would be a grievous affliction if under the emotional stress and turmoil produced by war, our people were to permit doctrines to take a footing on our soil which their sober wisdom heretofore has scornfully rejected as will-o'-the-wisps and as un-American. It would be bitter irony of fate if, while democracy triumphed on the bloody fields of war over that arch representative of the paternalistic system and spirit, Germany, our own governmental and social conceptions and practices were to be infected with the poison of paternalism and bureaucracy.

We must stand together, counsel with each other and work together. We must give voice to our convictions. We must become a militant phalanx in the cause of that which we profoundly believe to be right and wise and just, and making for the greatness of America and the happiness and welfare of her people. The problems of the immediate future loom large before us. That nation which will best know how to combine the dictates of social justice with incentive and protection to individual effort will secure the prize of world leadership no less than of opportunity, well-being and contentment for the masses of its own people.

Manganese Development in Virginia

By Marshall Haney*

War conditions have made it possible and profitable to reopen several manganese mines in Virginia, and many of the operators have realized good profits on small original investments in manganese properties. The old Paddy's Run mine, at present generally known as the Nelson, is situated on a conical-shaped hill in the southwest corner of Frederick County, a few miles from the postoffice of Star Tannery. The nearest shipping point is Capon Road, a station on the Baltimore & Ohio Ry., and 14 miles from the mine.

Old records show that the property was operated in 1832, although the length of operation and production at that time are unknown. Considerable development was done in 1882, and for a period of seven years the mine was actively worked and produced from 2000 to 3000 tons of ore ranging from 45% to 52% manganese. Over 1000 ft. of shaft and tunnel work was done, and this remains in a fair condition, owing to the formation and the fact that the workings are 150 ft. above the local water level. The formation belongs to the Paleozoic era, and the workings occur near the line between the Devonian and Silurian periods. The deposit is associated with what is locally known as flint limestone, which forms many small anticlines and synclines. The ore-bearing formations vary in thickness from two to twelve feet and the veins from a few inches to three feet.

After closing down in 1889, the property remained idle until 1915. Some prospecting by Charles M. Nelson confirmed his opinion that large quantities of high-grade ore could be profitably mined, so he reopened the mine in a small way, and by a one-horse operation shipped several carloads of ore of the following grades:

SORTED MANGANESE ORE PILED READY FOR SHIPMENT

ANALYSIS OF VIRGINIA NELSON MINE MANGANESE-ORE SHIPMENTS

	Per Cent				
Type	Moisture	Iron	Silica	Phosphorus	Manganese
Hard blue ore........	1.57	0.85	1.08	0.227	52.67
Fine soft blue ore.....	1.60	3.25	5.43	0.257	50.28
Hard black ore.......	1.58	3.25	7.05	0.226	48.34
Black ore	5.46	1.30	2.05	0.284	49.18
Fine soft black ore....	7.65	4.50	5.55	0.261	48.03

Early in 1917 the property was purchased by competent mining men, who have installed a complete plant at a cost of over $50,000 and are now shipping a large quantity of high-grade ore. Results accomplished at this old mine can be duplicated at many other places in the state. The manganese industry, under existing conditions, presents larger possibilities for quick returns on small original investments than any other branch of mining. In order to purchase requisite machinery, many of the small operators have been able to secure large advances on their ore in sight, and the present rate of development should soon materially relieve the shortage in manganese.

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*Consulting mining engineer, Geer, Greene County, Virginia.

Mining Men in the Service

CAPT. HARRY L. MEAD

CAPT. STEPHEN L. GOODALE

LIEUT. E. G. SNEDAKER

LIEUT. J. V. RICHARDS

Recording Accidents in Mines*

By ALBERT H. FAY

Accidents are considered from the statistical standpoint, and a plea is made for a more thorough standardization of records. Examples are quoted and tables given to show that fatal accidents are decreasing, in metal mines, whereas non-fatal accidents are increasing. It is pointed out, however, that labor turnover is not always taken into consideration, with the result that statistics from small operators are sometimes of doubtful value. The contention is advanced that greater attention to the details of recording mishaps in mines will lead to real progress in accident prevention and facilitate the compilation of a just and an equitable scale of insurances rates.

WHEN the U. S. Bureau of Mines began the collection of mine-accident statistics, in 1911, the data available concerning the non-fatal injuries in the mining industry were fragmentary and incomplete. Reports of fatal injuries were not as complete as they should have been, but sufficient data had been accumulated to identify the principal hazards. The returns first received and published showed what was then considered a high rate for non-fatal injuries, because there was nothing with which to compare it. In 1911 efforts were made to legislate into existence the Industrial Accident Commissions. The mining companies had not been accustomed to keeping complete records for either the state or Federal Government, and, in many cases, not even for their own use.

The recording of all accidents is absolutely necessary if there is to be a reduction in the number of accidents at mines. Detailed records will give the exact cause of the accident, and, knowing this, remedies will readily suggest themselves in most cases, and such records furnish the safety engineer a reliable mass of data from which he may formulate safety rules and regulations, advise the adoption of safety devices, and point out the advantages of safer methods of mining. To this end the Bureau prepared a form for keeping a record of accidents at mines. On this form is to be recorded the name of the injured person, the date of the accident, the cause, and whether or not the accident was fatal, and also, in non-fatal cases, the degree of disability, measured in days lost, due to the accident. A number of mining companies are keeping such data, and the returns which have been received indicate that the records are being prepared more carefully than was usually the practice in the past. They show an increase in the number of non-fatal accidents which is more apparent than real, because the industry is no more dangerous than when records were not kept. The record simply brings to light the hidden dangers.

In order to bring out more clearly the results of keeping records, Table I has been compiled from the Bureau metal-mine accident publications from 1911 to 1916, inclusive, and refers to the entire United States. This table shows that the fatality rate is decreasing, whereas non-fatal injuries are increasing. In 1911, 170 non-fatal injuries per thousand 300-day workers were reported to the Bureau, and in 1916 the number reported was 250, thus indicating that better records are being kept. The fact that there are fewer fatal accidents indicates increased efficiency in safety and first-aid work.

Table II refers to the quarry industry for the period 1911 to 1916, inclusive, and indicates an increased non-fatal injury rate ranging from 63.8 in 1911 to 175.6 in 1916, per thousand 300-day workers. The fatality rate at the quarries shows practically no change.

By reason of the lack of complete records among the smaller operators of mines and quarries, these figures are entirely too low. This is indicated in Table III, in which data show the returns of 258 companies in 1914, 280 in 1915, and 246 in 1916, all of which are keeping records practically in accordance with the form prescribed by the Bureau. It will be noted that this selected group of mines also shows an increasing non-fatal injury rate, the figures being 331 per thousand 300-day workers in 1914 and 398 in 1916. The fatality rates, however, show a reduction from 4.92 per thousand 300-day workers in 1914 to 4.06 in 1916.

The accident rates at mines, as heretofore published, also appear lower than they actually are, because in so many instances, the operator reports the total number of men on the payroll during the year. By reason of the annual labor turnover, the number of men on the payroll is much larger than the actual number of full-time workers. Hence, in order to get true accident rates, it is necessary that the time the men were employed also be known. Such a record of the hours worked has been kept by the New Jersey Zinc Co., thus placing the accident rates on a basis regarding the exactness or completeness of which there can be no doubt. One of the reasons why the Bureau's rates in earlier years appear low is that it has been difficult to obtain detailed information, which is kept by only a few of the larger companies. The next step was to reduce all accidents to a 300-day basis. This, however, does not take into account the eight-hour or ten-hour day, but in most of the metal mines, in recent years, the eight-hour day has prevailed. Many inequalities have been eliminated by reducing the figures to a common denominator of 300 days. This, however, does not eliminate the payroll discrepancies when the number of men employed is given as per total on payroll.

The increasing completeness in the matter of records is to be credited, in part, to the Bureau's campaign for safer conditions, and also, in no small degree, to results from the annual requests for reports of accidents during the current year, and to the enactment of accident-compensation laws. The mining companies expect to make the returns, and the majority of companies, therefore, are now keeping records in such a condition that they may be able to render reports at the close of the year. There is, however, some lack of uniformity as to what injuries shall be recorded, although it is believed

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*A paper presented at the seventh annual congress of the National Safety Council, 1918.

TABLE I. UNITED STATES METAL-MINE ACCIDENTS, 1911–1916

Number of Men Employed, Days' Work Performed, and Number of Men Killed and Injured at All Metal Mines in the United States

Year	Average Days Active	Men Employed: Actual Number	Men Employed: Equivalent in 300-Day Workers (Calculated)	Total Shifts	Number Killed: Total	Number Killed: Per 1000 300-Day Workers (Calculated)	Number Injured: Total	Number Injured: Per 1000 300-Day Workers (Calculated)
1911	282	165,979	156,089	46,826,573	695	4.45	26,577	170.27
1912	287	169,199	161,662	48,498,510	661	4.09	30,734	190.11
1913	288	191,276	183,593	55,077,855	683	3.72	32,971	179.59
1914	271	158,115	142,619	42,785,840	559	3.92	30,216	211.87
1915	280	152,118	141,997	42,599,015	553	3.89	35,295	248.56
1916	282	204,685	192,455	57,736,425	697	3.62	48,237	250.64

TABLE II. ACCIDENTS IN THE QUARRY INDUSTRY, 1911–1916

Number of Men Employed, Days' Work Performed, and Number of Men Killed and Injured at All Quarries in the United States

Year	Average Days Active	Men Employed: Actual Number	Men Employed: Equivalent in 300-Day Workers (Calculated)	Total Shifts	Number Killed: Total	Number Killed: Per 1000 300-Day Workers (Calculated)	Number Injured: Total	Number Injured: Per 1000 300-Day Workers (Calculated)
1911	228	110,954	84,417	25,325,094	188	2.23	5,390	63.85
1912	249	113,105	93,837	28,151,043	213	2.27	6,552	69.82
1913	246	106,278	87,141	26,142,237	183	2.10	7,739	88.81
1914	233	87,936	68,187	20,456,157	180	2.64	7,836	114.92
1915	246	100,740	82,447	24,734,224	148	1.80	9,671	117.30
Average for five years	240	103,802	83,205	24,961,751	182	2.19	7,438	89.39
1916	253	90,797	76,457	22,937,178	173	2.26	13,427	175.62

TABLE III. SUMMARY

Metal-Mine Accident Data Grouped by Methods of Mining During the Year Ended Dec. 31, 1916

Method of Mining	Number Companies Represented	Number States Represented	Days Active	Total Days' Labor	Number Men Employed in Mines	Number 300-Day Workers	Number Killed: Total	Number Killed: Per 1000 Employed	Number Killed: Per 1000 300-Day Workers	Number Injured: Total	Number Injured: Per 1000 Employed	Number Injured: Per 1000 300-Day Workers
1. Room and pillar	62	14	280	2,522,986	9,023	8,410	47	5.21	5.59	4,013	444.90	477.17
2. Overhand stoping:												
(a) With stulls	22	7	324	1,385,778	4,281	4,619	21	4.91	4.55	1,824	426.17	394.81
(b) With square sets, cribs, etc	32	10	326	4,695,937	14,385	15,653	55	3.82	3.51	7,661	532.38	489.52
(c) With filling	21	10	329	2,031,454	6,170	6,771	35	5.67	5.17	2,584	418.80	381.68
(d) Shrinkage	13	7	351	958,754	2,729	3,196	14	5.13	4.38	1,129	413.56	352.81
3. Underhand stoping	5	5	306	1,113,333	3,635	3,711	12	3.30	3.23	1,707	496.43	460.11
4. Caving methods	61	7	301	6,121,033	20,326	20,403	80	3.93	3.92	7,134	350.91	349.71
5. Open pit, with steam shovel	23	7	283	2,574,733	9,100	8,582	27	2.97	3.15	2,416	265.49	281.58
6. Open pit, without steam shovel	7	5	265	92,319	348	308	..	....	....	108	308.57	348.39
Total, 1916	246	...	307	21,496,327	69,997	71,653	291	4.16	4.06	28,576	408.23	398.82
1915	280	...	303	22,842,999	75,365	76,140	324	4.29	4.25	27,314	362.42	358.73
1914	258	...	292	22,004,824	75,453	73,349	361	4.78	4.92	24,306	322.13	331.38

TABLE IV. NON-FATAL INJURIES, 1916–1917

Injuries by Causes Obtained From the Records of the New Jersey Zinc Company

Causes	Injuries, 1916 and 1917: Number (a)	Per 1000 300-Day Workers	Number (b)	Per 1000 300-Day Workers	Injuries, 1914 to 1917: Number (a)	Per 1000 300-Day Workers	Number (b)	Per 1000 300-Day Workers
Fall of rock or ore from roof or wall	44	25.17	184	105.26	78	26.05	338	112.86
Rock or ore while loading at working face	69	39.47	365	208.81	101	33.72	499	166.61
Timber or hand tools	31	17.74	226	129.29	93	31.05	617	206.01
Explosives	16	9.15	24	13.73	25	8.35	37	12.35
Haulage	39	22.31	81	46.34	82	27.38	255	85.14
Falling down chute, winze, raise, or stope	25	14.30	69	39.47	49	16.36	139	46.41
Run of ore from chute or pocket	9	5.15	31	17.74	36	12.02	216	72.12
Drilling, machine or hand	20	11.44	131	74.94	54	18.03	299	99.84
Electricity	2	1.15	4	2.29	3	1.00	9	3.01
Machinery	..	.....	2	1.14	..	.....	3	1.00
Nails	..	.....	2	1.14	1	0.33	14	4.67
Sledging chunks and mucking	5	2.86	12	6.87	23	7.68	137	45.74
Other causes	19	10.87	133	76.09	26	8.68	184	61.44
Total underground	279	159.61	1,264	723.11	571	190.65	2,747	917.20
Falling down shafts	2	1.14	3	1.72	2	0.67	3	1.00
Objects falling down shafts	..	.....	...	.....	...	.....	1	0.33
Overwinding	1	0.57	1	0.57	1	0.33	1	0.33
Skip, cage, or bucket	1	0.57	5	2.86	1	0.33	6	2.00
Other causes	3	1.72	14	8.01	3	1.00	15	5.01
Total shaft	7	4.00	23	13.16	7	2.34	26	8.68
Total underground and shaft	286	163.62	1,287	736.27	578	192.99	2,773	925.88
Surface haulage	...	.....	1	0.57	...	.....	1	0.33
Railway cars and locomotives	...	.....	....	.....	...	.....	...	....
Run of ore from bin	1	0.57	1	0.57	1	0.33	1	0.33
Falls of persons	1	0.57	4	2.29	2	0.67	6	2.00
Hand tools, axes, bars, etc	4	2.29	12	6.87	6	.....	15	5.01
Machinery	1	0.57	2	1.14	2	0.67	3	1.00
Other causes	5	2.86	29	16.59	7	.....	42	14.02
Total surface	12	6.86	49	28.03	18	6.01	68	22.70
Falls or slides of rock or ore	8	4.58	24	13.73	14	4.67	48	16.03
Haulage (cars, locomotives, etc.)	1	0.57	4	2.29	3	1.00	16	5.34
Falls of persons	3	1.72	13	7.44	9	3.01	41	13.69
Machinery	1	0.57	6	3.43	3	1.00	13	4.34
Hand tools	...	.....	8	4.58	2	0.67	35	11.69
Sledging chunks and mucking	...	.....	2	1.14	11	3.67	32	10.68
Other causes	9	5.15	33	18.88	9	3.01	34	11.35
Total open cut	22	12.59	90	51.49	51	17.03	219	73.12
Total open cut and surface	34	19.45	139	79.52	69	23.04	287	95.82
Grand total	320	183.07	1,426	815.79	647	216.03	3,060	1,021.70
Hours labor worked			4,195,412			7,187,504		
8-hour shifts			524,427			898,438		
300-day workers			1,748			2,995		
300-day workers, per year			874			749		

(a) Includes all injuries except fatal and trivial. (b) Includes all injuries except fatal.

that the larger companies are recording practically all that occur. Accidents reported to the Bureau are only those which cause disability of one day or more. It is not expected that accidents causing a disability of less than one day will be reported, although in some cases it is believed they are included.

Such figures, however, are not as complete as they may be, as is shown by the New Jersey Zinc Co.'s report for the period of four years, in which it is believed every non-fatal injury that caused loss of time has been recorded. Reference is pertinent to a paper prepared by B. F. Tillson, entitled, "Recording Accidents, and Safety Measures Employed by the New Jersey Zinc Co.," published in the *Journal* of Apr. 17, 1917, which gives a detailed description of the system used by that company in keeping records of accidents, together with methods of determining rates for comparative purposes. Information is given as to what had been done in the matter of safety improvements, and concerning methods employed among the foremen and shift bosses to reduce accidents.

Mr. Tillson's paper shows that for the first four months of the year 1913, without special safety organization, but with complete records, the non-fatal injuries at the mines which caused loss of time amounted to 2.24 per 10,000 hours of labor performed. In the last eight months of 1913, during which the safety-first campaign was started, the accident rate was reduced to 2.17. The organization was further perfected in 1914 and 1915, with the result that in 1916 the non-fatal injury rate was 0.77 per 10,000 hours, and in 1917 the rate was 0.78. By keeping detailed records, the company has been able to determine the principal causes of accidents, and to apply remedies therefor. By an educational campaign among the employees, and by the giving of bonuses to the shift bosses, reduction in the number of accidents has been marked. The records of the company not only show accidents by causes, but by occupations, and also chart them according to the actual number of hours employed in the mines.

Through the courtesy of the New Jersey Zinc Co., I am able to present a summary of the non-fatal injury figures for the two-year period 1916 and 1917; also a summary for a four-year period, 1914 to 1917, according to causes, as shown in Table IV. The accident data classified by occupations is given in Table V, in which is shown not only the occupations, but the hours' work performed in each occupation, the number of injuries and the number of injuries per thousand 300-day workers. It also shows the number of hours lost per accident in each occupation and the total number of hours lost in each occupation as the result of accidents. The trivial injuries referred to in this table include all such accidents as do not prevent the men from returning to work the next day, or, in other words, they do not include those which record only the loss of the remainder of the shift.

TABLE V. CLASSIFICATION BY OCCUPATIONS

New Jersey Zinc Co. Accident Data, 1916 and 1917, by Occupations

Occupations	Hours Labor Worked	300-Day Workers	Injuries (a) Number	Injuries (a) Per Cent. of Total	Injuries (a) Per 1000 300-Day Workers	Injuries (b) Number	Injuries (b) Per Cent. of Total	Injuries (b) Per 1000 300-Day Workers	Number of Accidents (c)	Total Hours Lost by Accidents (c)	Hours Lost Per Accident (c)
Muckers	996,535	415	81	25.31	197.59	350	24.61	843.37	350	7,104	20.3
Timbermen	781,769	326	51	15.94	156.44	233	16.39	714.72	233	6,930	29.7
Trammers	751,550	313	63	19.69	201.28	273	19.20	872.20	273	5,368	19.7
Runners, drill	564,832	235	72	22.50	306.38	323	22.72	1,374.47	323	7,934	24.6
Helpers	194,394	81	7	2.19	86.42	45	3.17	555.56	45	392	8.7
Ground trimmers	106,385	44	10	3.13	227.27	33	2.32	750.00	33	1,896	57.5
Pipemen	88,058	37	4	1.25	108.11	31	2.18	837.84	31	168	5.4
Nippers	79,123	33	3	0.94	90.91	15	1.05	454.54	15	400	26.7
Bosses	76,999	32	5	1.56	156.25	18	1.27	562.50	18	536	29.8
Motormen	45,621	19	2	0.62	105.26	8	0.56	421.05	8	24	3.0
Trackmen	45,920	19	0	.....	......	9	0.63	473.68	9	0	.....
Chutemen	44,925	19	2	0.62	105.26	10	0.70	526.32	10	16	1.6
Blockholers	37,746	16	2	0.62	125.00	11	0.77	687.50	11	72	6.5
Car repairmen	15,023	6	3	0.94	500.00	6	0.42	1,000.00	6	80	13.3
Miscellaneous	184,024	77	15	4.69	194.81	57	4.01	740.26	57	987	17.3
Total	4,012,904	1,672	320	100.00	191.99	1,422	100.00	850.48	1,422 (c)	31,907	22.44

(a) Includes all injuries except fatal and trivial.
(b) Includes all injuries except fatal.
(c) Does not include 3 trivial accidents to ore loaders and 1 trivial accident to linemen in 1917, as these occupations were free from accidents in 1916 and the time of exposure to risk in the latter year could not be segregated.

Although these records are as complete as it is possible to make them, they represent the returns from only one company, and it is doubtful whether the figures are sufficiently large to be thoroughly fair to each occupation, or even to each cause of injury. Data compiled by a large number of companies on this plan would undoubtedly furnish a reliable basis on which to study accidents and their causes, and at the same time give sufficient information to make it possible to establish equitable insurance rates.

Exact records should contain sufficient data to show the causes of all accidents—hazards by occupations, as in Table V; hazards by mining methods, as shown in Table III; and the days and hours worked and the time lost per accident, as in Table V. This would serve as a basis for insurance rates that would be fair to all. Such records would also show the real progress that is being made in accident prevention.

Duty To Replace Mining Machinery

BY A. L. H. STREET*

A mine was leased under a contract binding the lessee to operate the mine continuously, "keeping the machinery in as good working order as when he takes possession 10 days hence, less the natural wear and tear of the same." While the lessee was in possession, an unusual flood practically destroyed the mill on the mine premises, and he did not restore it, although he continued to mine ore. Under these circumstances, the Arkansas Supreme Court holds that the lessee was guilty of a breach of the lease in failing to rebuild the plant within a reasonable time, entitling the lessor to terminate the lease. (Bradley *vs.* Holliman, *202 Southwestern Reporter, 469.*)

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Mining in Northern Manitoba

By J. A. CAMPBELL*

The area included in the mineral districts of Northern Manitoba, now in process of development, is in the form of a triangle, of which the apex is The Pas; the westerly side is formed by the Saskatchewan River and connecting lakes; the east side by the Hudson Bay Ry., and the base extends from Lake Athapapuskow to Herb Lake. Owing to transportation difficulties the development of properties has been retarded, but recent exploration has proved the presence of rich deposits, and some successful operations have been and are now being carried on.

UNTIL recently the known mineral area of Northern Manitoba was confined practically to that lake and river district stretching from Lake Athapapuskow and the Saskatchewan boundary, on the west, to Wekusko, or Herb Lake, on the east, a distance of approximately 100 miles. Lake Athapapuskow is reached by means of the Ross Navigation Co.'s steamers, which give regular summer service from The Pas to Sturgeon Landing via the Saskatchewan River, and Cumberland and Sturgeon lakes. From Sturgeon Landing to Lake Athapapuskow is 16 miles, and a road built by the Manitoba government is of material assistance in the haulage of machinery, supplies and other freight. There is also an alternative canoe route, via Sturgeon and Goose rivers and Goose Lake, connecting with the terminus of the government road at Lake Athapapuskow, by a three-mile portage.

Eastern End of the District More Accessible

The other end of the district at Herb Lake is more easily reached by means of the Hudson Bay Ry. from The Pas to Mile 82. From there a government road, locally known as the "Gordon Highway," extends to McKay's Landing, at the south end of the lake, a distance of 11 miles. Mining properties already discovered begin at a point about five miles north of this landing and extend to the northern end of the lake. Mineral discoveries in this district were first made at each end of the mineral area, because of the accessibility of these points, and it is here that active development and mining operations are now being carried on.

Sulphide Ore Deposits at Flin Flon Lake

The great sulphide mine at Flin Flon Lake was located in August, 1915, and the richness of the deposits has indicated that copper must be considered one of the important mineral resources of the North. Thomas Creighton, the original discoverer, was one of a group of six prospectors sent out to examine the district by a group of Toronto capitalists and mining men known as the Hammill-Currie-Fasken syndicate. Ten claims were staked, and steps immediately taken to determine the quality and extent of the orebody. By stripping and trenching, it was found that the ore deposit is approximately 2000 ft. long, narrowest at the north end and widest at the south end, where it enters the lake, being about 300 ft. wide at that point. It consists of a vast deposit of solid sulphide. Sampling and resampling indicated that at normal return the ore would realize $10 to the ton in gold, copper and silver, the copper content averaging 1½%. This discovery attracted wide attention, and though various propositions have been submitted to the original owners, no outright sale has yet been effected. Others have become interested in the property, and it is now in control of a syndicate under the management of David Fasken and John H. Black, of Toronto.

Extensive Orebody Shown by Drilling at Great Sulphide Mine

Some months following the discovery, a contract was let to diamond drill the property. A complete drilling outfit, supplies and equipment were taken in during the winter, and a camp was established on the lake shore. On Mar. 26, 1916, two drills were started, and they continued operations until July 15 of the same year. Further contracts were subsequently let, and the drills have now been operated constantly for nearly two years, $200,000 having been spent in this and other work of investigation. But the expenditure has been justified, for the drilling has resulted in proving more than 20,000,000 tons of sulphide ore which will yield from $8 to $10 per ton at normal prices.

Schist Lake Deposits Smaller but Richer Than Those at Flin Flon

Operations at the Mandy Mine, at Schist Lake, are remarkable in that the ore, after being mined, is hauled 40 miles by team, shipped 125 miles by boat and barge to The Pas, and from there by rail to the Trail smeltery at Trail, B. C. The discovery of this deposit was made in October, 1915, by F. C. Jackson, a sub-contractor on the Hudson Bay Ry., and S. S. Reynolds, a prospector of some experience. J. E. Spurr, vice president of the Tonopah Mining Co., was in the district at the time and inspected the claims staked. The result was that, before he left, an agreement was entered into by which the Tonopah Mining Co. was to take over the property and to develop and operate it. A subsidiary, known as the Mandy Mining Co., was formed for this purpose, and in the summer of 1916 $40,000 was spent in diamond drilling, trenching and other preliminary work. This exploration proved more than 100,000 tons of ore in one lens which assayed about 20% copper, some zinc and approximately $5 a ton in gold and silver.

The decision to place the mine in the producing class was reached the latter part of December, 1916, and a contract to haul 3000 tons 40 miles to the head of navigation at Sturgeon Landing was let to C. B. Morgan. By the spring break-up 3335 tons had been deposited at the landing, with the exception of a small amount which had been teamed all the way to The Pas. The ore was mined by open cut, the only machinery used being a couple of steam drills and a horse derrick. Ore shipped to the Trail smeltery during the summer of 1917 contained 337 oz. gold, 60 oz. silver, and 1,113,935 lb. of copper. During that summer a complete mining equipment, which had been taken in during the preceding winter, was installed. The main shaft was sunk to the 200 level, and two drifts were driven in the orebody. The company also placed in operation a 52-ft. tug on Lake Athapapuskow and a small stern-wheel steamer on Schist Lake, together with a number of large barges. By this means some of the ore was transported part of the distance by water, which lessened the winter team haul to a considerable extent. Last winter the same contractor hauled 8600 tons to Sturgeon Landing, from which point it is taken by the Ross Navigation Co. steamers to Trail. A spur track of the Canadian Northern Ry. at The Pas connects the main line with the dock, and this facilitates the work of transshipment.

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*The Pas, Manitoba

TRANSFERRING ORE FROM BARGE AT THE PAS RIVER TO CARS FOR SHIPMENT TO TRAIL SMELTERY

Deposits of the Lake Athapapuskow District

In the Lake Athapapuskow district, the Chica claims, situated on the Pine Root River, are being thoroughly prospected, and a diamond drill has been working there for several months. Other claims in the neighborhood give promise of satisfactory results. On the north shore of the east arm of Lake Athapapuskow discoveries have recently been made which indicate the existence of a large body of sulphide ore, carrying from 2½% to 3% copper. According to report, it is estimated that this district will rival the Flin Flon discovery in extent and in the quality of the ore deposits.

The Herb Lake Gold Mining District

The first important mineral discovery of the North was made during the summer of 1914, at Wekusko, or Herb Lake, as it is now generally known, by Hackett and Woosey. The first claims staked were the Kiski and Wekusko, which were located following the discovery a vein of gold-bearing quartz which showed considerable free gold. The find attracted wide attention, and soon the entire shore of the lake north of the above-mentioned claims and for some distance in was staked.

Among the claims subsequently located were those of the Rex group, staked by Campbell, Hassett and Moore, and these properties have since become the best known in the district and now contain a producing mine. The preliminary work of stripping and trenching exposed a vein of such promise that a deal was consummated with Makeever Brothers, mine operators of New York and Boston, whereby they undertook to develop the property, build a mill and carry on the mining work. In sinking a shaft it was found that the width of the vein increased with the depth. Two shafts have been sunk, one to a depth of 120 ft., and considerable drifting has been done. Upon completion of the road from the railway to the lake last summer, a portable sawmill was taken in to prepare lumber for mine buildings, and buildings were erected and machinery was installed during the winter. Machinery and equipment include a 10-ft. 40-ton Lane mill, amalgamation plates, Deister-Overstrom concentrating tables, a 55-hp. engine, two 60-hp. return-tubular boilers and a 390-cu.ft. air compressor. The Rex mill started crushing ore on May 1, 1918, and, with small interruptions for adjustments and cleaning, has operated continuously since that time. The first clean-up, from 433 tons of ore crushed, resulted in a sponge containing 365 oz. gold, 82% fine, having a value of $6186.53. Similar results were obtained from the next run of ore. A few months ago a company known as the Herb Lake Gold Mines, Ltd., was formed, the stock being held mainly by Makeever Brothers and the original owners of the claims.

Other Properties in the Herb Lake District

The Northern Manitoba Mining and Development Co. was the first to make an ore shipment from the Herb Lake district. This company owns the Moosehorn claim, where an 80-ft. shaft has been sunk. A trial shipment which was sent to the Trail smeltery consisted of 57,000 lb. of gold-bearing quartz, taken from the shaft. The returns for the whole car were $2323.60 or $81.53 per ton. Local capital has been insufficient to work the property satisfactorily, so an interest therein has been disposed of to Mekeever Brothers, who have undertaken to proceed with the development work and mining operations. As this mine is near the Rex, the two properties can be worked together advantageously.

COPPER ORE DUMP AT STURGEON LANDING, MANITOBA

Another well-known group consists of the Elizabeth-Dauphin claims, where considerable work has been done, including the sinking of a 50-ft. shaft. The Pas Consolidated Mines, Ltd., controls this property, and expects to carry on considerable development work during the current year. Shallow shafts have been sunk on several other claims, particularly the Syndicate, Kiski-Wekusko and McCafferty.

A recent discovery which is attracting attention is that made by Paul Gasse and associates at the northern end of Herb Lake, where a pegmatite dike showing considerable development of quartz in stringers and irregular masses occurs in the granite, which has hitherto been avoided by local prospectors. The width of mineralization is from 10 to 50 ft. and the length is not yet determined, but appears to be extensive. A number of samples have been assayed, and the results are promising. The discoverers are doing the usual preliminary work on the property in order to get a general idea of the extent and character of the deposits.

A new field has been discovered at Knee Lake, near Oxford House, on the Hayes River. Several prospectors working for an English syndicate have recently recorded a number of claims, and the discovery of low-grade gold quartz and surface examinations there indicate a large orebody of uniform quality.

Australian Lead, Silver and Zinc

SYDNEY, N. S. W., CORRESPONDENCE

The first half of 1918 shows an increased output of silver, lead and zinc in Australia, as compared with the production in the latter half of 1917, which was sub-normal, owing to strikes. The chief centers are Broken Hill, New South Wales; Zeehan, Tasmania, and Northampton, W. A., but a small output is obtained from Yeranderie, N. S. W. Fully 96% of the total production, apart from silver recovered from blister copper, comes from Broken Hill. The lead concentrates are treated at three works—the Associated Smelters plant, at Port Pirie; the Sulphide Corporation plant, at Cockle Creek, N. S. W., and the Fremantle Trading Works, at Fremantle, West Australia.

Operations at the Port Pirie plant are confined practically to the treatment of the Broken Hill outputs, other than Central Mines products, which are owned by the Sulphide Corporation and smelted at its works. These works also take ores from Zeehan, Yeranderie, and elsewhere, as well as all suitable gold concentrates. The Fremantle works smelt the products from their mines at Northampton, as well as small lots of customs ores and concentrates. The zinc concentrates are treated at two plants—those at Risdon, Tasmania, of the Amalgamated Zinc Co., taking roasted Broken Hill concentrates and making electro-spelter at the rate of about 10 tons daily, and those at Port Pirie, making spelter by the distillation process at a smaller rate than at the Risdon works. New lead and zinc plants in connection with the Hercules-Roseberry mines, of Tasmania, are not yet built, although projected by the Mount Lyell Co., which practically owns these mines.

The present Broken Hill methods are the outcome of many years of trial and failure, and of much hard work and invention. The present process is by wet milling the ores, and four products are obtained—lead concentrates, zinc sands, slimes, and barren tailings. The lead concentrates are smelted at the above-named works; the zinc sands are further treated by flotation, and give flotation lead concentrates and flotation zinc concentrates and slimes. The two products of slimes are further treated by various modifications of the selective flotation processes to produce slime lead concentrates and slime zinc concentrates.

The total ore milled during the first half of 1918 at Broken Hill was about 410,000 tons, the sands treated amounted to 222,000 tons, and the products consisted of about 106 000 tons of lead concentrates and 142,000 tons of zinc concentrates. Not all the lead or zinc concentrates came from the above-mentioned quantity of ore. Of the 10 companies concerned with this output, two, the Zinc Corporation and Amalgamated Zinc, treat old zinc sands accumulated before the institution of the flotation processes, and produce a little lead concentrate therefrom and much zinc concentrate. The accumulated slime is also treated, and this accounts for about 7% of the total of 106,000 tons of lead concentrate.

The Zinc Corporation treats three materials—the old zinc sands purchased, the ores from their own mine, the South Blocks, and the current output of zinc sands from the North and South mines. The Amalgamated Zinc Co.—the pioneer of flotation process work—treats almost exclusively old zinc sands which have been purchased. The largest producer for the year was the South Mine, with 19,000 tons of lead concentrates. Next came the Broken Hill Proprietary Co., with 16,300 tons. The largest producer of zinc concentrate was also the Broken Hill Proprietary Co., with 42,000 tons, followed by the Amalgamated Zinc Co., with 40,000 tons.

It must not be concluded that the Proprietary Co.'s mine is today the largest; it has only a short life on present reserves, and the large output is chiefly from accumulated zinc sands and slimes. Unlike most other companies in this field, the Proprietary sold none of its old sands. Of the nine companies with mills, all except two have flotation plants in operation. Each of these is about to complete the fulfillment of a long-period contract with the Zinc Corporation for the treatment of current zinc sands. The Broken Hill South Co. already has its flotation plant, and it was recently announced that the North Mine had decided to follow its example.

The mines in the field will have a life of considerably more than 10 years, on present reserves and outputs, but one or two may drop out. Present production is just about the capacity of the two works, which take the outputs of the various properties, and produce soft lead, fine gold, and fine silver.

The disposal of the metal is in the hands of the Australian Associations, which, through the Federal government, have been able to sell all the lead to the Imperial government, and have also made good arrangements for future disposal of the large amounts of zinc concentrate now stacked in Australia. Freighting has been the chief difficulty, and there are never enough ships to transport all the soft lead made. As for the zinc concentrates, the normal output could be greatly exceeded. Even the present amount cannot be shipped, and, if it could, there are no works in England large enough to take it all. The whole question is now in the hands of the Minerals Imperial Bureau in London, and no one doubts its ability to satisfactorily solve all the problems with which it is concerned.

The only appreciable increase in outputs of lead, silver and zinc in Australia will come from the Hercules-Roseberry fields, and it may be one or two years before this materializes.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Arizona United Mining Company

By Harry E. Scott*

The Arizona United Mining Co. is now operating the Arizona United mine, formerly known as the Republic mine, in the Johnson-Dragoon district of Cochise County, Ariz. The Goodrich-Lockhart interests operated the property for the last three years, under the name of the Cobriza Mines and Development Corporation, although the mine was first worked about 45 years ago by the Arizona United company.

An eight-mile railroad connects the mine with the main line of the Southern Pacific at Dragoon, and all supplies, including oil, coal and timber, are brought in over this route. The empty cars are set at the chutes at the collar of the shaft, and ore is dumped direct from mine cars to the standard-gage railroad cars.

The mine is worked through a 1300-ft. incline shaft, and hoisting is done by a 50-hp. Western gasoline hoist, using skips. Extensive development work has been carried on at each level, and a large tonnage of ore is blocked out. Several years ago a smeltery was built to treat the ore from the Republic and other mines in the district, but this has since been dismantled, and the ore is now shipped to El Paso and Douglas, where better results are being obtained.

ARIZONA UNITED MINE, IN JOHNSON-DRAGOON DISTRICT OF ARIZONA

The management of the Arizona United company contemplates building a mill to treat low-grade ores, of which there is a large tonnage already blocked out. A water supply can be developed sufficient for the operation of a concentrator large enough to treat the ore of the entire district, although the shortage of building material and slow delivery of machinery would necessarily delay the erection of such a plant.

The power plant is equipped with a 200-hp. oil-burning boiler, an Imperial, Type-10, Ingersoll-Rand steam-driven compressor, and a small high-speed engine which is used to drive the generator that furnishes lights for the mine and dwellings. A Sullivan sharpener and drill press are installed in the blacksmith shop.

The labor turnover is smaller than at most properties in the Southwest, owing to the fact that the management has built a number of houses provided with electric lights, water and sewer connections. The dwellings are furnished the married men free of charge, and kept in repair. Coal is supplied at cost plus the freight. The single men occupy smaller cabins, which are furnished them free of charge, including coal. A first-class boarding house is maintained at the mine.

Operations are superintended by J. M. Libby. The main office is in Philadelphia, and the officers of the company are Alfred S. Miller, president; Alfred C. Harmer, Jr., vice president and general manager; David H. Ross, treasurer, and Alfred H. Miller, secretary, all of Philadelphia.

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*Johnson, Arizona.

Zinc and Its Uses

On account of the enormous strain on the supply of non-ferrous metals, especially tin plate and aluminum, zinc is assuming a position of greater importance in the industrial world than ever before. Experiments have recently brought to light the fact that rolled zinc has previously unrecognized qualities that will insure its increased use both at present and after the war.

For some time manufacturers have been urged, as a matter of patriotism, to use metals other than tin plate and aluminum in the production of certain commodities. As a result, the "Make It of Zinc" slogan was adopted. That this suggestion has been acted upon will be evident from a perusal of a new list of zinc products which the New Jersey Zinc Co. has compiled. The manufacture of such things as pencil tips, shaving-soap containers, trouser buttons, bottle covers, boxes and linings, addressing plates, stencils, and scores of others, is the outcome of this campaign. The new practice has achieved the result desired by the Government in the matter of conserving tinned iron, and in keeping up the supply of material to those essential industries which were almost cut off from tin and aluminum on account of the reduction in imports consequent on abnormally unfavorable shipping conditions.

"Zinc is just coming into its own" said E. V. Peters, assistant general sales manager of the New Jersey Zinc Co., at the Chemical Exposition recently held in New York. "Extensive research has indicated that this metal possesses the essential qualities needed for metal products of the non-ferrous class. The response to the Government's request for such a replacement metal has brought to light convincing evidence of the wide scope of the usefulness of zinc. Few realize the numerous services to which zinc products can be put. For instance, it is not generally known that zinc oxide forms a considerable proportion of the material composing an automobile or truck tire; or that it gives tires and other rubber goods resiliency and durability.

"Zinc oxide also gives wearing quality to paint. This material, when used in conjunction with white lead sulphate, insures toughness, luster and color constancy to paint—qualities that are essential in this age of conservation. Spelter or metallic zinc, made from the uniquely pure Franklin, N. J., ore, is, with copper, a component of high-grade brass. It is used to galvanize telephone and telegraph wires, to keep them from rusting and becoming brittle, and has an extensive field of usefulness in many other ways.

"It has been demonstrated that rolled zinc can be easily drawn and spun, and that the high-grade quality, such as that produced from 'Horse Head' spelter, is not brittle and takes as high a polish as may be desired. America will be expected after the war, to supply several countries of the Old World now in the throes of the great struggle. They must be rebuilt; and a long time will elapse before their own resources, such as reëstablishment of manufacturing plants and the procurement of materials, can be available again. Much zinc will, therefore, be required from America to aid in the rebuilding program.

"American zinc fields are both accessible and almost inexhaustible, and the facilities of the country, which were increased soon after the requirements of the Allied countries became apparent at the beginning of the war, are ample to meet the expected demands. Zinc roofing, being non-corrosive, will be needed in large quantities during the reconstruction period. In America, as well as in Europe, zinc, as a roofing material, has been much used in the past. In fact, its non-rusting property is a quality already attracting much favorable attention on the part of manufacturers. Weather strips made of zinc have been used in all climates for years, and the metal has proved entirely suitable for such purpose.

"For hardware, zinc has likewise demonstrated its utility. It is used for doorknobs, door casings, window sashes and fixtures, thus opening an entirely new field of use for the metal. Consumption of zinc along these lines promises to increase when building activities are again renewed on an extensive scale. Zinc is the logical material to use for making leaders and gutters, because of its ability to withstand outdoor corrosion; and in such apparatus as electric fuses it is the standard metal. Sulphuric acid, an important ingredient in fertilizers, is produced from sulphur found in Western zinc ores. This product will grow in importance after the war, on account of increased crop production in various parts of the world. Zinc dust, another form in which the metal is used, is in extensive demand in the dyeing industry, in connection with the recovery of gold and silver by the cyanide process, and also for the manufacture of non-corrosive marine paint."

Manganese Ores in Utah

Manganese ores occur in several places in the area extending from Utah Lake southwestward 75 miles or more and that embraces parts of Utah, Tooele, and Juab counties, states a U. S. Geological Survey bulletin. Most of the development work has been done in the central part of this area, in the Tintic and West Tintic or Erickson mining districts. The deposits elsewhere are reported to be wholly undeveloped or opened only by shallow workings. Several manganese deposits are partly explored by workings made, during the last 40 years, in search of silver and lead ores. Small amounts of manganese ores and manganiferous iron ores have been produced in the Tintic region for use as flux in lead and silver smelteries. The Tip Top tunnel, at Homansville, and the Black Jack group, in the West Tintic district, are now producing high-grade manganese ore. Other mines in which considerable bodies of manganese ore are found are the Baby Elephant group, Queen Mary, Indian Boy, May Farmer, and Eutonia. Undeveloped outcrops of manganiferous material, similar to that in outcrops of developed orebodies, are numerous.

The production in the West Tintic district could be increased if reasonably cheap transportation to the railroad was available. Ores of different grades are more or less intimately mixed in most of the deposits, and it is uncertain whether the grades can be readily separated either by selective mining or by an easy method of concentration. Estimates indicate that there is in sight more than 500 tons of ore carrying 40% of manganese and between 8 and 12% of silica, and probably in reserve more than 3000 tons of ore of this grade. The reserve of ore carrying 25 to 40% manganese and high silica will probably exceed 10,000 tons.

The orebodies form irregular branching pods, lenses, or pipes that lie along the upper parts of jaspery quartz lodes in limestone, quartzite, or shale. Most of them extend nearly to the surface, and the lower limit of two or three is about 100 ft. The largest bodies yet developed are at least 100 ft. long and 15 to 20 ft. in diameter in their widest parts. The orebody at the Tip Top has yielded about 27,000 cu.ft. of manganiferous material, and is not yet exhausted. About two-thirds of this material, or 1200 tons, was sorted as high-grade ore. At two mines, the Baby Elephant No. 1 and the Eutonia, the water level, which is about 100 ft. below the surface, marks a rather abrupt change from manganese oxides above to rhodonite below. The workings at the other mines have not penetrated below the oxidized zone.

The ore is a mixture of manganese oxides, chiefly pyrolusite and wad. Although most of it is soft and crumbly, it includes considerable quantities of rather tough and compact wad. Ores of different grades are intermixed in most of the deposits, and it is a question whether the grades can be readily separated by selective mining or easy methods of concentration. Jaspery quartz is more or less intimately mixed with the ore, and streaks of a soft gray or yellow clay, apparently a decomposition product of the wall rock, are common. The lodes in which the manganiferous bodies occur are persistent and are apparently of deep-seated origin, and all contain more or less silver and lead.

Mount Morgan Co., Queensland

Mount Morgan Co., for the year ended June 2, 1918, reports a revenue from all sources of £1,233,983 3s 4d, and expenditure, including development and depreciation, £981,233 18s 4d, leaving a surplus of £252,749 5s. Dividends paid during the period amounted to £250,000, the balance from the previous account was £95,986 6s, and the balance carried forward was £98,735 11s.

The concentrator treated 214,989 tons of ore and produced 83,567 tons of concentrates. The smeltery and refinery made an output of 7619 tons of refined copper and 86,219 oz. of gold. The ore reserves at the date of the issuance of the report were estimated at 3,825,685 tons, as compared with 3,942,029 tons on Nov. 25 last. The grade of the reserves remains practically stationary at 2.58% copper and 6.16% gold.

Artificial Graphite may be prepared (Swedish patent No. 4330, Nov. 28, 1917, reported in *Chemical Abstracts*) by a method in which oxides of the heavy metals, such as Fe_3O_4, together with $Ca_3(PO_4)_2$, are added to the distillation residues from calcium sulphite cellulose manufacture and the mass is heated to a high temperature in vacuum, in a state of compression. The product is freed from impurities by treatment with acids, sliming and drying, amorphous C is added, and this mixture is used for the production of pure graphite.

Sound Statesmanship in Dealing With Oil Problems*

It is important in these times of swift and sometimes violent readjustments that every landmark of sound Government policy be pointed out and preserved. It has been intimated in a published article that Mark L. Requa, director of the oil division of the Fuel Administration, has undertaken his task with a belief in the principle of Government control and operation of the oil industry during the war. It was suggested that Mr. Requa, upon becoming better acquainted with the point of view of the leaders in the petroleum industry, had changed his mind and was now of the opinion that the oil industry should regulate itself.

As a matter of fact, the acts and utterances of Mr. Requa show, the official record proves, that since its initiation the oil division of the Fuel Administration has been as a rock seeking to hold as long as possible to the doctrine that Government control and operation of the oil industry should be avoided to the utmost limits.

When Mr. Requa took office he requested that the oil industry itself constitute a representative and responsible committee upon whose judgment and advice it would be prepared to rely, and that that committee should serve as a medium through which the Government might advise with and communicate with the industry as a whole, the Government, however, retaining the prerogative of final decision. This was the origin of the formation of the National Petroleum War Service Committee. Of that committee Mr. Requa, in an address at Tulsa, Okla., on July 22, said before a large gathering of oil men:

> The national committee and the subcommittees are preëminently volunteer organizations formed for the purpose of placing for war needs most completely and efficiently at Government command the combined resources and activities of the petroleum industry. It has an important function to perform in the matter of fair prices. The knowledge of its members, freely given to the Government for the asking, is of greatest value. The national committee and the subcommittees deserve, I am sure, the confidence, not only of the industry, but of the Fuel Administration.

The relationships between the Government and this committee present a happy suggestion of a model plan of regulating great industries in America. The committee sits regularly and considers every question of interest to the industry which may be referred to it by the Government; Mr. Requa and other representatives of the oil division often sit with it.

It was through this committee that there was recently worked out and sanctioned by the Government a voluntary plan for stabilizing the prices of crude oil. Mr. Requa took the position that further increases in the prices of crude oil would not result in additional production, and that the industry itself should work out the plan of stabilizing. This was done.

Other problems relating to the oil industry—and these problems are vital in winning the war—are being dealt with in the same way. Mr. Requa has frequently said that if the oil industry could not successfully and effectively regulate itself in accord with the national interest, the Government would, of course, be forced to exercise control of, or as a last resort, actually operate, the industry. But examination of his published utterances shows that from the very beginning his attitude has been, as he reiterated in his Tulsa speech, as follows:

> I shall expect that, in all vexatious problems, disputes and trade adjustments, the industry will endeavor to govern itself and reach a satisfactory agreement either independently as between the parties interested or with the aid of the local committees; failing that, then through the good offices of the national committee, appealing to Washington only as the last resort after all the above suggested means of settlement have been exhausted. Centralization of control in Washington as to the details of the industry is hopeless if we are to have the greatest efficiency and exertion of the maximum effort.

The sound common sense in the above quotations from Mr. Requa's utterances, together with the fact that these utterances have been actually embodied in the policy of the Government toward the oil industry, is one of the gratifying episodes of the war. The point to observe is that this is neither unrestrained self-regulation nor governmental regulation. It is coöperation and coördination of all the knowledge and wisdom of both sides to a common end. These principles and the experience which has grown out of them seem well worthy of further study as a matter of national statesmanship.

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*Editorial in the New York *Sun*, Oct. 10, 1918.

Quicksilver in First Half of 1918

The production of quicksilver in the United States during the first half of 1918 was 17,576 flasks, according to F. L. Ransome, of the U. S. Geological Survey. The total production in 1917 was 35,954 flasks, so that the quantity thus far produced this year falls short by 401 flasks of that which should have been produced to equal last year's output. As quicksilver is a metal for which it would be exceedingly difficult to find satisfactory substitutes in all of its uses, and as an output of 36,000 flasks would, it is estimated, be barely enough to meet the demands in this country in 1918, the shortage indicated calls for energetic efforts by producers, consumers, and the Government to increase the supply and to curtail less essential uses. The demand is likely to be greater in 1919 than in 1918, and the perfection of satisfactory detonators for high explosives that shall contain little or no mercury is one of the urgent problems of chemistry as applied to war.

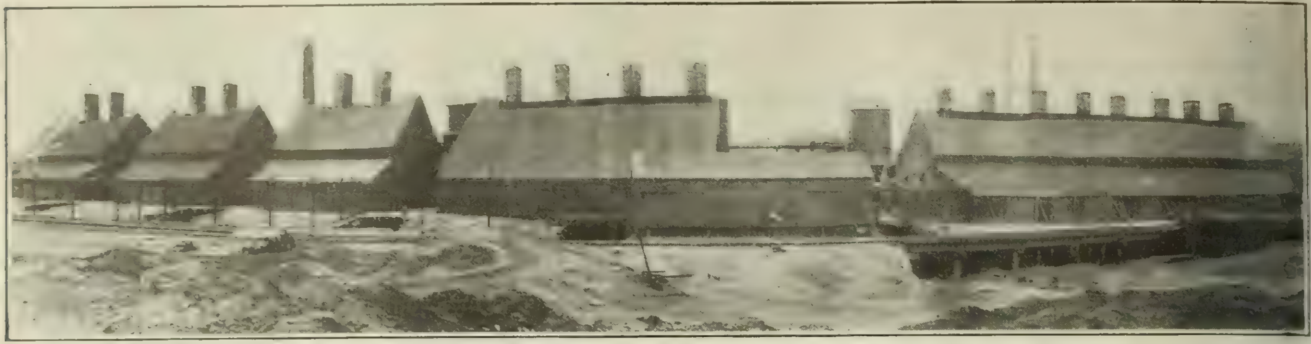
The decline in production during the first half of 1918 was due chiefly to shortage and increased cost of labor and to exhaustion or depletion of known orebodies under the stimulus of high prices. The practice at some of the larger mines has been to postpone underground exploration and development. On the other hand, the high price of quicksilver has not led as extensively as had been hoped to the reopening of old mines long idle, although there are some notable examples of this result, and, during the second half of the year, these reopened mines may make good the shortage.

One of the achievements in the industry during the year has been the successful adaptation of the rotary cement kiln to quicksilver metallurgy. Eight of these furnaces are now or will soon be in operation in California, and are expected to make an increase in production that may more than offset the falling off during the first half of the year.

* * *

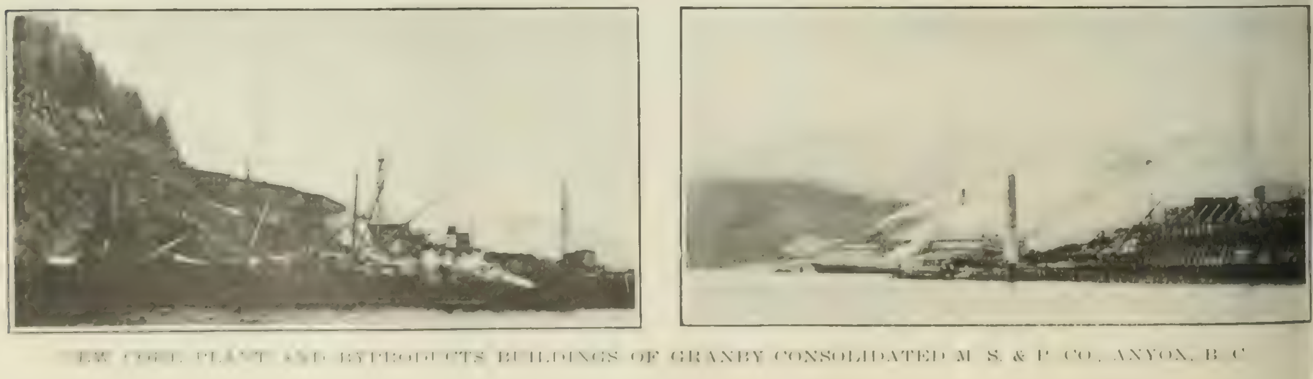
The miners in the Fairbanks district of Alaska intend to make use of the new experiment station. This is indicated by the fact that large numbers of mineral specimens are being sent to the station for examination. Miners within a radius of 200 miles of Fairbanks are bringing in specimens, it is reported.

Photographs From the Field



THE GLENDALE WORKS OF THE EDGAR ZINC CO., RECENTLY SHUT DOWN AFTER OPERATION FOR 49 YEARS

INTERNATIONAL SMELTING CO.'S SMELTERY AT MIAMI, ARIZONA



NEW COKE PLANT AND BYPRODUCTS BUILDINGS OF GRANBY CONSOLIDATED M. S. & P. CO., ANYOX, B. C.

GREAT FALLS PLANT OF ANACONDA COPPER MINING CO. "POURS OVER THE TOP" IN THE FOURTH LIBERTY LOAN DRIVE

Details of Practical Mining

A Reënforced Drift Set

By James E. Harding*

The crushing of drift sets under stopes was one of the worst difficulties encountered in a certain mine at which I was employed a few years ago. Owing to the large amount of loose ore above the sets, they could not be taken out and replaced, so the only recourse left was to double them up. The final result was a solid set drift, and even this would not hold, making it necessary frequently to abandon a drift long before it was desirable to do so. To correct this condition the set illustrated in Fig. 1 was developed to replace that of Fig. 2. The new set consisted principally of three caps placed one above the other, but a few ideas were developed which are not brought out by the sketch.

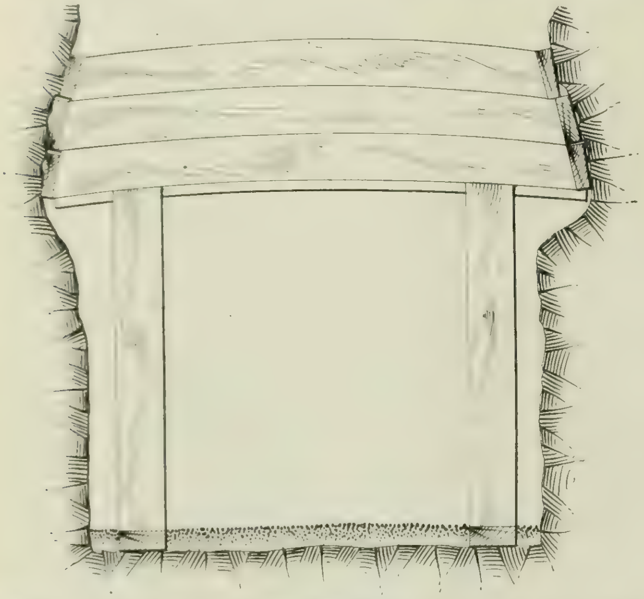


FIG. 1. DRIFT SET STRENGTHENED BY AN INITIAL BOW OBTAINED WHILE THE TIMBER IS SEASONING

Timber was received at this mine in carload lots, and was green. As soon as received it was stacked in single layers, with the ends supported, leaving the middle of the timber to sag as much as possible as it seasoned, and this sagging was assisted by piling a few pieces across the middle of the pile. By the time this seasoning had progressed for a week or two, a sag of about 3 in. in 10 ft. developed. The reason for desiring this sag will appear later. When a drift was being timbered, hitches were cut for the blocks in the usual way, but the caps, instead of being framed, were merely cut and put in as stulls, and three of them were blocked one above the other. Then the posts were placed under the stulls, with a 2-in. plank spiked to the stull on both sides of the post to hold it in position while the timber above was taking weight. Collar braces were also set, so that no freedom of movement was allowed the post. Care was exercised to place these stulls with the bowed side up, thus forming a solid timber arch and adding greatly to the strength of the members. By using these stulls for caps, one piece of timber served where three had been used before, namely, the cap and two blocks, and at the same time the strength of the set was materially increased..

It was interesting to observe the action of these sets as they took weight. The lower stull naturally showed greater effects of the weight. The posts were forced into this stull sometimes as much as 5 in. before the stull broke, and then the weight was taken up by the others in such a way that they showed only slight signs of weight and in no case did the second or third stull break. It was never necessary to replace or reënforce any of these sets.

At first glance the sets look expensive, and they are. On an average they require 68% more timber than those formerly employed and they cost about 20% more to install. In the end, they proved much more economical, for the reason that they never had to be replaced. The final advantage of this method over that formerly used was that there was a difference in cost of 76% per foot of drift in favor of the new method. No account is taken of the greater convenience or of the greater strength. Although the difference in strength cannot be definitely known, I am of the opinion that the new is about five times stronger than the old.

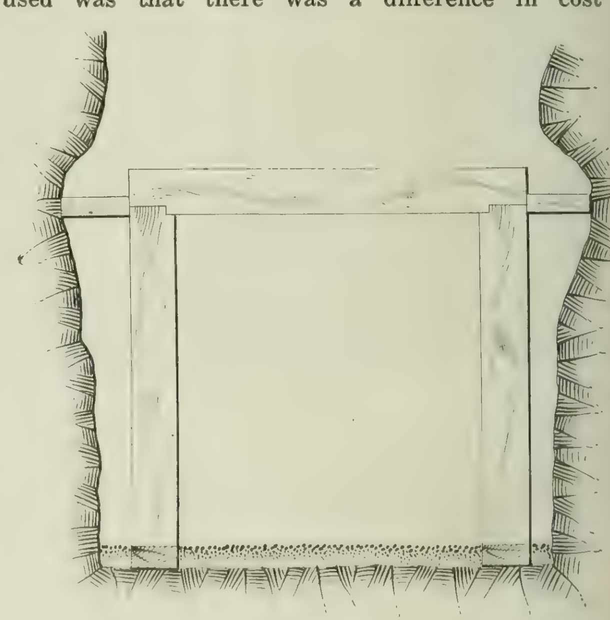


FIG. 2. THE OLD, UNSCIENTIFIC AND POORLY PROPORTIONED DRIFT SET

The design shown in Fig. 2 is as old as mining itself. The oldest sets of this type that I have personally encountered were in the Santa Francisca mine, at Asientos, Aguas Calientes, Mexico, and these were placed, as nearly as could be determined, in about the year 1585. If small amount of theoretical mechanics is applied to his design, its folly immediately becomes evident. The trength of the posts is about 10 times that of the cap.

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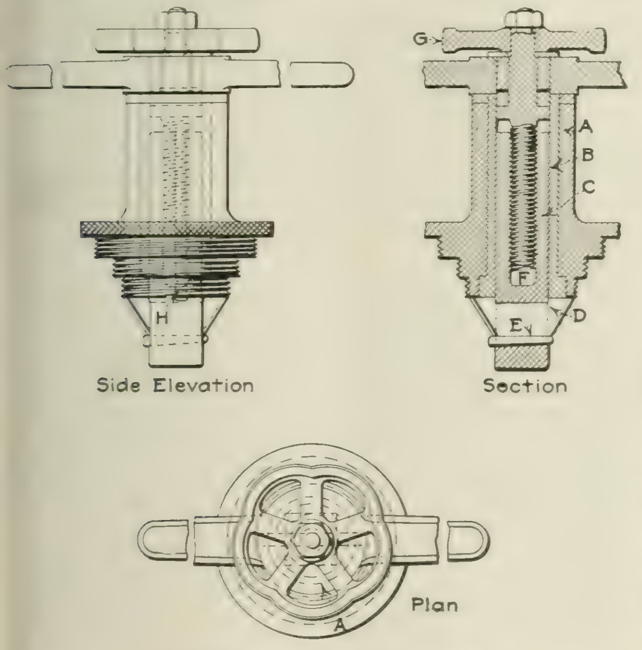
*With American Smelting and Refining Co., Casilla 49 D. Santiago, Chile.

I carefully refrain from making any comment on the locking shown in this sketch, which happens to be a epresentation of a set used at present in one of the argest mines in the world. On a recent visit to that nine, I saw about 1000 ft. of drift, which had been imbered with such sets, entirely collapsed. These rifts are now being retimbered by the same method at cost of approximately $500,000. The cost per foot is ather high, and it is hard to understand the reason for ollowing a method which has proved a failure. However, in mining, as in many other industries, there seems o be either a lack of initiative or a great desire to ollow precedent.

Valve-Reseating Device

By Charles Harbottle*

A valve-reseating device which was designed to re-laim a number of old globe valves and which should be ound generally useful is illustrated in the cut presented erewith. Its operation may be described as follows: he sleeve *B* revolves in the body *A*, and the spindle *C* lides in *B*, and is splined from the cutter *D* to the uper end. The sleeve *B* has a driving key *H*, which car-ies the cutter. The spindle *C*, with the cutter *D*, is aised or lowered by the screw *F*, actuated by the wheel . The cutter is gibbed to fit the spindle, and is held n place by the key *E*. The body *A* is threaded to fit hree consecutive sizes of valves; the one shown handles , 1½, and 1¼ in. A separate cutter is required for ach size of valve.



VALVE-RESEATING DEVICE

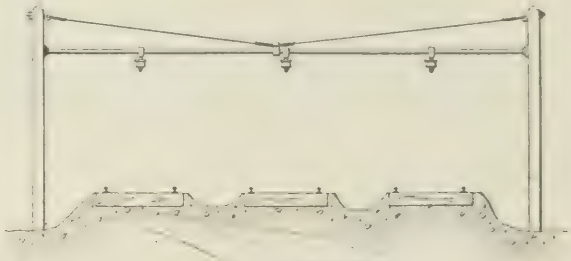
To use the device the valve bonnet is unscrewed and emoved, and the reseater screwed into its place. The utter is fed by the wheel *G* and revolved by the handle ntil a sufficient cut is made. The valve need not be emoved from the pipe line.

A minor drawback to the device is that it will fit valves of only one particular brand, i.e., those which have the bonnet threaded to one standard range of sizes. The cost of making the reseater is small, however; and, in these days of high prices for new valves, the device is paid for when one valve of each size is reclaimed.

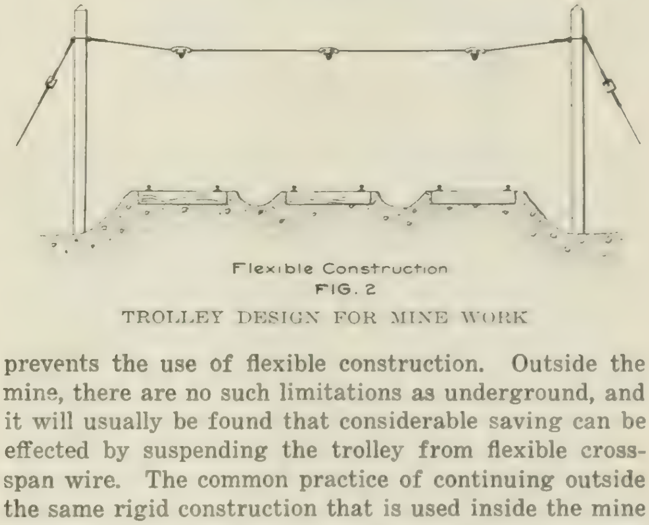
Flexible Trolley Construction*

By G. H. Bolus

The more flexible or yielding overhead trolley construction is made, the longer will be the life of the trolley wire and wheels that operate on it. There are some conditions under which it is not feasible to install the trolley from flexible supports. Inside mines it is most convenient and economical to attach the trolley to insulated hangers fastened rigidly to the roof or overhead timbers. Also, lack of headroom in the mine often prevents the use of flexible construction. Outside the mine, there are no such limitations as underground, and it will usually be found that considerable saving can be effected by suspending the trolley from flexible cross-span wire. The common practice of continuing outside the same rigid construction that is used inside the mine shortens the life of wire and wheels and requires an unnecessary amount of material. Great lengths of pipe have been used, some spanning four or five tracks, and quite low, in an endeavor to make the overhead rigid.



Rigid Construction
FIG. 1



Flexible Construction
FIG. 2

TROLLEY DESIGN FOR MINE WORK

Fig. 1 shows an installation of the rigid type. Hangers are secured to cross pipes spaced about 30 ft. apart. There is a great weight of material to hold up in the air. A better construction for such a condition is shown in Fig. 2. Light ⅜-in. soft steel cross-span wires take the place of the heavy pipes; hangers are snapped into the strand without cutting, and the whole line is flexible, thus insuring maximum life of wheel and wire. At 1800 lb. trolley tension, which is good practice, a 4-0 hard-drawn trolley wire supported every 30 ft. sags only about ½ inch.

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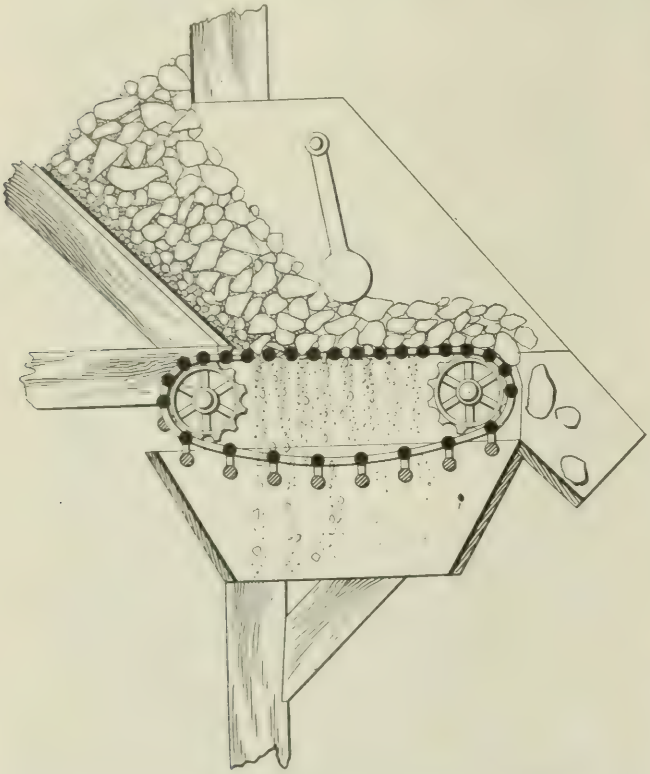
*Master mechanic, Chiksan Mining Co., Chiksan, Chosen.

*Abstracted from O-B Bulletin.

Mining and Metallurgical Machinery

The Ross Automatic Drop-Bar Grizzly Feeders

An automatic grizzly has recently been placed on the market by the Ross Engineering Co., of Montreal, Canada, and is fully described in the company's Bulletin R. 100. Two types are made—the rotary and the traveling bar. Mechanically, both types operate on the same principle. The traveling-bar type as shown in the accompanying illustration comprises a grizzly conveyor consisting of round bars, the width being somewhat greater than that of the chute gate. The bars are set parallel to the chute lip, each end being set in link chains traveling conveyor-belt fashion over sprockets at each end. The grizzly bars are arranged in pairs, one bar only of each pair being fastened to the chains. By this arrangement the free bar in each pair rests in a crotch of the chain when traveling with the load along the upper portion of the grizzly conveyor, and the interval between bars is spaced for the maximum undersize desired.


ROSS AUTOMATIC DROP-BAR GRIZZLY FEEDER

Upon passing over the sprockets at the discharge end, the loose bars of each pair successively drop downward by gravity, thereby doubling the interval between bars in the under or return side of the grizzly belt and permitting any pieces which may have been lodged between the bars to become released.

The rotary type of grizzly is similar in principle, and consists merely of a horizontal cylindrical-bar arrangement, somewhat greater in diameter than the sprockets in the traveling type. The latter is suitable where a long conveyance of the ore is desirable, and the former where immediate discharge of the oversize is required.

In order properly to control the feed, a swinging gate consisting of three sections, as shown in the illustration, is suspended at the chute opening. The special features that are claimed for this type of grizzly are (1) self-feeding at a uniform rate; (2) rapid elimination of fines; (3) efficient disposal of lumps; (4) no choking—complete discharge of wedged pieces; (5) minimum wear; (6) simplicity of construction; (7) minimum headroom requirements. This mechanism is designed to take the place of grizzlies at mines or mills. The self-feeding feature and the decrease of headroom required are the chief apparent advantages.

"Stack Gun" for Cleaning Chimneys

In many industrial plants the smoke or kiln stacks become clogged with soot. It is necessary, in order to maintain draft, that they be frequently cleaned. A simple, economical and efficient method to accomplish this is to "shoot" the stack with the "stack gun" and FFF (du Pont) blasting powder. This gun can be used in cleaning either lined or unlined brick or steel stacks without possibility of injury to either the stack or the lining.

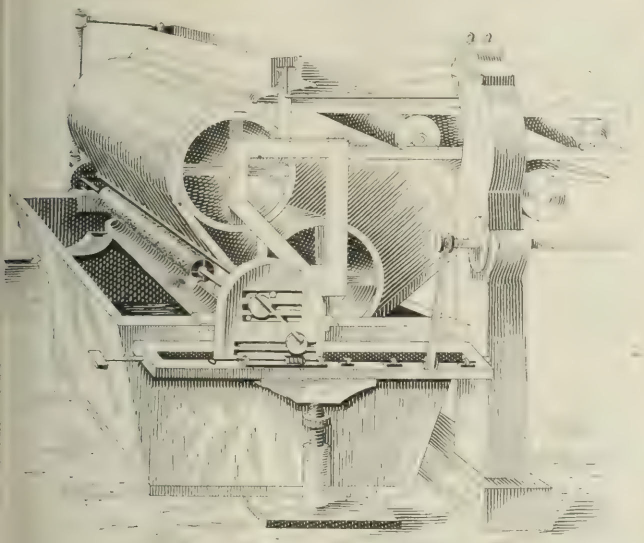
The gun can be made of an old piece of shafting about 4 in. in diameter and 14 to 16 in. long. Bore a hole 1¾ in. in diameter and 10 in. long in the center of the piece. Then bore a small horizontal hole ¼ in. diameter through the piece to the bottom of the center bore. This hole serves as a touch hole for inserting the fuse. The gun can then be mounted on a pedestal about 6 in. in diameter, so that it will stand in an upright position.

The method of operation is as follows: Pour FFF blasting powder into the mouth of the cannon to about 2 in. from the top. Tamp to the collar with dry clay. A short piece of fuse is inserted in the touch hole and in contact with the main powder charge. Open the flue door at the bottom of the stack, set the cannon on the bottom and in the center of the stack, light the fuse and close the flue door. The explosion shakes and loosens the soot adhering to the sides, causing it to fall to the bottom. It can then be removed through the flue opening.

A cylinder of 8 x 1¾ in. of FFF powder is sufficient for a stack as high as 100 ft. and 4 ft. in diameter, or over. The number of shots necessary to clean a stack thoroughly depends upon its condition. Ordinarily three or four are sufficient, but if very dirty t may require more. The size of the charge and length f the cannon may be regulated to suit the height and iameter of the stack.

Vanner Belt Cleaner

A device known as the Croesus Saver, and designed or the purpose of effectively cleansing the vanner belt f deposited mineral, has been patented and placed on he market by the Croesus Co., of Salt Lake City, Utah. t consists of a brush in contact with the face of the anner belt, and placed at a point in the water box where he belt will sag against it, and between the two rollers t the discharge end. Below is a padded roller, which evolves in the same direction as the brush, but in the pposite direction to the belt. An iron spool is fastened o the power shaft of the vanner, and from there a belt onnects with a small countershaft. This operates a worm gear connected with the shaft of the padded roller, to which the necessary movement is given, and precise adjustments are possible by means of suitable adjustable screws and rods.

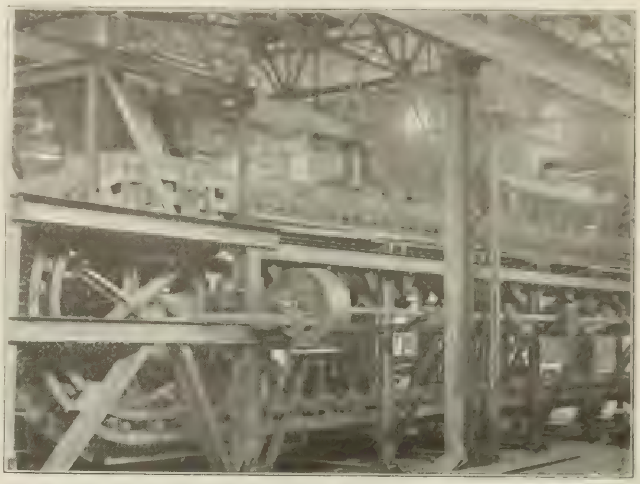

CLEANING DEVICE FOR VANNER BELT

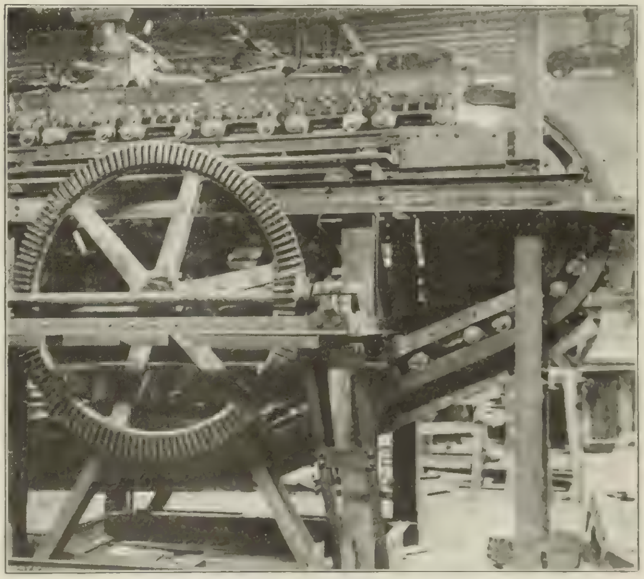
Adhering concentrate is brushed off the belt in the first instance, and then the surface is rubbed with the padded roller. The concentrate recovered is delivered by sprays to a suitable trough. It is said that the use of the apparatus results in closer concentration and higher recovery of mineral, owing to the cleanness of the belt and the saving of material usually unavoidably lost with the tailings.

Improved D. & L. Sintering Machine

An improved type of Dwight & Lloyd sintering machine recently manufactured for the Carnegie Steel Co., of Newcastle, Penn., and containing several new and distinctive features, is shown in the accompanying illustrations. The model has an effective grate area of 42 in. by 57 ft. 4 in., and it is estimated that its capacity on various materials will be as follows: Flue dust, from 300 to 350 tons of sinter per 24 hours; pyrite cinder, from 375 to 450 tons of sinter per 24 hours; magnetic concentrate, from 450 to 550 tons of sinter per 24 hours.

Among the new features may be mentioned the adoption of seal bars on the pallets, which insure an airtight joint between the latter and the top of the wind boxes. The returning pallets are driven along the lower track by sprocket wheels, instead of returning by gravity, as in the standard type of machine. The driving wheel is equipped with a shearing pin which automatically prevents an overload to the driving motor, which might arise from an accident with the machine. The weight of the pallet is carried on wheels running on rails; and there is capacity for a month's supply of grease for lubrication. Tooth depressions are cast in the drive, and the sprocket wheel engages with these and not against the pallet wheels themselves, as in the standard model. Sprocket-wheel teeth and gears are all cast in steel and are suitably housed. The sprocket-wheel teeth are removable, so that repairs may be effected with the minimum of dismantling.


GENERAL VIEW, IMPROVED DWIGHT & LLOYD SINTERING MACHINE


DISCHARGE END, IMPROVED SINTERING MACHINE

Events and Economics of the War

The refusal of President Wilson to consider peace with Germany under the present circumstances allayed the fears of many lest the enemy be allowed to gain any military advantage through an armistice, such as had been suggested to Washington. Berlin's reply to the first note of the President, professing to accept the conditions laid down by him as necessary to secure a permanent peace, was widely looked upon as German trickery. The unrepentant German attitude was again amply expressed in the shelling of the lifeboats of the freighter "Ticonderoga" after torpedoing the vessel.

The retirement of the Germans on the Western front was hastened in the last few days by the wedge driven by Haig in their lines between Cambrai and St. Quentin; Le Cateau, 15 miles east of Cambrai, was taken in this drive, the latter town having previously been captured. Laon and La Fère, the last strongholds of the Hindenburg line, were evacuated by the enemy. Roulers, in Belgium, was captured by the Allies and over 10,000 prisoners taken in this move on the Belgian coast. In the Balkans, the Entente forces have taken Nish, the capital of Serbia, thus cutting the Orient road from Berlin to Constantinople. The loss of the U. S. transport "Otranto" by collision off the Irish coast was reported, 372 men being missing.

Taxing Oil Profits

The convention of the Independent Oil Men's Association, held in New York from Oct. 8 to 11, was attended by more than 300 operators of independent oil plants throughout the country. Among those who addressed the members was Henry L. Doherty, who is a member of the National Petroleum War Service Committee. The excess-profits provisions of the present War-Revenue Act and of the tax measure pending were discussed by Mr. Doherty, in so far as they affect the oil industry.

"The fundamental idea of this bill," Mr. Doherty said, "is that all earnings in excess of 8% are abnormal and represent an excessive profit which can be justly taxed. The normal condition in the oil-production business is losses and profits which would be abnormal in other kinds of business. Again, the bill assumes that all earnings in excess of the pre-war period are due to the war. This is not the case. The sale price of crude oil has not advanced enough to offset the increased cost of drilling and operating, and many of the present producing properties represent discoveries made since the date of the pre-war period specified in the bill.

"It is proposed to tax gasoline 2c. a gallon on the plea that the commodity is a luxury," Mr. Doherty continued. "I dispute the claim that gasoline can be regarded as a luxury. The fact is that very little gasoline is used for pleasure purposes—not over 15% of the total production."

The difficulty experienced by operators in obtaining supplies was reflected in the remarks of M. J. Freeman, who described the extent to which concrete oil tanks had superseded steel tanks since the war started. He said that more than 100 such tanks, with 18,000,000 gal. capacity, had been built in the United States.

Unequal hazards in business as related to taxation were the subject of recent comment in Washington. The man trying to develop an oil well is taking a larger chance than the man who buys at market price a $100 share interest in the National City Bank of New York. The Kitchin bill puts each on the same basis, and under the Kitchin idea of excess-profits tax each should receive an exemption of 8% on the original cost of the enterprise before excess tax applies.

Secretary McAdoo, and all his tax advisors, suggested to Congress that the owner of the bank and the owner of the possible oil well were in a different class, and should not be taxed on the same basis, but that a sliding scale of exemption ranging from 8% to 12% should be established.

Daylight Saving May Continue

The Daylight-Saving Law would remain in effect until rescinded by Congress under a bill passed on Oct. 10 by the Senate. The measure, which was indorsed by Bernard M. Baruch, chairman of the War Industries Board, in the interest of fuel economy, is now being considered by the House. Under the present law the clocks would be turned back an hour on Oct. 27.

The acute shortage of power in many large centers, especially in the East, has led Mr. Baruch to support the proposed change. In a letter to the press he says:

> Some time ago it was brought to our attention that the continuance of the Daylight-Saving Law through the winter months from Oct. 26 until April next would reduce the load required of the power stations at the time of their peaks by a considerable amount, and thus really place at the disposal of these power service companies a considerable amount of power.
>
> At the request of the Power Section, J. W. Lief, chairman of the national committee on gas and electric service, made inquiry of 20 of the largest power producers in the country as to the result of the continuance of the Daylight-Saving Law upon their peak load. With one exception, in Pittsburgh, Penn., the universal reply has been that such action would reduce the peak load required of them between 10 and 15 per cent.
>
> It is difficult to estimate from these comparatively few replies the total effect upon the whole country, but the following figures may be of value in connection therewith:
>
> It is estimated that there is installed in the central station of the United States at the present time approximately 10,000,000 kw. capacity of power. If the replies received are at all indicative of the situation throughout the country that it would reduce their peak load approximately 10%, this would mean that the saving would make 1,000,000 kw. capacity available. This figure, however, has to be much modified from the fact that there are a great many power stations where the power capacity is not short, and that there are others where their limiting capacity is dependent not upon the peak load but upon their total output in kilowatt hours, but we believe it can be conservatively stated that at least 25%, or 250,000 kw., would be made available by continuation of the Daylight-Saving Law.

The advantage of the proposed change may be seen in the record of power consumption of Detroit, Mich., according to Alex Dow, president of the Detroit Edison Co. That city has used Eastern time in place of Central time since 1915, although it is in the Central time zone. The change is advocated as one of immediate relief.

More Oil Available in Great Britain

In Great Britain, it is possible to produce 400,000 tons of crude oil per year by retorting material that can be secured if the government will lend assistance. This is the belief of a committee of petroleum technologists, who have recently studied the production of oil from cannel coal and similar materials. Over 10,000 tons of the raw material can be collected per day, in the opinion of the committee, which, at an average yield of 30 gal. per ton, is equivalent to the stated 400,000 tons of crude oil per year. The yield per ton, obtained in testing various processes on the material available, ranged from 15 to 80 gal. By using the proper type of retort for the raw material employed, a wide range of the latter can be utilized.

Would Check Fuel-Oil Wastage

Fuel sufficient to operate the railroads for one month is wasted every year by users of fuel oil. Five times the fuel necessary for the Government, including the Army and Navy, is thrown away. These are the conclusions of experts of the Bureau of Mines, who have been coöperating with the Fuel Administration in a survey of the use of fuel oil for power purposes.

Last year 160,000,000 bbl. of fuel oil was used and 40,000,000, or one-fourth, might have been saved by more intelligent operation of plants and by proper firing. This represents a useless expenditure of $140,000,000, or enough to pay some of the important war bills, the oil selling at about $3.50 per bbl. This wastage is doubly criminal at this time, because of urgent need for naval and other essential war purposes. The 40,000,000 bbl. lost each year is equivalent to 10,000,000 tons of coal

The Bureau of Mines and the Fuel Administration have sent into those parts of the country where oil is extensively used a number of engineers to demonstrate where losses occur and how they may be stopped. Van. H. Manning, director of the Bureau, has ordered that a copy of these instructions be forwarded to all mines known to be using fuel oil.

Labor Unrest in South Africa

The strike movement in South Africa by natives employed at the mines and elsewhere has remained without result so far, according to the *Ironmonger* of Sept. 14. Seventy-one of the ringleaders have been put under arrest. The men demand a raise of 1s. a day. The situation is said to be well in hand. General Botha, who has a great influence over the natives, has issued an appeal through loyal chiefs and has summoned them to an "Indaba" (conference). A few "International" white agitators, who are alleged to have incited the natives by leaflets and other propaganda, have been laid by the heels.

There is much discontent at the increased cost of living. The Consolidated Trade Unionists' Federation is said to be formulating a demand for a rise in wages for all mechanics on the mines to a standard of £8 2s. for a 48-hour week, set up by municipal engineers recently. Handy men employed on other than skilled work in mechanical departments are to be paid not less than 75% of the standard rates for mechanics, and others in proportion. The Federation has also demanded that all colored drill sharpeners shall be dismissed, failing which, after a month's notice its members will refuse to coöperate with them. The above demands, coupled with the shortage of colored labor, will adversely affect many low-grade mines.

New Metal Company in Brazil

By decree of Aug. 7, 1918, the President of Brazil authorized the American Steel Co.'s Brazilian corporation to operate in that country, according to a consular report. This is a branch of the American Steel Export Co., of New York. The objects of the company are the manufacture of iron, steel, manganese, copper and other metals and their alloys, the purchase and sale of metal products, and the purchase and exploitation of mines and timber lands of all kinds. The capital stock of the company's branch is $20,000, divided into 200 shares of $100 each.

Spain To Control Potash Output

The *Gaceta de Madrid* of July 28 contained the text of a law dated July 24, 1918, according to Consul Ely E. Palmer, at Madrid, whereby the Spanish government assumes supervisory control of all national mining concessions already granted or to be granted, producing potash salts and other substances entering into the manufacture of fertilizers. Work in such mines will be under the supervision of the mining inspector of the district in which the concessions are situated.

To survey and exploit the already discovered sources of potash in the provinces of Barcelona and Lerida owned by the government, an appropriation of 80,000 pesetas ($15,296 at 5.23) has been authorized by the law above referred to. Whenever the total national production of potash salts reaches 50,000 tons or more per year, a special office will be created to regulate such production, and the quantities and proportion to be produced by each mine will be determined by the office in question, and work in such mines cannot be diminished or stopped without the assent of the mining inspector of the district.

Among the war uses for antimony is an antimony-lead alloy, carrying 12 to 13% of antimony, employed in the manufacture of shrapnel bullets, says a statement issued by the U. S. Geological Survey. Smaller quantities of liquated antimony sulphide are used in the primers of shells. For the last-named purpose it is claimed that the material must carry less than 2% of impurities insoluble in hydrochloric acid. Antimony sulphide, as a powder, is used in the charge of some shells to produce, on explosion, a dense white smoke, which is of service in range finding.

Franklin K. Lane, Secretary of the Interior, says: "Germany has thought and still thinks, no doubt, that she has a whip hand over America because of her supply of potash, but America can in two years become entirely independent of Germany by development of her own deposits and use of processes devised by Dr. Cottrell, of this department."

Industrial News from Washington

By Paul Wooton, Special Correspondent

Depletion in Iron Mines

John R. Vanderlip, of Minneapolis, during the hearings on the Revenue Bill, pointed out to the Senate Committee on Finance that a distinction exists in the matter of depletion in the iron mines of the Lake Superior region. Mr. Vanderlip represented the iron-ore interests from whose properties 80% of the iron ore produced in the United States is taken. An extract from his remarks before the committee is as follows:

> The particular point in respect of depletion to which I should like to direct attention is this: In the Lake Superior region at least—and I cannot speak for other regions—almost all of the iron ore is disposed of under what are called mining leases. By the terms of those leases the lessee agrees to pay a specified price per ton for all the ore that he mines. He is further obligated, whether he mines or not, to pay to the owner of the property an annual minimum sum, being the royalty rate on an agreed number of tons —perhaps a hundred thousand tons. And that is paid whether he mines or not, and after it is paid he is entitled to take out the number of tons of ore for which he has so paid without making any further compensation.
>
> Under the existing law, the act of Sept. 8, 1916, it is provided in general terms—I am not quoting exactly—that the owners of mines shall have the right to deplete to the extent of the value in the mine of the ore which is mined and sold in the taxable year. That does very well where the lessee is mining and taking out his ore; but in those years when he does not mine and take out the ore and pays advance royalties, under the construction that has been put on that law by the Commissioner of Internal Revenue, the owner of the iron property is not permitted to take any depletion, and is, on the other hand, required to return all of his royalties received as income and to pay income and excess-profits taxes upon them.
>
> It takes but a moment's consideration to reveal that in those years when the operator takes out ore against the advance royalties that he has already paid in previous years, the mine owner receives no money at all for that ore from which he can make any depletion. That is the general suggestion that I want to make in respect to that, and I desire, therefore, to submit in connection with it a proposed form of a clause for depletion which will protect the iron-mine owners of the Lake Superior district, and, in fact, will protect the owners of all natural resources, whether it be timber, iron, or any other mineral or oils or gas. So much for that.
>
> With respect of the definition of invested capital, I feel that subdivision 2, restricting the value of tangible assets which are paid into a corporaton to the par value of the stock issued therefor, works a great injustice. Prior to 1913, when, for the first time, Congress had authority to levy an income or any other form of tax based upon income, whatever gain there might have been over cost in the value of properties became the capital assets of the owner of those properties, as was distinctly held by the Supreme Court in those recent cases which were decided on May 20 and June 3 last.
>
> There are today thousands of corporations in the United States organized to handle certain properties with practically a nominal capitalization, in return for which properties worth many, many times the par value of the stock were turned in. If this present law be enacted in the form submitted by the Ways and Means Committee, you can see at once the injustice that it will work, and upon that point I think that the definition of invested capital demands some revision.

Mills and Smelteries Added to List

After efforts on the part of the U. S. Bureau of Mines, the War Industries Board has placed on its list of preferred industries smelteries and mills devoted to the treatment of metallic minerals. The smelteries, mills and necessary mines of the non-metallic minerals also have been included, but with the proviso that each plant or mine must establish its individual essentiality and must apply to the War Industries Board for listing. The failure of the first list to include mines and plants producing and handling such non-metallic minerals as pyrites, sulphur and graphite caused protest.

Cuyuna Manganese Estimated

Ore reserves in the manganiferous iron properties of the Cuyuna Range amount to 20,000,000 tons, according to an estimate made by the U. S. Bureau of Mines. Classified according to phosphorous content, the tonnage is divided as shown in the following table:

TONNAGE OF MANGANIFEROUS IRON ORE ON CUYUNA RANGE

	Tons Ore	%Dry Mn	%Nat. Mn	Tons Mn
Class 1, Phosphorus below 0.1%	1,640,000	16.50	14.50	237.500
Class 2, Phosphorus between 0.1 and 0.2%	3,330,000	12.10	10.63	366,300
Class 3, Phosphorus over 0.2%	14,745,000	8.38	7.08	1,040,000
	19,715,000	9.70	8.28	1,643,800

Of Class 1, 160,000 tons, and 1,670,000 tons of Class 2 have more than 20% silica content. Besides these reserves, such mines as the Ferro Algoma, and Cuyuna-Mille Lacs have immense tonnages of highly siliceous, intimately mixed, manganiferous material, containing about 15% manganese and less than 35% silica. "This material," comments one of the Bureau's engineers, "can be made into silicospiegel if it should be deemed advisable to use large quantities of this alloy. The alloy from this material, reduced in an electric furnace, gave the following analysis: Fe, 58%; Mn, 25%, Si, 17%; C, 1%; Al, Ca (?); Mg (?), 1%. The uncertainty of prices, the lack of equipment for electric furnaces, and the unfavorable attitude of most of the furnace men against silicospiegel, stand in the way of producing large quantities of this alloy from material which is found ready to mine, but unmerchantable.

Prior to the conference on Oct. 15 between representatives of the zinc producers and of the zinc smelters, the earnest hope was expressed in Washington that an agreement be reached. It was regarded as far more desirable to all concerned that the matter be adjusted so as to avoid fixing prices on zinc concentrates and on smelter tolls. It was feared that if an agreement was not reached, the general dissatisfaction among the miners would force such action.

It is reported that the War Industries Board has called the attention of the U. S. Bureau of Mines to the differences arising in certain districts between the shipper and purchaser of ores on questions of sampling and analysis and has suggested that the Bureau might render some help to the producer in this matter. So far as can be ascertained, no action has been taken on this request, but it is known that at least some of the Bureau officials believe that it is reasonable that the miner should be protected by the Government through the establishment of a uniform and correct standard of sampling and assaying.

Monthly Copper Production for 1918

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo, Backus & Johnston and Kantanga companies, whose copper does not come to the United States.

MONTHLY CRUDE COPPER PRODUCTION, 1918

	June	July	August	September
Alaska shipments.......	3,980,197	3,994,204	4,245,557	4,216,816
Arizona:				
Arizona Copper........	3,700,000	4,000,000	4,300,000	4,330,000
Cons. Ariz. Smelting....	1,750,000	1,430,000	1,250,000	1,200,000
Inspiration............	10,300,000	9,000,000	9,000,000	7,800,000
Magma.....	947,128	800,000	900,000	747,805
Miami..............	4,692,554	4,793,082	5,374,198	5,012,865
New Cornelia (*a*).......	2,822,000	2,300,000	2,838,000	2,468,000
Old Dominion..........	3,368,000	2,533,000	2,064,500	2,292,000
Ray................	7,736,559	7,300,000	6,625,000	7,250,000
Shannon.............	672,000	794,225	708,000	..
Shattuck Arizona.......	805,310	672,024	682,861	686,844
Other Arizona..........	25,823,920	24,727,751	26,363,078	25,002,934
California:				
Mammoth............	1,196,000	1,330,000	1,320,000	1,140,000
Michigan:				
Calumet & Hecla.......	11,699,212	11,118,426	10,718,520	10,341,468
Other Lake Superior (*b*)	7,000,000	7,000,000	7,000,000	7,000,000
Montana:				
Anaconda.............	25,800,000	25,400,000	24,900,000	21,800,000
East Butte............	1,999,760	2,076,460	1,714,358	2,134,700
Nevada:				
Mason Valley..........	1,224,485	1,190,177	1,032,702	1,682,340
Nevada Cons..........	7,250,000	6,400,000	6,500,000	6,670,415
New Mexico:				
Chino................	6,706,474	6,310,396	5,065,818	7,936,000
Utah:				
Utah Copper..........	18,500,000	16,021,766	19,920,947	17,785,000
Eastern smelters (*b*)....	1,750,000	1,750,000	1,750,000	......
Total reported.......	149,723,599	140,941,511(*c*)	144,273,539	...
Others, estimated.......	17,000,000	17,350,000	16,650,000	......
Total United States...	166,723,599	158,291,511	160,923,539	....
Imports: Ore and concentrates, etc..........	11,624,275	12,898,436	18,546,115	.....
Imports in blister, etc..	13,801,332	19,543,854	42,519,271	...
Grand total..........	192,149,206	190,733,801	221,988,925	....
British Columbia:				
Canada Copper Corpn..	244,586	232,647	159,821	....
Granby Cons..........	3,438,521	2,167,077	2,820,207	3,371,535
Mexico:				
Boleo................	1,322,720	1,697,360	....	....
Cananea.............	4,100,000	5,000,000	5,000,000	4,900,000
Other Foreign:				
Braden..............	8,292,000	7,036,000	6,690,000	6,020,000
Cerro de Pasco.........	5,874,000	5,238,000	5,786,000	6,150,000
Chile.........	9,280,000	7,556,000	8,496,000	...
Katanga.........	3,505,315	4,894,200	4,894,200	.....
Backus & Johnston.....	2,096,727	1,324,823	......	...

(*a*) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery, which is included under "Other Arizona." (*b*) Estimated. (*c*) Does not include United Verde Extension, whose figures are not yet available

The production of the United States by months since the beginning of the year is as follows:

	Pounds
January.....	165,431,568
February.	160,011,364
March........	185,525,168
April.........	163,207,096
May.....	181,070,350
June.........	166,723,599
July........	158,291,511
August....	160,923,539

The item "Alaska shipments" gives the official figure of the U. S. Department of Commerce. Kennecott production for June, July, August and September was 4,044,000, 5.090,000, 5,280,000, and 5.508,000 lb. respectively.

Labor's Best Friend

Accidentally our eye fell upon an editorial that appeared in the July issue of the *Wage Earner*, the official organ of the Workingman's Club of Massachusetts. We did not see the original, but noticed the reprint of it. It seems to us to express very sensible opinions:

> There is one industrial truth which the workingman has got to learn to appreciate.
>
> Of course there are a great many of this kind of truths, but no matter how important they may be, the one we are writing about is the most important.
>
> The labor union, the political club, the fraternal association, all have their places in the industrial world, and each organization plays an important part in the matters which come under its jurisdiction.
>
> There is one thing, however, which is away above all others, and that thing is for the workingman to find out who is his best friend.
>
> The business agent of your union will claim that he and our fellow members are your best friends; the political leader, who got you or your relative a job, will say that he is your best friend, and the president of the fraternal order will prove to you that the fraternal brothers, who call on you when you are sick, attend your funeral when you die, and help pay the expenses—that these are your best friends.
>
> All may be your dear friends, your good friends, and may be willing to put their individual hand into the individual pocket and chip in a dollar or so to help you out, and this is real friendship.
>
> But let us tell you one thing, that the best friend the workingman has got is the man who goes out, week after week, and digs up the money for the payroll.
>
> Yes, sir, it is your old boss who is your best friend. His pride is in his business, and to keep his business going he has got to pay his help, and many a business man has gone into an early grave, unsuccessfully trying to be the "best friend" of his workmen, the man who dug up their payroll every week, until it killed him.
>
> Your business agent may tell you, and you may believe, that the small boss, the big boss, the small contractor, the big corporation, are all taking advantage of you, and this may be true. but as long as you keep working for them, and they keep putting over the pay envelope to you every week, they are your best friends.
>
> If you do not get all in your envelope that you are entitled to, if you work longer hours than you believe you ought to for your money, and matters of kindred nature, all are open for your discussion, but while you discuss, the man who pays you off is your best friend.
>
> If you strike, you expect your union to be your best friend, and help you live by paying your something every week. If your union did not support you in this way, where would you find the "best friend" who would pay your bills?
>
> The workingman must not forget at this time, when he is able to make his best friend pay him more and more and more, that he is working his best friend to the limit, and even the best of friendships becomes strained when money matters are injected and too much is requested.
>
> The least that you and your representatives can do, in enforcing demands, is to do so in a friendly way, in a decent way, in a way which will not line up every "best friend" in the country against our unions.
>
> Organized labor will never be able to gain any more than organized capital in the end, and with organized labor and organized capital working together, all at the same time, to get the most they can out of the people of the United States, there will be three big factors fighting, and the fittest will survive.
>
> Capital and labor are powerful, but the third factor, the citizenship of the United States, is greater than they, individually or combined, and it ill behooves labor to become opposed by the general public because of the assumption, on the part of labor, of the same prerogatives in the past claimed by organized capital, namely, to the powerful belong the spoils.
>
> We believe it good tactics to remember, at all times, who really is the best friend of the workingman.

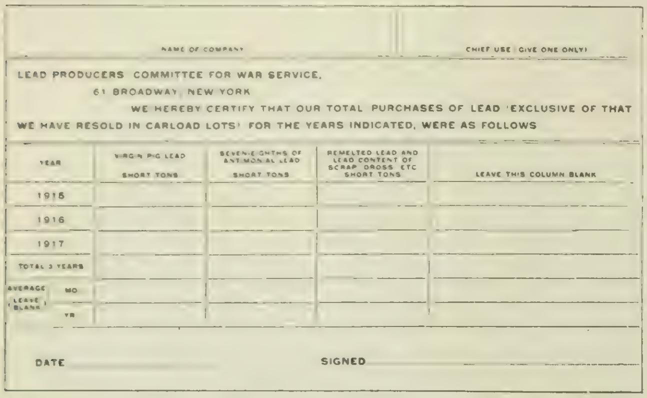
The Consolidated Interstate-Callahan Mining Co. reports that, in the second quarter of 1918, 23,215 tons of zinc- and lead-silver ores was mined. The mill and flotation plant treated 38,802 tons, with an average content of 16.19% zinc, 4.40% lead and 1.5 oz. silver per ton; and produced and shipped 11,781,177 lb. zinc, 1,438,396 lb. lead, and 27,218 oz. silver. The total cost of mining and milling was $7.35 per ton.

Notice to Lead Purchasers

The announcement of the Lead Producers' Committee for War Service, which was quoted on the market page of the last issue of the *Journal*, is reprinted herewith, together with a reproduction of the card that has been sent out with the notice. The text of the notice follows:

The Lead Producers' Committee for War Service is now allotting and clearing all carload shipments of virgin lead, both domestic and bonded, refined and antimonial.

In order to distribute most equitably the supply of lead after provision has been made for United States Government orders, the Lead Producers' Committee for War Service seeks the information requested on the enclosed card relative to your purchases for the years 1915, 1916 and 1917.



NAME OF COMPANY

CHIEF USE (GIVE ONE ONLY)

LEAD PRODUCERS COMMITTEE FOR WAR SERVICE,
61 BROADWAY, NEW YORK

WE HEREBY CERTIFY THAT OUR TOTAL PURCHASES OF LEAD (EXCLUSIVE OF THAT WE HAVE RESOLD IN CARLOAD LOTS) FOR THE YEARS INDICATED, WERE AS FOLLOWS

YEAR	VIRGIN PIG LEAD SHORT TONS	SEVEN-EIGHTHS OF ANTIMONIAL LEAD SHORT TONS	REMELTED LEAD AND LEAD CONTENT OF SCRAP DROSS ETC SHORT TONS	LEAVE THIS COLUMN BLANK
1915				
1916				
1917				
TOTAL 3 YEARS				
AVERAGE (LEAVE BLANK) MO				
YR				

DATE

SIGNED

Below is a list of "chief uses" of lead. You are asked to name one only in the place provided on the card for that purpose. In case your chief use does not appear in the below list, kindly state briefly what it is.

TABLE OF CHIEF USES OF LEAD

Batteries
Brass
Bullets and shot
Car seals
Cable
Foil
Locomotives
Mixed metals
Paints and colors
Railroad equipment —other than locomotives
Retail sales
Shrapnel
Sheets, pipes, bends.
Steel mills

You are urged to immediately fill in and return the card.

The notice is signed by Clinton H. Crane, chairman of the committee. Attached to it is a sticker on which the purchaser is asked to apply as a test to all transactions a query, namely, "to what extent, if at all, will the sale of this lead contribute directly or indirectly toward winning the war; and, if at all, how urgent is the need?"

September Pig-Iron Production

Pig-iron production during September reached a new high record, 113,942 gross tons per day, or a total of 3,418,270 gross tons, according to *Iron Age*. This exceeds the former high mark of pig-iron production—113,189 tons daily in October, 1916—by 753 tons, and the August output of 109,341 gross tons by 4601 tons daily. Ferroalloys produced in September amounted to 66,275 gross tons, creating another record, and surpassing the former of 54,633 tons in May, 1918, by more than 21%. For the first nine months of this year, 28,231,415 gross tons of pig iron was made, as compared with 28,794,231 tons in the same period in 1917, and 29,041,045 tons similarly in 1916. Fourteen furnaces were blown out and seven put in blast, giving 365 active on Oct. 1, as compared with 372 on Sept. 1. The estimated capacity in blast on Oct. 1 is 114,570 gross tons, as against 112,390 tons on September 1.

"Bunker Bullion"

The Bunker Hill & Sullivan Mining and Concentrating Co. has begun the publication of an interesting little paper with the title "Bunker Bullion," of which C. L. Larson is editor. John Rock, R. S. Handy and A. D. Moir also are on the staff. It is intended to have it serve as a medium through which those who remain at home may keep in touch with the men who are serving in the Army or Navy, by sending messages of good cheer, hope, and gratitude, as well as news of what is being done to back up those "over there." The first issue gives the names of 256 of the company's employees who are in the service, and contains greetings from the manager of the company, the Mayor of Kellogg, and the chairman of the Red Cross branch, as well as some figures of the response to campaigns for the Liberty loans, the Red Cross, and other organizations.

Export of Copper From Australia

Sydney, N. S. W., Correspondence

The copper producers in Australia are in an awkward position. The amount shipped to England at present is almost nil, because all available space is taken up with other exports having precedence of copper. Up to June 30 last the position was excellent. Those connected with the selling of the whole Australian output had been able to arrange with the Imperial Munitions Department that the latter would accept delivery at any Australian port, and pay for the copper at a fixed price, f.o.b., thus relieving the producer from any anxiety as to shipping space. This arrangement has not, so far, been renewed, or at least there has been no public announcement of any such renewal. More than 10,000 tons of munitions copper in Australia, in the form of metal that has been paid for, is awaiting shipment.

Since June 30 the output of copper has been maintained at the normal rate of about 3000 or 3300 tons monthly from all Australia, but the metal has not been sold to the Imperial Munitions Department and is still lying at the ports. Naturally, before it can be shipped, the above-mentioned 10,000 or more tons must be first disposed of. Meanwhile the cost of making the current 3000 tons monthly must be met by the producers, an expenditure amounting to over £70 per ton for most of it, and £100 per ton for the remainder. The banks cannot help to an effective extent in aiding the producers, because their resources are fully taken up with financing those who are interested in wool, lead and other products having precedence on copper—in addition to aiding the flotation of the sixth and seventh war loans.

Producers feel no little anxiety as to the disposal of current copper outputs. The Metal Trust, that has done so well in the past for the Australian metal producers, is fully alive to the situation. Shipment of the accumulation of munitions copper is being arranged for, and about 3000 tons is soon to be dispatched. Mr. Hughes and his colleagues in London are working hard to relieve the situation. Meanwhile it is possible that the two chief customs works—Port Kembla and Wallaroo—may have to cease buying customs ores temporarily. Small producers who are not under contract with these works must consider themselves fortunate in having obtained payment during the last few months at the rate of £80 per ton, with further payments deferred to a time when the price is again fixed, usual smelting deductions and bank interest being charged in the meantime. So far, none of the seven chief producers has had to decrease output, and the next couple of months will decide whether they can continue at normal rates or must shut down.

Since the receipt of the above from our Australian correspondent, the following additional information as to the copper situation in Australia, bearing date Sept. 16, has come to hand:

The anxious position in which Australian copper producers were placed during July and August has now been relieved. The Australian authorities in London have succeeded in obtaining a renewal of the contract for Australian copper with the Imperial government. The published terms are £106, f.o.b. Australia, and the period is until the end of 1918. Though this relieves the copper mines from financing their product, it does not make shipping space any more plentiful, and before the copper made in the period from July to December, 1918, can be shipped, that made in the first half of the year must be cleared.

Between the delivery of blister at Port Kembla works and handing it over as electro to the local Imperial agents, about 60 days elapse. This means that blister made on and after Nov. 1 next will not be delivered as electro till after the end of 1918. Such electro or furnace-refined copper as is delivered after the end of 1918 must be disposed of under a fresh contract. Considering the small total quantity of Australian copper and the difficulties of transport to England, as compared with American copper, the obtaining of a fresh contract on f.o.b. terms must be considered as a piece of good fortune to Australian producers, due mainly to the efforts of their London representatives.

Special Mining Industry Committee For the Liberty Loan

New subscriptions for the Fourth Liberty Loan placed through the special Mining Industry Committee of the New York Federal Reserve District up to and including Oct. 15 are given in the accompanying list, which, with the amount previously reported, shows a total of $38,885,300.

Cerro de Pasco Copper Corporation	$500,000
First National Copper Co	100,000
Consolidated Arizona Smelting Co	50,000
Homestake Mining Co	100,000
Charles T. Carnahan	2,000
Walter H. Aldridge	30,000
James F. Kemp	2,600
Employees, Albert R. Ledoux (additional)	9,000
Utah Consolidated Mining Co	100,000
The Dorr Co	15,000
North American Refining Co	2,500
Franz Fohr	1,000
R. H. Martin Co	5,000
Horn Silver Mines Co	10,000
Charles W. Welch	1,000
Schaaf-Regelmann, E. O.	20,000
General Mineral Co., Inc	2,500
Anonymous subscriptions	1,045,000
Anaconda Copper Mining Co	3,050,000
United Verde Extension Mining Co	500,000
Magma Copper Co	135,000
New Mines Issues Co	50,000
New Process Mining Co	20,000
Superior Arizona Copper Co	25,000
Mason Valley Mines Co	110,000
American Zinc, Lead and Smelting Co	150,000
Argonaut Consolidated Mining Co	50,000
Lucius Pitkin, Inc	3,750
Charles L. Peabody	2,000
Thomas H. Leggett	2,500
H. J. Greutert Co	1,500
Nipissing Mines Co	250,000
Butte & Superior Mining Co. (additional)	500,000
Chino Copper Co. (additional)	1,000,000
Ray Consolidated Copper Co. (additional)	1,000,000
Nevada Consolidated Copper Co. (additional)	1,000,000
Utah Copper Co. (additional)	2,000,000
George Lewis & Co	1,000
F. Howald	10,000
William Young Westervelt	7,500
Sydney H. Ball	1,000
Shattuck Arizona Copper Co	62,500
Employees, New Jersey Zinc Co. (additional)	39,800
Julius Goldman	115,000
Kuno B. Heberlein	1,000
Rowland W. Cox (additional)	3,000
Alfred W. Dodd	1,000
North Star Mines Co	10,000
Yukon Alaska Trust (additional)	50,000
E. N. Breitung & Co	25,000
Poillon Poirrier	10,000
Hamilton M. Brush	1,050
H. W. York	2,000
North Butte Mining Co	60,000
Minerals Separation Co	500,000
National Zinc Co	15,000
Employees, National Zinc Co	20,000
Charles E. Herrmann	1,250
Adolph Lewisohn & Sons (additional)	300,000
Matthiessen & Hegeler Zinc Co	100,000
Percy G. Beckett	5,000
Unity Gold Mines Co	5,000
Tobias Wolfson	10,000
American Vanadium Co	1,000,000
E. P. Earle	125,000
L. A. Chapin	1,200
Robert M. Raymond	7,500
Phelps Dodge Corporation	800,000
Cleveland H. Dodge (additional)	250,000
William Earl Dodge	50,000
James McLean (additional)	250,000
Arthur C. James (additional)	250,000
St. Joseph Lead Co	785,000
Clarence C. Burger	7,000
Elko Prince Mining Co	64,150
George Notman (additional)	25,000
R. V. Dey	10,000
J. V. N. Dorr	10,000
Subscriptions of less than $1000 each	6,200

Gold and Silver Production in 1917

The corrected and revised statement of gold and silver production in the United States in the calendar year 1917, prepared jointly by the Bureau of the Mint and the Geological Survey, has just been issued and shows that the preliminary estimates made in January were too high.

GOLD AND SILVER PRODUCTION OF THE UNITED STATES

(Gold, Value; Silver, Fine Ounces)

	Gold		Silver	
	1916	1917	1916	1917
Alabama	$7,400	$2,200		
Alaska	16,124,800	14,671,400	1,266,317	1,207,164
Arizona	4,092,800	5,180,600	6,680,252	6,962,257
California	21,980,400	20,929,400	1,936,910	2,107,107
Colorado	19,185,000	15,974,500	7,551,761	7,291,495
Georgia	20,400	6,500		
Idaho	1,058,300	754,800	11,570,399	11,402,542
Illinois			5,782	7,116
Maryland			153	538
Michigan			759,068	684,225
Missouri		300	128,860	63,344
Montana	4,328,400	3,673,200	14,046,054	14,555,034
Nevada	9,064,700	6,932,500	13,682,067	11,217,654
New Hampshire			935	
New Mexico	1,350,000	1,085,400	1,729,917	1,535,807
North Carolina	23,000	10,800	1,738	590
Oklahoma			606	
Oregon	1,901,500	1,687,300	221,887	172,152
South Carolina	300	1,700		
South Dakota	7,471,700	7,372,900	210,100	190,382
Tennessee	5,700	5,500	93,837	106,975
Texas	500	100	664,319	587,945
Utah	3,859,000	3,522,100	13,545,802	13,360,905
Vermont	300	100	1,964	403
Virginia	500	1,300	508	4,500
Washington	580,600	488,200	294,516	266,112
Wyoming	20,200	3,700	3,407	3,400
Continental U. S.	$91,075,500	$82,304,500	74,397,159	71,727,647
Philippines	1,514,200	1,446,100	17,643	12,715
Porto Rico	600	100		
Total	$92,590,300	$83,750,700	74,414,802	71,740,362

The revised figures give the total production of gold in 1917 at 4,051,440 oz., or $83,740,700 in value, or less than the January estimate by $705,900. The output of silver was 71,740,362 oz. fine, which is 2,504,128 oz. less than the preliminary figures.

GROUP OF OFFICERS OF THE TWENTY-SEVENTH ENGINEERS

Word From the Front

News of the mining regiment is always welcome, the more so now because of its scarceness. All mining men are interested in what the boys of the 27th Engineers are doing. The following letter was lately received from an officer in the regiment:

> Our hardships are many and our life at the front has not been over-described, but the worst hardships in the men's eyes are not those that you would expect. They take for granted the rain, the mud, the vermin, the long hikes, the occasional shortages of food, the constant subjection to bombardment and gas; the occasional casualties. The one thing, or things, that they are always seeking is tobacco, sweets and magazines. These seem petty wants, but are undoubtedly what we crave.
>
> The Comfort Fund of the 27th Engineers is a really fine thing, and has already made a name for itself here. Company C is at present detached from the regiment and attachment to the ——; they are doing combat engineering work, are constantly under fire, have had their share of casualties, and have been highly praised by high officers. They are all volunteers, a splendid bunch of miners and men, and deserve all that can be done for them.
>
> The Comfort Fund is used as the name indicates, and more than once has enabled us to provide for the men in a tight place.

Friends are assured that their contributions are still wanted for the Comfort Fund. Possibly some have mistaken the total reported weekly on this page to be the amount on hand in the treasury. This, of course, is not the case, and the balance is steadily dwindling. Mining men may well take pleasure in helping the mining regiment through "a tight place." A check now will accomplish this end.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Sections, National Safety Council	125.00
Total	$18,632.77

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Captain Irving

The *Yale Alumni Weekly* gives the following new and interesting information:

> Mr. C. W. Mendell,
> Director Yale Bureau, Aug. 2, 1918.
> American University Union,
> 8 Rue de Richelieu, Paris.
>
> My Dear Sir:
>
> In reply to your letter of July 31, would say that the burial of Capt. John D. Irving, Engineers R. C., took place on Tuesday, July 23, 1918. The escort left the American hospital at Langres at 5 p.m. and proceeded to the American section of the Langres cemetery, just north of town. A military band led off, playing the funeral march, followed in order by Company A, 27th U. S. Engineers, which formed the escort, then the remains supported on a gun carriage and draped with the national colors, and finally a number of allied officers attending the funeral. The honorary pallbearers were Col. P. S. Bond, Commandant, Army Engineer School; Col. F. B. Wilby, Lieut. Col. J. W. Schultz, Maj. J. G. B. Lampert, Maj. Evarts Tracy, and Maj. Brooks, all of the Engineer Department.
>
> The burial service was conducted by Dr. C. W. Lowrie, pastor of the Presbyterian church, Detroit, Mich., who is now serving as a chaplain of the Y. M. C. A. In the course of a most excellent address Dr. Lowrie made a number of well-chosen remarks upon the value and importance of the work on which Captain Irving was engaged, upon the important results already attained by him, and upon the great loss to the service that his death occasioned. The Army Engineer School can most heartily concur in all of the above, as Captain Irving was one of our most valuable officers, and his place will be most difficult to fill.
>
> At the conclusion of the service, Company A fired three volleys over the grave and a trumpeter sounded taps beside it. There were a number of flowers presented by Captain Irving's friends.
>
> All of Captain Irving's effects have been secured and disposed of according to orders and regulations, the grave is properly marked and identified, and it is therefore believed that there is nothing that you could possibly accomplish by coming to Langres.
>
> Yours truly, W. H. Holcombe,
> Major, Corps of Engineers,
> Assistant Commandant.

Copper Mining in Ontario Unprofitable

As a result of high mining costs and increased freight rates and smelter charges, copper mining has become unprofitable in the province, states an Ontario Bureau of Mines report. The only recent shipper was the Hudson Copper Co., at Havilah. Nickel-copper mining and smelting, however, show an increase in output. The Canadian Copper Co. is no longer known by that name, having been absorbed by the International Nickel Co. of Canada, Ltd. The new refinery of the company, at Port Colborne, began operations in July. From the Creighton mine, ore is being raised at the rate of over 100,000 tons per month. During the half year, 804,640 tons of ore was raised from the operating nickel-copper mines. Ore smelted was 717,119 tons, producing 40,178 tons of nickel-copper matte.

The Butte and Superior Mining Co. reports that, in the second quarter of 1918, 114,716 tons of ore was milled, of an average grade of 16.242% zinc and 6.154 oz. silver per ton. The concentrates produced amounted to 32,653 tons, containing 51.882% zinc and 19.763 oz. silver per ton. The total cost of mining and milling amounted to $9.9088 per ton. Ore milled during the quarter was 21,161 tons less than during the first three months of the year. This was due to shortage of labor, and as the result of a serious wreck in No. 1 shaft, occasioned by the fall of a loaded skip from the surface to the 1200 ft. level, which cut away a considerable part of the shaft timbering between the 1000 and 1200-ft. levels.

Editorials

The President's Messages

THE President in his replies to the German proposals for peace has said exactly what every American has wanted him to say. He has the unqualified backing of the American people. If in the first message—the interrogatory message—the critical found what they thought were omissions of things that ought to have been said, they learned later that the President in his superior wisdom had omitted them simply owing to the time for them not yet having come.

The second message—the real reply to the German appeal—breathed the spirit of unconditional surrender and the immediate cessation of the atrocities that are horrifying the civilized world. The President says in effect: Discontinue your outrages, evacuate the countries that you have invaded, arrange an armistice with the military commander of the Allied armies that will be satisfactory to him, and then, and not until then, we will talk about paece.

This is equivalent to a demand for unconditional surrender, and there is every indication that Germany is ready to yield to the inevitable. Bulgaria is already out of it. Turkey is prostrate. Austria-Hungary is manifestly on the point of breaking into pieces. The military supremacy of the Allied armies over the German on the Western front is unquestioned. This state of affairs has developed without Germany beginning to feel the full measure of America's mechanical power.

With President Wilson and his advisers acting in collaboration with the governments of the Allied nations, we may rely upon the brushing away of any German trickery. The President is expressing the voice of the American people, and every citizen stands with him in the intention of not relaxing one ounce of effort until unconditional surrender is enforced.

Zinc in the Third Quarter, 1918

THE zinc statistics for the third quarter of 1918, in comparison with those for the previous quarters, are given in the accompanying table. The figures do not reveal any great industrial changes. The market during the third quarter averaged a little better than in the second, which induced the firing of some idle furnaces, with the result of an increase of about 4500 tons in the production of distilled spelter. The production of electrolytic spelter, which is governed by independent factors, showed proportionately a large increase.

The total number of retorts in distillers' works decreased from 196,580 at the end of the second quarter to 173,944 at the end of the third. This was due to the dismantling of some large plants. We are carrying on our list some other plants that probably will be abandoned.

The number of retorts in use at the end of the second quarter was 110,956. At the end of the third it was 118,008, of which 3556 were in use for redistilling. Only three companies reported such use. The contraction in the margin between the prices of high grade and common spelter naturally reduced that business.

The position of stocks at the end of the quarters showed little change, as to the aggregate. We include in our enumeration of stocks all that is in smelters' hands, irrespective of whether they intend to use it in accessory factories of their own, or not. The technical position may indeed be considered to have been improved. However, the ability of smelters to increase their production and the easiness of the situation in high-grade spelter were counteracting factors, and therefore the advance in the market during the quarter did not go far.

Production in short tons:	First Quarter	Second Quarter	Third Quarter
Distilled	125,572	117,512	122,130
Electrolytic	8,096	9,404	11,124
Total	133,668	126,916	133,254
Stock at end of quarters:			
At works	(*a*)	43,149	42,854
Elsewhere	(*a*)	2,932	2,934
Total	64,443	46,081	45,788
Total number of retorts	198,894	196,580	173,944
Number of retorts in use	124,072	110,956	118,008

(*a*) Not segregated in reports.

The reported stocks as of Apr. 1, July 1, and Oct. 1, respectively, include only what was in producers' hands, either at their works or held elsewhere.

Electrochemistry and the War

THE achievements of electrochemistry are manifold, and its products multiform. This science has grown in usefulness at a phenomenal rate. It forms the basis of innumerable and important industrial enterprises, and it works hand in hand with many other industries which profit by its help. It has increased and enlarged the market for many old standard mining and metallurgical products, and has invaded new fields, and with its magic touch has created demands for products that formerly were of limited interest and usefulness.

The importance of electrochemistry in all departments of usefulness may easily appear to be unlimited when we contemplate its nearly vital service in that one most spectacular of all fields for the moment—the battlefield. The electric furnace or the electrolytic cell has played its part in the production of almost every important substance or contrivance used in modern warfare.

Of all the steel produced in the United States, it is estimated that 60% is now applied to war work. In the manufacture of high-grade steel the electric furnace is rapidly supplanting the crucible. The largest manufacturers of axles and bearings for automobiles are using electric furnaces to make their steel. Electric steel is increasing in production and gaining in popularity.

One naturally thinks of ferroalloys and electric furnaces at the same time. Ferromanganese is now pro duced in considerable quantity in the electric furnace. Its use in steel manufacturing is too well known to require comment. Ferrotungsten, ferrovanadium, ferromolybdenum, and ferrotitanium, are used in the production of modern guns, high-speed cutting tools, and in many kinds of machinery. Ferrochromium is an essential in armor plate and armor-piercing projectiles. Ferrosilicon is used to deoxidize steel, and is an important constituent in the manufacture of shell steel.

All fine machine work requires the use of abrasives. Carborundum and alundum are machine-shop necessities. Carborundum is essential in the manufacture of machine guns, rifles, shells, automobile trucks, airplanes, and all machine work. Alundum, aloxite, and exolon are artificial emeries of wide usefulness. All these abrasives, and others, are electric-furnace products. In the manufacture of carborundum the raw materials which enter the furnace are coke and sand. Alundum, aloxite, and exolon are made from bauxite. Alundum has found considerable use as a refractory. It is also used by the chemist for filters in analytical work.

Electrolytic copper refining has become a vast industry. Copper is a metal of wide application in war equipment. Its uses in brass and for wire are common. No satisfactory substitute has been found for the copper bands on shells. Electrolytic zinc has taken rank in the high-grade class. Aluminum, made in the electric furnace from bauxite, is most important in the manufacture of airplanes, automobiles, and auto trucks.

Calcium carbide is made in the electric furnace, the raw materials being coke and limestone. Calcium carbide naturally suggests acetylene and the oxy-acetylene torch, and it is the raw material in the manufacture of cyanamid, which in turn suggests ammonia, nitric acid, and acetone, the last named important in the manufacture of certain explosives. Cyanamid is also a valued intermediate agent in the fixation of atmospheric nitrogen.

From common salt the electrolytic cell makes caustic alkali and chlorine gas, and bleaching powders, disinfectants, peroxides, and sodium metal, the latter being used in incendiary bombs, are produced as byproducts. The gases used for war purposes include oxygen, hydrogen, chlorine and bromine, all produced electrolytically.

Among the materials used in explosives are caustic potash, caustic soda, sodium chlorate, potassium chlorate, nitric acid, and other nitrogen compounds. These are commonly products of the electric furnace or cell. Other substances of similar method of production are phosphorus, used in matches and incendiary bombs; magnesium, employed in making alloys of great strength and light weight, to be used, in turn, in the manufacture of aircraft; magnesium, a constituent in devices to illuminate battlefields at night; graphite, used as a lubricant; and carbon bisulphide, a valuable solvent, made from the raw materials charcoal and sulphur. The carbon and graphite electrodes with which all electric furnaces are equipped are themselves electric-furnace products.

Electrochemistry is not just coming into its own—it has arrived; and it is proving itself to be a most willing, powerful, and versatile agent in the winning of the war. It has greatly enlarged the field for chemical and metallurgical engineers.

The Gold Question

SOME people talk about the "price for gold" being "fixed," as if that were an arbitrary act of some government, or governments, which can arbitrarily alter the fixation. The value of gold is what it will buy. There is no price for gold and no fixation. Sovereigns and dollars are simply names corresponding to certain quantities of gold. The alteration of those names would not effect anything.

The miner delivers to the mint an ounce of gold, roughly speaking, and receives a coin called the double-eagle, which is marked 20 dollars. With that coin he can buy, say, four tons of coal or the labor of a man for four days. Call the double-eagle, or the coined ounce of gold, 40 dollars, instead of 20, or 40 simoleons, or whatever may be pleased, it will not buy any more coal or labor merely by reason of the changes of name, and if the gold miner cannot buy any more things, he is no better off.

The claim of the gold miner for governmental consideration must rest upon different grounds than any conception that is so naive, and those grounds are substantially these: That our currency has departed from the gold basis, so that gold would really be at a premium if it were free and private owners and producers of gold are deprived of the benefit of a premium by governmental interference. Or, that money is simply a vehicle of commerce, that the gold basis for conducting the greatly expanded commerce of the present time is insufficient, and that the Government can properly contemplate the payment of a bonus merely for the sake of obtaining a further supply of new gold.

BY THE WAY

We recently had an opportunity to peruse a circular issued by the Metal Mine Workers' Industrial Union, which is No. 800 of the I. W. W. This circular, which is an appeal to workers to join that union, is interesting indeed, especially the following:

> It is the union that is going to get the pay dirt for the miner. We are starting out with real modest demands. These demands will be multiplied as soon as we have the power to enforce more demands. Among the demands that we want at once are these:
>
> First, a six-hour workday. Down in the hot stopes a decree has gone forth that six instead of eight hours shall be the length of a shift. That decree, backed up as it is by organization, must be complied with.
>
> Second, no less than two men on a machine. This demand is exceptionally modest. Years ago we worked two men to a machine, and today, after 24 years of M. F. M. organization, one man to a machine is the rule. In the drifts and crosscuts we have held our counsel and have decided to abolish that rule. Our decision, backed by real organization, must be the law.
>
> Third, no more speeding up. Too many of our fellow workers are rustling on the hills now. By the curtailing of production we not only will make life more bearable for ourselves, but we will also provide more jobs for the boys rustling on top of the hills.
>
> Fourth, the abolition of the physical examination. We do not propose to be stripped before going to work and then be stripped again when we get our pay check. One of the strippings must be abolished now. We will tend to the other one later.

There are some people who naturally prefer the trade of robbery to working for a living. What's the use of talking about a six-hour day?

Reed Smoot, of the Senate Finance Committee, says he revenue bill will be radically altered before it passes he Senate. The measure as it stands, he claims, is unientifically framed and tends to restrict production. provides for $2,000,000,000 more than is needed, and he excess-profits section lacks justification. The bill, says, is a political measure designed to get money om the smallest possible number of voters. He points it that of $24,000,000,000 estimated war expenditures, ,000,000,000 are loans to our Allies, so that on a he-third basis $6,000,000,000 would be sufficient to raise taxation. Even then, he adds, "we can't spend $18,00,000,000 in a year." Senator Smoot advocates conimption taxes on sugar, tea and coffee, estimating the venue as at least $1,000,000,000. An additional $1,000,00,000 could be realized from a 1% tax on gross sales, said. Estimates submitted to the House Ways and eans Committee indicated that a 1% tax on gross sales ould bring in not less than $2,000,000,000.

The Belgian government has conferred the title of Honorary Citizen and Friend of the Belgian Nation" Herbert C. Hoover, the American Food Administrator. The preamble of the decree conferring the honor Mr. Hoover renders homage to his forceful personaly, when he stood at the head of the colossal underking for feeding Belgium. It adds that the govnment would have liked to give him testimony of its lmiration and gratitude in the usual form, but owing the fact that Mr. Hoover is now an American Govnment official the Belgian government refrained from oing so, in respect for American traditions. "That why the government," says the announcement, "proposes to the King to reserve for him a place of honor the Belgian family, over which he has been the agent Providence, and to affirm in a public official document he unalterable friendship of Belgium to her great beneactor. That purpose is accomplished by conferring upn him the title of honorary citizen and friend of the elgian nation, which has been borne by nobody since elgium has existed as a state." The preamble is igned by all the ministers.

Senator Fall, of New Mexico, has some interesting leas. In the course of the debate on Senator Henderon's bill he expressed himself contemptuously respectng the geologists of the country, using the following anguage: "Bear in mind that no geologist in the employ f the United States Government or any private cororation, so far as I am aware, ever discovered or develped a lode or body of minerals. We have geologists, ut they are not practical miners or mining men, and y the time one of them completed a geological survey where some brogan-shod miner had discovered a deposit, nd told you how the particular mineral happened to e deposited, by the time he had arrived at this conlusion and put it down upon paper, to tell how that mineral was deposited, the war would have been over." Oh, Senator Fall! We do not remember any discoveries hat have been made by the geologists in Governmental ervice, but we are sure that the Anaconda Copper Minng Co. would not dispense with its geological departnent for any consideration. Senator McCumber inuired of Senator Fall if the geologists and the scientists would not be the very people who would be employed under the terms of the bill. Senator Fall replied: "Not if Barney Baruch or Replogle run the business. I say that unhesitatingly, because they are business men. One of them for years has been buying and selling minerals and the other one's business has been that of producing iron and steel economically, and he knows more about that business than any other man in the United States, I presume." We wonder whether the smile is broadest in the environs of Wall Street or in Mr. Baruch's own office.

On one occasion a "sport" of herculean frame, and wearing a huge black beard that gave him a most ferocious appearance, cheated a miner out of $400 or $500 in a game of draw poker, reminisced Dan de Quille in "The Big Bonanza." The miner saw the cheat and left the place wearing an ugly look. Some of those present who knew him told the big sport that he had better leave, as his man had gone off to "heel himself," and there would soon be trouble. "Why, gentlemen," said he, "you don't know me—you don't know who I am! I'm the Wild Boar of Tehama! The click of a six-shooter is music to my ear, and a bowie knife is my looking glass—." Here he happened to look toward the door, and saw the miner entering with a shot gun, and concluded "— but a shot gun lets me out," and he went through the window behind him head first.

The War Labor Board, on which the public and the business interests are represented, is really subordinate to the War Labor Policies Board, headed by Felix Frankfurter. The Policies Board is interdepartmental, supposedly, but it is, in reality, dominated entirely by Mr. Frankfurter, who was born in Vienna, Austria, Nov. 15, 1882, and who was brought by his parents to this country when he was 12 years old. The labor policies outlined by Mr. Frankfurter become, almost automatically, the policies of the Taft-Walsh board, says the *Boston News Bureau.* Mr. Frankfurter has never been employed in any business of his own, and previously had no experience with labor. He graduated from the Harvard law school and has been a professor of law. He was engaged for a long time in municipal research work, and shortly after the war began became a special assistant to the Secretary of War. The policy of the Frankfurter board, of course, is to avoid strikes, and to avoid any impairment of good working conditions. As the policy has been worked out by the War Labor Board, higher rates of wages than were actually asked for have been granted in some instances. The financial ability of a company to pay increased wages is seldom taken into consideration. The eight-hour basic day is being applied everywhere. The Labor Policies Board, in addition to dictating the policy of the War Labor Board, also dictates the policy of the United States employment service, which has already assumed complete control of common labor and partial control of skilled labor. The Railroad Administration has raised the wages of workmen $400,000,000. The Wage Adjustment Board of the Shipping Board has raised wages in the shipyards about $300,000,000. There is no member of the Cabinet of the President who can be regarded in any way as a spokesman for American business.

NEW PUBLICATIONS

Report on the Building and Ornamental Stones of Canada. Vol. V, Province of British Columbia. By Wm. A. Parks. Pp. 236, illus. Canada Department of Mines, Ottawa, Canada.

Gold Dredging in the United States. By Charles Janin. Pp. 226; illus. Bull. 127, U. S. Bureau of Mines Washington, D. C.

An exhaustive monograph on the subject, written with the object of summarizing the facts concerning the development of the gold dredge, describing in detail the essential features of present-day practice, discussing the data needed to determine whether a placer deposit can be profitably dredged, and suggesting approved methods of prospecting placer ground and operating dredges.

The author, a recognized authority on the subject, has handled the matter with conspicuous success; and the present volume—for it is more than a bulletin—will undoubtedly rank among the standard textbooks on this important method of gold recovery. After paying a tribute to New Zealand, as the originator of the first commercially successful gold dredge, Mr. Janin deals with the early history of the process, tracing the development of the industry step by step to the present day, and paying particular attention to the gradual progress in design and construction. The various gold-dredging districts in the United States are described in detail and classified in geographical order. Complete information is given as to the details of operation, and reference is made to practically every phase of the subject. A special chapter on dredge construction, by George E. Sibbett, will be found of considerable value. Details of practical control and many informative tables are given, and a large number of excellent plans and illustrations are included.

According to the author, the highest point of production for the gold-dredging industry has been reached, and a decline in output may be expected. Improved methods, such as those described and advocated by the author, will help in extending the industry beyond what was previously considered the limit. The bulletin will prove of value, as well as interest, to designers and builders of dredges, to mining engineers, and to all others who are connected in any way with or contemplate investing capital in placer-mining ventures.

The Metallurgists and Chemists' Handbook. By Donald M. Liddell. Revised Edition. 4 x 6¾, pp. 656, illus.; $4. McGraw-Hill Book Co., New York.

Captain Liddell, of the Signal Corps, has brought out a new edition of his little handbook, which he prepared in the first place while he was on the editorial staff of the *Journal*. In the new edition there has been no change from the plan originally adopted, and the additions, in the main, have been largely those bearing on war activities, such as additional information on alloys and toxic gases.

It is always difficult satisfactorily to review a handbook, for, as the author of this one says in the preface to his first edition, his friend who checked the page proofs from beginning to end is doubtless the only man besides the author who would ever read the entire book. In fact nobody expects ever to read a handbook from beginning to end, any more than he would a dictionary, unless something like proofreading requires him to do so. A handbook is not intended to be a means for passing a pleasant evening. On the contrary, its function is to serve as a work of reference; something to be kept on the desk or on a nearby shelf, that will be handy in supplying some necessary figure, such as the atomic weight of an element, or the boiling point of a metal. The practical test of a handbook is therefore the resources that such a compendium may be found to afford after prolonged use.

During the last five years there has been a considerable vogue in issuing handbooks. Many authors have sought to emulate in their own fields the classic productions of Trautwine and Kent. Most of these, unfortunately, have fail to grasp the handbook idea at all. What they have pr duced have been tabloid treatises, rather than handboo for reference. Both are valuable, but a distinction nee to be made between them.

Captain Liddell is one of the few who appreciated t handbook idea and produced one. His little book is ju as much a handbook in its own field as is the production Trautwine in its larger field, or perhaps we should bett say its more general field, for chemistry and metallur may be as large a subject as is the whole of civil e gineering, and probably is.

The best thing that we can say of Captain Liddell's bo is that since the publication of its first edition it has wo well. For the chemist and metallurgist it is a mighty han thing to have around, for the fundamental figures that a commonly wanted are easily to be found in it, and t author has shown good judgment in selecting his tables a testing their reliability.

Metallurgy of Lead. By H. O. Hofman. 6 x 9, pp. 6 illus.; $6. McGraw-Hill Book Co., New York.

Fortunate is that author who, having once written famous treatise on his special subject, attains the oppo tunity, after the lapse of many years, to do it all over aga This is something like the opportunity of living one's li over again. With the riper experience and keener perce tion of what ought and what ought not to be done, the resu is bound to be a great improvement. This is what h happened to Professor Hofman with his "Metallurgy Lead." His original treatise was published in 1892, sin which time it has been revised from time to time. length, however, it seemed wise to abandon the old bo and write a new one. The book that we are now reviewi is a new book. Only two or three chapters of the old o remain.

Let us make haste to say, right away, that the new bo is a great production. It is no special praise to say th it will immediately take its place among the classics metallurgical literature, for the old treatise was alrea enshrined among them. It is better for us to say that t new book is a great improvement upon the old one. It very satisfying. There is scarcely anything that the le smelter will want to know that he cannot find within pages.

Professor Hofman's new book reminds us, a good deal, Kerl's "Grundriss der Metallhüttenkunde," that famous wo of nearly 40 years ago. It has the same character as compendium, the same tendency to give figures of cos the same copious footnotes to references, and the sa air of presenting a digest of all printed knowledge on t subject. However, Hofman is in no wise a mere imitat in style. His own individuality is impressed througho the book, especially his imparting of knowledge that he h obtained by direct communication with the original sour and his reporting of the things that he has seen hims and the researches that he has made himself. His style d fers essentially from that of Peters, in the latter's m famous book, in being much less critical of practice and showing less inclination to pronounce what is best and condemn what ought not to be done.

Of course the conscientious reviewer must find somethi to criticize in every book, just to prove that he has read if for no other reason. We confess to a little irritation ov Professor Hofman's practice in referring to authorit *en bloc*. Thus, in describing the practice at some smelte or the theories respecting some process, he will offer digest of all and make one blanket reference to all, givi the reader no chance to discriminate among good and b authorities. Moreover, this must be disagreeable to go authorities, who find themselves thus associated with oth whom they know to be doubtful. We noticed one ca moreover, where Professor Hofman quite misundersto an authority whom he quoted, although this fortunat was more or less immaterial. The engravings in the n book are generally excellent, but in numerous cases t presentations could have been improved greatly by t omission of non-essential details.

Personal

Have You Contributed to the Association f the 27th Engineers?

William de L. Benedict is back from lifornia.

Harry J. Wolf examined mining property southwestern Colorado recently.

Norman Carmichael, of Clifton, Ariz., s at Globe, Ariz., early in October.

Forbes Rickard was in Idaho Springs, lo., recently on professional business.

Franklin W. Smith has returned to Bis, Ariz., from a visit to Parral, Mexico.

C. D. Leslie has been elected president the South African Institution of Engi rs.

Bulkeley Wells investigated mining propy in Montana during the latter part of ptember.

Cecil H. Desch has been appointed prosor of metallurgy in the Royal Technical llege, Glasgow.

J. B. Tyrrell, of Toronto, has been mak a professional trip to the chrome mines Black Lake, Quebec.

H. S. Meyer has been elected president the Chemical, Metallurgical and Mining ciety of South Africa.

C. W. Greenland, a graduate of Queens niversity, Kingston, Ont., has been apinted professor of geology there.

A. Gibb Maitland, government geologist r Western Australia, has received a long ave of absence on account of ill health.

Hugh Lee has succeeded **L. K. Fletcher** superintendent of the Mutual Chemical ., operating chromite mines in Quebec.

Maj. George B. Wilcox, formerly chief tchman for the Calumet & Arizona Ming Co., is now at Camp Greene, North rolina.

William S. Dun, lecturer on palaeontoly at Sydney University, Australia, has en elected president of the Royal Society New South Wales.

Stanley C. Sears, of Salt Lake City, has en commissioned a captain of engineers the United States Army, and ordered to mp Humphreys, Virginia.

Frank P. Knight and **J. Judson Dean**, esident and vice-president of the Iron p Copper Co., were visitors recently to e property at Globe, Arizona.

Oscar Lachmund, who recently resigned general manager of the Canada Copper rporation, will engage in private consultg work in Spokane, Washington.

Henry Bruere, vice president of the nerican Metal Co., has been appointed nployment Director in New York State r the U. S. Employment Service.

Frederick G. Lasier, mining engineer of etroit, Mich., has been commissioned a ptain in the Engineer Corps and ordered Camp Humphreys, Virginia, for training.

William Frazer, superintendent of the avis Daly Copper Co., of Butte, Mont., ho has been in California for several onths for his health, has returned to tte.

G. J. Mackay, recently assistant inspector industrial and technical education for ntario, has been appointed professor of etallurgy at Queens University, Kingston, ntario.

A. T. Thomson, assistant to the presint of the Phelps Dodge Corporation, has turned to Douglas, Ariz., from Los Aneles, where he recently underwent an eration.

W. J. Melville, superintendent of the ominion Mines and Quarries in Quebec, s been transferred to the company's ofes at Niagara Falls. He is succeeded **Martin Schwener.**

L. J. Mayreis will be in charge at the urma Mines, at Namtu, Burma, until the rival of **R. G. Hall**, of St. Louis, Mo., hose appointment as resident manager as recently announced.

H. Mortimer Lamb, accompanied by **eo Denis**, superintendent of mines for uebec, paid a visit to the asbestos and rome districts recently in the interest of e Canadian Mining Institute.

Harry H. Stout, smeltery superintendent Douglas, Ariz., for the Copper Queen anch of the Phelps Dodge Corporation, s been commissioned a lieutenant colonel the Ordnance Department of the U. S. rmy.

Willis Warner has been made general emist of the Republic Iron and Steel ., Youngstown, Ohio, and placed in charge of the openhearth and blast furnace laboratories, succeeding **T. J. Davies**, resigned.

J. A. Harvey, who has been associated with the development enterprises of M. J. O'Brien, of Renfrew, Ont., for several years, has been appointed to the faculty of applied science at Queens University, Kingston, Ontario.

Max. J. Welch, who has been designing a plant for extracting potash and aluminum by a new process for the American Metal Co. in New York, has returned to Los Angeles, where he will stay until the first of the year.

Edward P. McCarty, consulting mining engineer of Minneapolis, Minn., was commissioned a captain of engineers during September, and is now at Camp Humphreys, Va. He has temporarily closed his office at 318 Palace Bldg., Minneapolis.

S. E. Slipper, of the Canadian Geological Survey, who has been inspecting oil development work in the Peace River field, is leaving the government service to direct oil-drilling operation for a private company at High Prairie, Alberta.

T. H. Symington has been made a special assistant to the Chief of Ordnance and will be in direct charge of the metal components of artillery ammunition. He is a member of the firm of Symington-Anderson Co., of Rochester, N. Y., iron and steel manufacturers.

Joseph A. Thomson, who has been active for the last three years in the development of chrome interests and chrome exports in Black Lake and Danville districts of Quebec, has begun operations at the Port au Port chrome deposits in Newfoundland.

Cefernio Carreno, representing the Chilean Government, was at Nacozari, Sonora, Mexico, last month, where he inspected the operations of the Moctezuma Copper Co. He then went to Douglas, Ariz., and from there to Ajo, where he visited the plant of the New Cornelia company.

Charles A. Burdick has returned to New York after making an examination of deposits of high-grade manganese ore suitable for chemical purposes. Mr. Burdick visited many properties in the Rockies from Montana to Mexico, as well as those in Arkansas and in the Appalachians.

W. Spencer Hutchinson, of Boston, has been examining the Ajax mine of the Carolina Company at Cripple Creek. During the last summer he also examined the vanadium properties of the American Vanadium Co. at Minas Ragra, Peru, as well as that company's molybdenite deposits at Jauja.

J. M. Forbes, who has been manager of the Federal Asbestos Co., at Robertson Station, Que., has accepted a position with the Reid Newfoundland Ry., with offices at St. Johns. The management of the Federal Asbestos Co. will be conducted by the Jacobs Asbestos Co. of which it is a branch company.

Rudolf Gahl has opened a consultation office at the First National Bank Bldg., Denver, Colo., and will continue to specialize in the treatment of copper ores by wet methods. Equal attention will be given to the metallurgical design of new plants and to the solution of problems arising in connection with those now in operation.

Conrad Wolfle, of Spokane, president of the United Copper Mining Co., of Washington, has been made chairman of the Washington board of advisers to assist the director of the U. S. Bureau of Mines in securing deferred classification of miners and furloughs for miners who have been drafted. Other members of the Washington committee are W. R. Rust, of Tacoma; George Turner, of Spokane; George S. Railey, Republic, and W. J. C. Wakefield, of Spokane. **Frederick Burbidge**, of Wallace, Idaho, is chairman of the Idaho board, and **John Gillie**, of Butte, is chairman of the Montana board.

Obituary

Edward Randolph, president of the Balbach Smelting and Refining Co., died suddenly of apoplexy on Oct. 11 at the company's plant in Newark, N. J., aged 47 years. He was a member of the American Institute of Mining Engineers.

Lieut. Sydney A. Lang, of Toronto, aged 34 years, died in the Officers' Hospital, St. John, Que., on Oct. 5, of Spanish influenza. He had been serving with the Canadian engineers, but was unable to go overseas on account of an injury to his knee. Lieutenant Lang was graduated from the School of Science, Toronto, in 1913, and went to Chile as a mining engineer, returning to Canada to enlist on the outbreak of the war.

Industrial News

Manhattan Oil Co. has removed its offices in Tulsa, Okla., to the Cosden Building.

Chicago Pneumatic Tool Co. has appointed B. H. Tripp as district sales manager for the Pacific Coast. Mr. Tripp succeeds M. W. Priseler.

S. R. Vanderbeck, vice president of the Electric Furnace Construction Co., Philadelphia, has resigned to become president of the American Metallurgical Corporation, of Philadelphia. The latter company controls the Philadelphia Electric Steel Corporation, makers of electric steel castings. The business of the corporation covers the conditions entering into the design of all types of electric furnaces for melting and heat treatment. F. J. Ryan is general manager of both companies.

Trade Catalogs

Minerals. Ward's Natural Science Establishment, 84-102 College Ave., Rochester, N. Y. Price list No. 187; 6 x 9¼; pp. 8; September, 1918; a price list of minerals sold by weight. Price list No. 188; 6 x 9¼; pp. 16; September, 1918; a price list of rocks, American and foreign. Price list No. 190; 6 x 9¼; pp. 24; Sept. 1, 1918; a summary of collections of rocks and minerals for sale.

Condensers, Pumps, Cooling Towers, Etc. Wheeler Condenser and Engineering Co., Carteret, N. J. Bulletin 112-A, 1918; 8 x 12½; pp. 32; illustrated. Those contemplating the installation of a condenser may be interested in a discussion in this bulletin, entitled "Choice of Kind of Condenser," and in the illustrations and descriptions of other Wheeler condensing machinery in detail. The bulletin embraces large and small surface condensers, showing typical complete installation; rectangular and cylindrical types; jet condensers; barometric condensers; Wheeler-Edwards air pumps; Wheeler rotative dry vacuum pumps; the Wheeler turbo-air pump; centrifugal pumps for circulating water; natural and forced draft cooling towers; the Wheeler feed-water heater and Wheeler multiple-effect evaporators and dryers.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alloy Containing Cu, Ni, Fe, Zn, Pb and a trace of P. Foster Milliken, Lawrence, N. Y. (U. S. No. 1,277,989, Sept. 3, 1918.)

Alloy Steel Containing Mo in addition to Usual Constituents. Childe Harold Wills, Detroit, Mich. (U. S. No. 1,278,082; Sept. 3, 1918.)

Flotation Process and Apparatus. Jackson A. Pearce, Idaho Springs, Colo. (U. S. No. 1,277,750; Sept. 3, 1918.)

Furnace, Electric. Horace Freeman, Niagara Falls, Ontario, Canada, assignor to American Cyanamid Co., New York, N. Y. (U. S. No. 1,277,899; Sept. 3, 1918.)

Iron—Process of Making Magnetic Product in Furnace. Trygve D. Yensen, Swissvale, Penn. (U. S. No. 1,277,523; Sept. 3, 1918.)

Mine Cars, Rotary Dump for. Joseph Bierer and Edward N. Zern, Morgantown, W. Va., assignors of one-third to Everhart Bierer, Morgantown, W. Va. (U. S. No. 1,277,836; Sept. 3, 1918.)

Steel Containing 1.2 to 3.5% C, 8 to 20% Cr, and 1 to 6% Co. Paul Richard Kuehnrich, Sheffield, England. (U. S. No. 1,277,431; Sept. 3, 1918.)

Sulphuric Acid, Manufacture of. Arthur B. Foster, Washington, D. C. (U. S. No. 1,277,896; Sept. 3, 1918.)

Tungsten Trioxide, Method of Producing Finely Divided. Carl A. Pfanstiehl, Waukegan, Ill., assignor to Pfanstiehl Co. Inc., North Chicago, Ill. (U. S. No. 1,277,175; Sept. 3, 1918.)

Editorial Correspondence

SAN FRANCISCO—Oct. 8

The American Mining Congress contemplates the organization of a California chapter, and preliminary steps were taken recently at a meeting at the Engineers' Club, when Secretary Callbreath addressed mining men on the results of the Reno meeting, which was held for the consideration of the gold-mining situation. California mining men suggested the organization of a chapter of the congress, and Albert Burch was selected as chairman of a committee for preliminary arrangements. Mr. Burch appointed Fletcher Hamilton and L. D. Gordon, and the committee is arranging for definite preliminary action. The California Metal Producers' Association will hold its annual meeting on Oct. 23, and following that gathering the committee for organization of the American Mining Congress chapter will probably arrange for its meeting, taking advantage of the presence of mine superintendents, operators and owners, to follow the Metal Producers' annual conclove. The sense of representative mining men on the subject will be obtained, at any rate, and there is little doubt that the organization of the chapter will follow.

Water Production in the Oil Fields of California is an important factor in the problem of increasing oil production that is being solved in a practical way by the state oil and gas supervisors. In his report for the week ended Sept. 28, R. P. McLaughlin, chief supervisor, says that although the new wells reported are the principal indication of the maintenance of oil production, a study of proposed deepening and redrilling operations is interesting in showing what can be done toward increasing production by decreasing the amount of water that is necessary to raise the oil to the surface. The second annual report of the supervisor, recently issued, shows that the production of Los Angeles and Orange counties during June, 1917, was 1,396,020 bbl. of oil and 321,840 bbl. of water; fields in Ventura county produced 81,840 bbl. of oil and 31,620 bbl. of water; Santa Barbara County produced 477,408 bbl. of oil and 207,135 bbl. of water; Coalinga field, 1,282,602 bbl. of oil and 313,138 bbl. of water. Complete production figures for Kern County were not available at the time of the report, but the figures given for other fields show 873,735 bbl. of water, an average of 21%, produced with 3,237,870 bbl. of oil.

DENVER—Oct. 10

Replacement of Orebodies is the object of a special allowance provided for in one of the proposed amendments to the Revenue Bill. This replacement allowance is in addition to that for depletion, and is to be sufficient to replace the ore extracted during the year. The cost is to be fixed in each district, and the amount allowed is to be used in further prospecting or development to replenish the ore reserve. This allowance is to be granted when the regular depletion allowance is not sufficient to meet the cost of such replacement. Colorado mine operators are urging their senators to work for favorable action on this amendment.

All Persons Possessing Platinum in Colorado have been warned that they must take out licenses. Applications for licenses may be filed with county clerks or other regularly appointed agencies now under Federal control. All applications will be sent to Washington for approval. Considerable platinum is held by jewelers in Colorado, and a good deal is owned by individuals. Most of the metal so held is in the form of jewelry and ornaments. Owners are being urged to report at once and obtain permits to hold these possessions in order to avoid possible embarrassment later. Thomas S Price, United States explosives inspector for Colorado, has been notified that persons and firms having platinum, iridium, and palladium in their possession and not reporting same are liable to a fine of $5000 or imprisonment for one year or both. The warning was issued by the U. S. Bureau of Mines in compliance with a law passed by the last Congress which placed platinum, iridium and palladium under Federal control. The act prohibits the use of platinum in the manufacture, alteration or repair of any jewelry or ornament. It also restricts the use of platinum in dentistry.

PHOENIX, ARIZ.—Oct. 11

A Proposed Change of the workmen's compensation laws will be voted upon at the coming election, and it is being fought by trades unions and by attorneys who have specialized on personal-damage suits. The new reading is declared to be just and reasonable for both sides, designed to avoid necessity for appeal to the courts and to assure immediate relief for injured employees of the mines, especially. Even a provision making the measure elective in case of injury has not served to diminish the opposition, though a number of labor leaders are giving strong support to the new plan. The measure is especially favored by the smaller mining operators, whose casualty insurance rate lately was advanced to 10.4%. They have just met in Phoenix to consider this phase of their expense accounts and also to join in a petition for the allowance of fuel oil for certain kinds of prospect work. For instance, one Bisbee company, without surface showing, has $15,000 ready for sinking to the ore level, but is able to secure no fuel.

MAYER, ARIZ.—Oct. 1

Manganese Deposits in the Big Bug district are situated at the confluence of the Agua Fria, Big Bug, and Cycamore, creeks 13 miles east of Mayer. The manganese occurs as nodules and irregular stratified veins, of horizontal attitude, from 1 in. to 3 ft. in thickness, lying above and somewhat mixed with a chalcedonic variety of silica and travertine, overburdened by a soft semi-stratified sand and clay that is in turn capped by a layer of basalt. Deposits are confined to a single stratigraphic horizon, and cover an original area of 4 by 5 miles, but the erosion by several streams has left the manganese in isolated patches of from 5 to 20 acres in extent. Ore is principally psilomelane, although pyrolusite has been identified in small quantities; also a bog variety brecciated with clay and silica. The problem of deposition does not appear clear, but in consideration of the fact that the schist and lime formations of higher stratigraphic positions yield various amounts of manganese, the Big Bug deposits may be redepositions from an older group of planation. Most of the manganese occurs close to the surface, and mining has been confined to open cuts and short adits. To date, seven car lots have been mined and shipped, averaging 43% in manganese and 1 to 6% in silica.

WALLACE, IDAHO—Oct. 5

Recovery of the Valuable Mineral Content in the tailings from various mills of the Coeur d'Alene district has grown to be an important branch of the mining industry, and no fewer than six mills, of varied capacities and designs, but all chiefly dependent upon flotation, are in operation. In the early days of the district, milling methods and mill equipment were decidedly crude compared with the metallurgical efficiency of today, with the result that mineral recovery was often not more than 50%. The tailings were discharged direct into a creek or river, and within a few years channels were filled with tailings and the consequent overflow deposited them on adjacent land. Thus the mining companies were confronted with numerous claims for damages by property owners along the streams. As a solution to the difficulty, and as a protection against further damage suits, the operators bought large tracts along the river and constructed dams, which served as great settling ponds for the slime tailings, and at the same time the coarse tailings were banked on ground adjacent to the mills. During the intervening years, changes and improvements have been made in milling processes which have greatly reduced the tailings losses, but while these improved processes were being evolved the creeks and rivers continued to carry down rich slime tailings, which have accumulated in the dams built for their reception, and great dumps of coarse tailings were built up which contain sufficient of value to pay for regrinding and recovery. In some cases the origina companies are retreating these tailings, bu generally it is being done by independen companies, which lease the dumps and dams and erect small milling plants embodying the special treatment required.

HELENA, MONT.—Oct. 8

A Mine Operators' Association of the manganese miners and producers of Philipsburg and Butte is being organized fo the purpose of formulating a request t the Government for a fair and reasonabl consideration of their claims, especially as to time contracts in selling their ores Among the claims made by the producers are that manganese is second only to copper in importance, and that the Iron and Steel Institute, by agreement with the War Industries Board, fixed the price o ferromanganese and all manganese ores without consulting the miners who produced the ores. At the conference, the price of ferromanganese was fixed at $250 per ton. The grade was lowered from 80% to 70% manganese, and the unit premium value was placed on the amount of manganese in the ferromanganese product in excess of 70%, so that the old standard o 80% manganese netted the ferromanganese manufacturer $290 per ton. On the rate adopted, the manganese miners received for their ores, to make a ton of ferromanganese, less than $75 per ton delivered a the ferromanganese furnace. The miners of Philipsburg declare they are compelled to pay freight on a standard ton of 2000 lb. whereas they receive pay for their ores on a basis of the long ton of 2240 pounds It is further claimed that all ore produced in Montana is siliceous, and that much of it requires concentrating, and producers are obliged to build concentrators and install expensive machinery for the purpose of concentrating such ores as will not stand the high freight rates East.

BATESVILLE, ARK.—Oct. 8

The Everton Mining and Development Co., which is operating in Pugh Hollow, in the Lafferty Creek district, is making the first experiment with table concentration of manganese ore that has been made in this field. The ore carries from 25 to 29% manganese and the gangue is clay and silica. There are other immense deposits of manganese ore in the field. By concentration, the grade of the crude ore is raised to 34.10%, and it is expected that this can be improved. To date no effort has been made to save the fines, and assays made from the tailings carried by the overflow from one washing plant carried 8.40% manganese; and if it can be demonstrated that the valuable content of the fines can be saved by means of tables, it is certain that several will be installed within the next few months. The experimental plant constructed by the Everton company consists of one ½-in. and one ¼-in mesh trommel, screen, a vortex classifier a settling tank, and two Wilfey tables one riffled for sludge and the other for a coarser product. The crude ore is first passed through the ½-in. mesh trommel screen, then through the ¼ in. Both of the screens have inside and outside spray pipes. From the screens, the product passes through the vortex classifier, which divides the material into two sizes, and each size is sent to the two-compartment settling tank From there the product goes to the tables the coarser to the rougher table and the finer to the sludge table. Tailings from the rougher table are also put over the sludge table. A recovery of 45% is obtained at the plant, which was built to determine what equipment would be needed to save all values in the 300-ton washing plant now under construction.

CLEVELAND, OHIO—Oct. 8

Iron-Ore Shipments during September were 8,995,014 gross tons, as compared with 9,725,331 tons in August and 9,536,152 tons during September, 1917, according to *Iron Age*. Shipments, however, still exceed those of a year ago, the movement from the Lake Superior district until Oct. being 48,321,278 tons, as compared with 46,059,706 tons up to Oct. 1, 1917. A year go the greater part of the vessel capacity vas being used to carry ore, as it was deired to bring down as much as possible uring the latter part of the season. The stablishment of a basic eight hour day by he United States Steel Corporation will pparently have little effect upon the ironre mining districts, as the mines have een generally on an eight-hour basis for he last two years.

TORONTO—Oct. 12

Construction of a New Roadway to the Boston Creek gold camp will be started s soon as the necessary labor is obtainble. The government engineers have arived to survey the route. The mineralized one, so far as determined, lies directly ast of the Temiskaming & North Onario Ry., so that the roadway will pass hrough a country possessing important rospective opportunities. In addition to erving Boston Creek, it will tap Skead Township to the east, which is regarded s a separate field.

Members of the Staff of the Ontario Bueau of Mines, including Cyril W. Knight, L. G. Burrows, P. E. Hopkins, and A. L. Parsons, are examining and mapping the geology of the territory lying south and west of Lake Abitibi, including the Lightning River area and Rickard Township, where important gold discoveries have been made. The department hopes to issue the map in time for use next spring, so that he results of the investigation of this field will be available for prospectors, many of whom will probably be found among the returned soldiers. Deputy Minister Gibson considers that the work of the bureau in directing attention to new fields for prospecting can materially assist in the soluion of the problem of providing suitable and congenial employment for the veterans, a considerable proportion of whom were engaged in mining before the war.

THETFORD MINES, QUEBEC—Oct. 8

In the Asbestos Industry, high prices and intensified production continue to characterize operations. The regular companies show an output for eight months equal to that of last year, and the new companies will give an increase of about 12,000 tons for the year. The Bennett-Martin Asbestos Co., at Coleraine Station, has been making a record, and the returns in both crude and long fiber are particularly gratifying. The new Fraser mine of the Asbestos Corporation of Canada, at East Broughton, is showing high returns in long fibers. The Regina Asbestos Co. and the Berlin Asbestos Co. at Robertson Station, and the Imperial Chrome and Asbestos Co., at Black Lake, are taking advantage of the high prices and show considerable activity. The new milling plant of the Windsor Asbestos Co., at Coleraine Station, was recently burned to the ground, and there is some uncertainty as to whether or not the plant will be rebuilt. The Eastern Townships Asbestos Co., at East Broughton, has been reopened by E. H. Garcin, of New York, with Milton Hersey & Co., of Montreal as engineers.

VICTORIA, B. C.—Oct. 8

A Striking Example of the effect of the reduced purchasing power of gold is shown by the present situation at Rossland, where the mines of the Consolidated Mining and Smelting Co. of Canada have been practically closed down. No ore has been shipped for some months, although work is being carried on in the chief mines of the camp with small forces. Those employed, however, are engaged only in development, preparations being made for the renewal of activity as soon as conditions again become normal. Only about 200 miners are working in the Le Roi, Centre Star, and War Eagle, and about 80 are employed in the Josie, all of which are mines of the Consolidated company. At the Velvet, situated about nine miles from Rossland and owned by the Granby Consolidated company, about 50 men are employed. The people of Rossland, however, are not discouraged. The camp is being sustained by other forms of mining, and better times than ever are anticipated later, when, it is expected, the mines now dormant will be reopened on a larger scale than heretofore, it being the firm belief that the time is not far off when costs will decline and the demand for gold will be insistent.

Approval by the Dominion Government of the proposed investigation of the affairs of the Consolidated Mining and Smelting Co. of Canada has been received. The members of the committee of investigation, who have been endorsed, are S. S. Fowler, chairman; Ivan De Lashmutt, and James Anderson. Mr. Fowler is a graduate of the Columbia School of Mines and a man of wide experience in mining and smelting matters. For several years he was consulting engineer for the British Columbia Goldfields and many other properties, and he is now consulting engineer for the Yankee Girl Gold Mines. He is best known as the manager of the Bluebell Mine, at Riondal, B. C. Ivan De Lashmutt, the superintendent of the Standard Silver Lead Mines, at Silverton, B. C., was for many years with the Anaconda smeltery and later was testing engineer for Utah Consolidated. He is a graduate of the Colorado School of Mines, and for some time held a post as professor of metallurgy at the University of Arizona. James Anderson is the mayor of Kaslo, B. C., and has had extensive mining interests in British Columbia for many years. He is the agent for the George Alexander interests, which control the Nettie L., Ruth, Silver Cup and other properties.

The Mining News

ALASKA

KENNECOTT (Kennecott) — September production of Alaskan properties was 5,508,000 lb. of copper.

ARIZONA

Cochise County

SHATTUCK ARIZONA (Bisbee) — September production was: Copper, 686,844 lb., lead, 325,496 lb.; silver, 8,621 oz. and gold, 105.09 oz. Production for nine months in 1918 was: Copper, 7,247,903 lb.; lead, 969,961 lb.; silver, 109,081 oz., and gold, 924.60 ounces.

DURING SEPTEMBER, 357 cars of ores and concentrates were sent through Douglas from Mexico.

CALUMET & ARIZONA (Warren) — Smeltery production during September amounted to 7,298,000 lb. of copper, of which 4,868,000 lb. was available for Calumet & Arizona.

Gila County

IRON CAP (Globe)—Shipping 10 carloads a day, including 100 tons of concentrating ore. Smelting ore goes to El Paso and concentrating to the Old Dominion. Output running about 1,000,000 lb. of copper a month. Iron Cap shaft down to 1100 ft., where good ore was broken in cutting the station, and will be continued to 1200. To build spur track to shafts. Has purchased a new 3000-ft. compressor and more boilers, and will secure additional power from the Inspiration electric system.

SUPERIOR & BOSTON (Globe)—Development on 1200 level to be extended eastward. Added equipment gives present pumping capacity of 2,000,000 gal. per day.

INSPIRATION (Miami)—To generate most of its own power, as electric supply from Roosevelt is small, on account of low level of Roosevelt reservoir.

Greenlee County

RIVAL (Twin Peaks)—Property shut down and machinery will be sold.

Pima County

NEW CORNELIA (Ajo)—September production was 3,744,000 lb. of copper.

Santa Cruz County

CONSOLIDATED ARIZONA (Patagonia)—New hoist installed on property at Mowry. W. J. Mitchell is manager.

HOSEY (Patagonia)—Property in the Santa Rita Mountains taken over by the Marguerite Mining and Smelting Co., of which E. R. Grund, of St. Louis, is president and general manager. Ore shipments have been started.

Yavapai County

NELSON (Crown King)—Taken over by Philadelphia Mining Co. George P. Harrington is in charge.

SWASTIKA (Crown King)—Taken over by Consolidated Arizona Smelting Co., of Humboldt, on surrender of lease of Frank W. Giroux.

BAUMANN (Humboldt)—Shipping copper ore.

DUNDEE-ARIZONA (Jerome)—Shaft sinking, stopped by water last January at 500 level to be continued to 969 ft. depth and drift driven to connect with United Verde Extension tunnel.

GRAND ISLAND (Jerome)—Work resumed on shaft, to be sunk from 300 level to 535 and then drift 200 ft. to cut vein. R. E. Moore, of Jerome, is president and managing director.

UNITED VERDE (Jerome)—Laying track on new high-line railroad from Hopewell tunnel mouth to old smeltery site above Jerome, where steam-shovel operations are to be started soon on the apex of the orebody.

VERDE COMBINATION (Jerome)—Manager Dave Morgan has started a new "drive" in the district by refusing to employ any one who cannot show a Liberty Bond receipt.

ARIZONA DAISY (Prescott)—New hoist installed on copper vein.

BLACK DIAMOND (Walker)—Purchased three claims from D. L. Booker.

ARKANSAS

Independence County

McCURRY (Anderson) — Completed installation of small washing plant and is producing concentrates; also some nugget ore.

BALL (Batesville)—Made rich strike of nugget and wash manganese ore recently. Operated by Shepherd and Wilson.

BLUE PIG (Batesville)—To install log washery and operate steam shovel. Intend to purchase log washer, engine, boiler, steam shovel and pipe. A. Besse is superintendent.

EUREKA (Cushman)—Installing three 3-cell jigs.

GEORGE (Cushman)—Logan Reeves and associates have installed a steam shovel and are securing a good production of high-grade nugget manganese ore.

CALIFORNIA

Amador County

SILICATE DEPOSIT producing material for shipment to Indiana glass manufacturers being hauled to railroad at Carbondale by motor trucks.

Butte County

BANNER (Oroville)—Court order issued for sale of property to satisfy judgment of $6110 in favor of Charles Lastreto, of San Francisco. Large producer in early days. Recent attempts to reopen have not been successful.

Calaveras County

PENN COPPER (Campo Seco)—Good ore coming from lower levels. Smeltery at Valley Springs treating large tonnage.

NAPOLEON COPPER (Copperopolis)—New 90-ton plant, consisting of two ball mills, flotation unit, two concentrators and Diesel oil-burning engines, completed. Has also installed precipitating boxes for handling water carrying copper in solution.

El Dorado County

SHIPMENTS OF CHROME ORE are being made from El Dorado County: the Negor Hill, Clarksville, and Latrobe districts, extending along the serpentine belt at the extreme west end of the county, being the largest shippers. Next come the Greenwood and Georgetown districts, in the northwest part of the county. In these two districts a large tonnage of the chromite ore is being mined and shipped from the Shepard, Castillo, Federwitz and Johnson leases. A. H. Simpson, of Placerville, general manager for the Union Chrome Co. of San Francisco, is handling the ore from these four leases. The Johnson lease is averaging one 60-ton car per week. The ore is hauled by Marmon trucks to Placerville station and loaded into cars of the Southern Pacific line. Johnson & Fitzlaaf have the trucking contract.

Humboldt County

CHILDS MOUNTAIN MANGANESE (Blocksburg)—New five-mile road completed. Ore hauled 3½ miles by team and 20 miles by motor trucks to Fort Seward, on Northwestern Pacific Railway.

Madera County

BUCHANAN (Madera)—Shipped five carloads of ore to Selby, and 10 carloads now ready for shipment. Five-ton motor truck hauls ore to railroad.

Nevada County

KENOSHA (Grass Valley)—Arrangements complete to reopen and develop. Fine prospect in early days, but never practically developed.

Placer County

CRANDALL (Auburn)—Eighteen-inch vein of high-grade ore reported. Mine was large producer in early days.

Plumas County

DROEGE (Greenville)—Good ore cut 200 ft. from prior development. Operations increased.

MILCAWLOR COPPER (Keddie)—Contemplates development of property in Indian Creek and Lights Canyon districts.

Shasta County

DELTA CONSOLIDATED (Delta)—Good ore reported in recent development. To resume regular operation.

GLADSTONE (French Gulch)—Electric hoist, which cost $13,000 five years ago, has been sold at the same price to Tintic Mining Co., Utah. Cost $2000 to remove and ship. Hoist was used at end of 3600-ft. tunnel to lift ore 1500 ft. Mine closed down two years.

MOUNTAIN COPPER (Keswick)—Enlarged flotation plant in operation.

Siskiyou County

CHROME SHIPMENTS to Gazelle, Hornbrook, and Yreka have been retarded by the September rains, which were unusual all over the state. In some of the higher elevations where the snowfall is always heavy, mining has been suspended for the winter. Discoveries of new chrome deposits are reported from Callahan, Happy Camp, Seiad, and other camps.

IDAHO

Shoshone County

COEUR D'ALENE ANTIMONY (Kellogg)—Cut body of high-grade ore in drift from botton of shaft, which is down 275 ft. Two levels above have considerable ore. New mill making satisfactory recovery. Equipment includes flotation.

IDAHO-CARBONATE HILL (Mullan)—Shaft down 300 ft. and is being sunk at the rate of 115 ft. per month. To be sunk 800 feet.

RED MONARCH (Wallace)—Work suspended in crosscut, as south line has been reached at 4410 feet. Three veins were cut, the first showing lead-zinc ore, which is now to be further explored. Two other veins are promising and will be developed when mining conditions are more favorable.

REX CONSOLIDATED (Wallace)—Negotiating with Red Monarch for extension of crosscut under Rex shaft and connection by raising 270 ft. Face of crosscut 1200 ft. from point under shaft, which is down 700 feet.

MINNESOTA

Cuyuna Range

PORTSMOUTH (Crosby)—Stripping by steam shovel. Gordon Mining Co. will ship next season.

SAGAMORE (Ironton)—Property leased by John H. Savage & Co.; will develop by hydraulic and steam shovel methods.

Mesabi Rrange

INTERSTATE IRON (Calumet)—To construct washing plant to treat ores from Hill-Annex mine.

OLIVER—(Hibbing)—Building new hospital at Alice.

WINSTON-DEAR (Hibbing)—Warehouse completely destroyed by fire on September 28.

STEVENSON (Keewatin)—Has resumed stripping operations due to cleaning up of all ore available in pit.

NEVADA

Esmeralda County

ATLANTA (Goldfield)—Exploring vein down to 1900 level.

GOLDFIELD MERGER (Goldfield)—Work in Merger ground discontinued until results of development work now under way in deep levels of adjoining Atlanta ground are known.

GREAT BEND (Goldfield)—Shipping-grade ore sorted from that broken on 160 level. Drifting in low-grade ore on 375 level, and it is expected that ore opened on levels above will be cut soon.

Humboldt County

GOLD CIRCLE MINES now employing about 180 men, and regular shipments of gold bullion being made from district. Elko Prince mill is operating steadily and also treating ore from Rex mine, recently purchased by Elko Prince company. Missing Link mine, purchased by George J. Shoupe, is shipping crude ore to smelting plants.

Nye County

MANHATTAN CONSOLIDATED (Manhattan)—Sufficient ore on dump and blocked out in the mine to justify milling operations.

UNION AMALGAMATED (Manhattan)—One shift working, and operations confined to 500 level.

TONOPAH EXTENSION (Tonopah)—Receipts from mine and mill operation during August were $125,344.41; current expenses, $87,969.29; leaving an operating profit of $37,375.12.

NEW MEXICO

Grant County

ATWOOD (Lordsburg)—Unwatering main shaft preparatory to sinking. Work on new shaft on Southern group, adjoining, is progressing satisfactorily.

BONNEY (Lordsburg)—New pumps being installed on sixth level. Ore shipments again started to Copper Queen smeltery at Douglas.

GREAT EAGLE (Lordsburg)—Compressor placed on foundation; new grizzlies and sorting tables installed; ore bins being enlarged, and new machine shop, blacksmith shop and boarding house being built. Shipping 20 tons of fluorspar daily.

CHINO COPPER (Santa Rita)—Six Mexicans were the first to buy Fourth Liberty Loan bonds, each subscribing for $500 and paying $100 in cash at the mine office.

OKLAHOMA

Joplin District

PROSPECTORS (Hockerville)—Plan erection of concentrator as soon as shaft reaches second ore level at 180 feet.

BIG JIM (Miami)—Sinking shaft, following careful drilling of 40-acre lease southeast of Douthat, Okla. To erect mill.

KELTNER (Picher)—Cut ore at west shaft and will operate mill in two shifts.

MISSOURI MULE (Picher)—Operating after shutdown due to water. Standifer brothers, of Miami, are operators.

KEN TEX (Quapaw)—Recently completed 300-ton mill. Closed down after operating six days.

PRAIRIE (Quapaw)—To erect 150-ton mill at Sunnyside, near Lead Boy.

GOOD EAGLE (Tar River)—To start up operations after shut-down due to installation of gas engine and drilling campaign.

OREGON

Coos County

SEFFERN COMPANY (Marshfield)—Mining of black sand chrome deposit to start upon arrival of $35,000 worth of machinery.

Douglas County

OREGON NICKEL (Riddle)—Mining chrome ore.

Jackson County

COPPER KING (Jacksonville)—Extensive improvements being made at this copper mine in the Blue Ledge district.

Josephine County

PACIFIC PLACER (Grants Pass)—Extensive equipment being erected at property known as the old Layton mine.

VIRGINIA

Bath County

PYROLUSITE OF HIGH GRADE and low in impurities and a large deposit of iron ore have been found recently by Stuart D. Marshall, consulting engineer, of Roanoke. The discoveries were made on the 2700-acre tract of timberland belonging to Boyd Stephenson, of Monterey.

CANADA

British Columbia

MONITOR (Alberni Canal)—Temporarily closed down. Contemplating reorganization to permit reopening.

OLD SPORT GROUP (Elk Lake)—Consolidated Mining and Smelting Co. continuing development. Diamond drilling has shown satisfactory results.

EUREKA MINE (Nelson)—Lease has been taken on power plant of Kootenay Gold Mines, and a 6000-ft. air line built. Repairing of tramway and wagon road, and timbering of shaft completed. Mine operated by Inland Mining Co. of Walla Walla, Washington.

SUNLOCH MINES (Vancouver)—Development proceeding. Wagon road has been built for transportation of supplies. R. H. Stewart is manager.

Ontario

NEW MINING SCHOOL has been established at Haileybury, and is provided with equipment for the treatment of ores, including the flotation process. The school is under the management of a board consisting of F. D. Reid, superintendent of the Coniagas mines, chairman; J. J. Denny, manager of the research department of the Nipissing mines; M. F. Fairlie, manager of the Cobalt Reduction Co., all of Cobalt, and E. A. Collins, of Haileybury, mining inspector. Thirty-five pupils have been enrolled for the present term.

McKINLEY-DARRAGH (Cobalt)—Flotation plant to be closed for the winter soon.

MINING CORPORATION (Cobalt)—Extensive exploration work to be carried on at property recently acquired in Bucke Township near North Cobalt.

ONTARIO KIRKLAND (Kirkland Lake)—New plans for development include 1700 ft. underground work. Main shaft will be sunk to 300 level.

COTTER (Boston Creek)—Diamond drilling has been started.

MILLER INDEPENDENCE (Boston Creek)—Mill completed and ready for operation. Drifting on 200 level.

HOWIE COCHENOR (Lightning River)—Mining plant installed. Shaft down 40 feet.

PREMIER LANGMUIR (Nighthawk Lake District)—Initial shipment of barite made.

CORDOVA MINES (Belmont Township)—Plant for the manufacture of ferrochromium, under construction, is expected to be ready for operation Nov. 1. Company acquired Belmont gold mine in 1912, and developed water power at the foot of Deer Lake for use in mining operations. Unfavorable conditions caused closing down of mine, and company will now use power for smelting operations. Plant to have capacity of 80 tons per month, and is so designed that other alloys may be produced.

Quebec

INDIAN PENINSULA (Amos Station)—A 100-ton flotation plant being erected. Groch flotation machines will be installed.

MEXICO

Sonora

GREENE CANANEA (Cananea)—Production in September was: Copper, 4,900,000 lb.; silver, 149,332 oz., and gold, 1090 ounces.

PERU

Junin

CERRO DE PASCO (Cerro de Pasco)—September production was 3075 tons of blister copper.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsan)—September cleanings amounted to $95,500.

The Market Report

SILVER AND STERLING EXCHANGE

	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Oct.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
	4.7550	101⅛	49½	14	4.7550	101⅛	49½
	4.7550	101⅛	49½	15	4 7550	101⅛	49½
	4.7550	101⅛	49½	16	4.7550	101⅛	49½

ew York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar r, 999 fine. London quotations are in pence per ounce of sterling silver, 925 fine.

ILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
	*26	†	8.05	7.75	8.20 @8.30
	*26	†	8.05	7.75	8 15 @8.25
	*26	†	8.05	7.75	8.15 @8.25
	*26	†	8.05	7.75	8⅛ @8¼
	*26	†	8.05	7.75	8.20 @8.25
	*26	†	8.05	7.75	8.20 @8.30

* Price fixed by agreement between American pper producers and the U. S. Government, accord- to official statement for publication on Friday, tember 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the ce for which has been fixed by agreement between erican copper producers and the U. S. Govern- nt, wherein there is no free market) are our raisal of the average of the major markets based erally on sales as made and reported by producers agencies, and represent to the best of our judg- nt the prevailing values of the metals for the iveries constituting the major markets, reduced to sis of New York, cash, except where St. Louis is normal basing point.

The quotations for electrolytic copper are for cakes, ots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c low the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime estern brands. We quote New York price at 35c. 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
Oct.	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
10	122	122	137	337½	337½	29½	28½	54
11	122	122	137	337½	337½	29½	28½	54
12								
14	122	122	137	336	336	29½	28½	54
15	122	122	137	336	336	29½	28½	54
16	122	122	137	334	334	29½	28½	54

The above table gives the closing quotations on ndon Metal Exchange. All prices are in pounds rling per ton of 2240 lb. For convenience in nparison of London prices, in pounds sterling per 40 lb., with American prices in cents per pound following approximate ratios are given, reckoning hange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; 10 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; 80 = 59.3937c.; £300 = 63.6362c. Variations, £1 0.2121205c.

Metal Markets

Copper—The refinery production in Sep- mber fell below the figures for August. e refiners are constantly falling behind eir expectations. This month the produc- n will be diminished, owing to labor oubles. The men working in the re- eries near Perth Amboy, who were ghtened away by the recent explosion, ve not yet fully returned. Now influenza making serious inroads.

Copper Sheets—The base price of copper sheets remains at 35¾c. per lb. Copper wire is quoted at 29½ to 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

Lead—The production in September was a trifle larger than in August. However, the figures reflect only the output of refined pig lead, and not the basic production of the mines, which is probably decreasing rather than increasing. Nevertheless, the situation in lead is distinctly easier, owing to the excellent management of the Lead Committee in controlling non-essential uses.

Our Washington correspondent writes that reports reaching Pope Yeatman, of the War Industries Board, are to the effect that an improvement has taken place in the lead situation. Production was a week oversold on Oct. 1, and there is a possibility that the companies will catch up within the next 30 days on orders that have been cleared. The effect of the work of the many agencies operating to conserve the supply is becoming more and more apparent. There is now enough lead to keep essential users supplied. How long the present good freight movement will last is a question that is giving considerable concern.

Tin—Importers are now out of business for the duration of the war. The whole business has passed practically under governmental control. There has not yet been any statement of what price will be fixed.

Zinc—The decline continued, and some low prices were accepted, but the appearance of some large orders on Monday had the effect of checking any tendency toward demoralization. Low prices were named for the business that was taken.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual traded discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—This market became considerably weaker, although there was an inquiry for a large tonnage, which doubtless will be taken if it has not been already. Perhaps the recession in the market was to meet that business. We quote spot at 13½@13¾c. and futures at 12¼@12½c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50 @2 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Unchanged at $125@130. Stocks in this market are reported light, but there seems to be an unsettled tone.

Gold, Silver and Platinum

Silver—The latest advices from London report China exchanges as still much above the level of the fixed price of silver. This is owing to the diversion of the white metal to India, but an adjustment of the requirements for the various Oriental countries is receiving Government consideration. The shipments to London in the week ending Oct. 12 were 1,132,000 ounces.

The general stock of money in the United States on Oct. 1 totaled $7,322,423,723; of this, $3,079,094,009 was in gold coin and bullion, $374,080,376 in standard silver dollars and $232,403,832 in subsidiary silver. The money in circulation on Oct. 1 was $5,721,433,020, or $53.82 per capita. On Oct. 1, 1917, the per-capita circulation was $46.10.

Mexican dollars at New York: Oct. 10. 78; Oct. 11, 78; Oct. 12, 78; Oct. 14, 78; Oct. 15, 78; Oct. 16, 77½.

Platinum—Unchanged

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 12—Blende, per ton, high, $78.20; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $50@47.50; calamine, basis 40% zinc, $40@35. Average selling prices: blende, $50.72; calamine, $38.86; all zinc ores, $52.02.

Lead, high, $102.95; basis 80% lead, $100; average selling price, all grades of lead, $99.93 per ton.

Shipments the week: Blende, 10,026; calamine, 632; lead, 1894 tons; value, all ores the week, $722,390.

Price cutting this week brought buying almost to a standstill. The basis price was cut to $50, then to $47.50, with some trying to buy on $45 basis. Sellers would not accept the reductions, and declined to do business.

Platteville, Wis., Oct. 12—Blende, basis 60% zinc, highest settlement price reported, $75; base price for premium grade, $75; base price for high-lead blende, $52 per ton. Lead ore, basis 80% lead, $97.50 per ton. Shipments reported for the week were 2468 tons blende, 328 tons galena, and 508 tons sulphur ore. For the year to date the totals are 101,220 tons blende, 6329 tons galena, and 36,870 tons sulphur ore. During the week 2923 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Although sellers were reported willing to make concessions in prices, no new business of consequence seems to have been effected.

Manganese Ore—Unchanged.

Molybdenum Ore—The market was dull and there seem to be offerings of ore in excess of the capacity for making ferromolybdenum.

Tungsten Ore—Chinese supplies are being offered more and more freely in this market. Some of this ore is of high grade and relatively free from impurities, but other supplies are impure and unavailable to the manufacturers of ferrotungsten by direct smelting. The works employing the chemical process are of limited capacity, and the ore supply seems to be in excess of what they will take; wherefore, sharp discounts are offered. It is not improbable that the capacity of the chemical plants will be increased in order to take advantage of the profitable differentials. High-grade scheelite was sold this week at $26, and the highest grades of wolframite at $24@25. The market for ordinary grades of wolframite was around $20, and inferior grades were salable only at prices lower than that.

Other Minerals

Pyrites—Prices of domestic pyrites are determined by negotiation between buyer and seller. Prices range between 28c. and 34c. per unit, according to location.

The War Trade Board has authorized the issue of licenses during the remainder of the calendar year, to those qualified to receive them, for the importation from Spain of the unimported balance of the 125,000 tons of pyrites the importation of which was sanctioned prior to Oct. 1, 1918. The amount is approximately 56,400 tons.

Iron Trade Review

PITTSBURGH—Oct. 15

Production of steel ingots in the United States in 1917 was about 43,700,000 gross tons, according to practically complete returns now available, or 1,500,000 tons more than the former estimate, based upon the returns of the 29 steel companies which make monthly reports of output. The gain over the 41,400,000 tons produced in 1916 is not altogether unsatisfactory. The monthly reports of the 29 companies indicate an increase in the rate of production from August to September of 12%, a large gain, even though August production was low. The rate of output in September was nearly 47,000,000 tons per annum, or close to rated capacity and by far the best showing thus far made. October is expected to do still better.

Ingot production presages an output of finished rolled steel in the third quarter of 9,500,000 net tons, and, with only a slight gain over the September rate, the fourth quarter should show more than 10,000,000 tons, making between 19,500,000 and 20,000,000 tons for the half year. With increasing demands from General Pershing and our Allies, the War Industries Board has been unable to reduce its estimate that not less than 23,000,000 tons is required for the half year, so there is to be an actual deficit of more than 3,000,000 tons. This will fall in various places. The factor of safety in shipbuilding and shell making, whereby the production of steel was being kept well ahead of consumption by forge shops and shell factories and by fabricating interests and shipyards, will be reduced. Chairman Baruch of the War Industries Board, in a public statement, pays a high tribute to the general manner in which Director General of Railroads McAdoo renounced a large quantity of steel allotted to the Railroad Administration, in favor of General Pershing, and notes that this may result in transportation difficulties this winter, for which the Railroad Administration will not be to blame. In this matter much depends upon the weather.

A large part of the deficit will fall upon commercial consumers whose operations have been recognized as distinctly helpful in winning the war. Practically all the consuming industries with which arrangements for curtailment of operation have been made will receive less steel than the reduced programs require. The agricultural implement makers, who have B-2 priority on their steel, cut by 25% for the twelvemonth beginning this month, will receive little steel this quarter, and many other manufacturing consumers are similarly situated. Practically all mills will be able to cover AA and A priorities to Jan. 1, but many will do little on B priorities, and the preference list, as such, will receive exceedingly small supplies.

Spanish influenza is affecting mill and furnace operations somewhat, but the epidemic is not as bad as at the cantonments or in cities, and some men giving the disease as cause for absence have possibly laid off for other reasons.

Pig Iron—Production of pig iron in September was at the rate of nearly 42,000,000 tons per annum, a gain of about 4% over the August rate. Capacity is figured at not under 43,000,000 tons, and the proportion of furnaces in blast is above rather than below normal. There is scarcely any shortage of coke, in point of tonnage, but poor quality is said to be restricting production. Quality is reported improving slowly as a result of efforts of the Fuel Administration. There are practically no sales in the open market, and even allocations are difficult to secure. Some large steel interests, normally self-supporting in pig iron, are short of iron, as they cannot secure a normal supply of scrap and need more pig iron in consequence. The market remains quotable at the maximum limits: Bessemer, $35.20; basic, $33; No. 2 foundry (1.75 to 2.25% silicon), $34; malleable, $34.50; forge, $33, f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less.

Steel—Several wire mills are now called upon for more shell rounds, to be rolled in their billet mills, and wire production will be correspondingly reduced. The plate allotment for shipbuilding cannot be increased, and will remain at the 50,000 tons a week that has obtained for several months. Shell-discard steel is being offered in a limited way. Middlemen are prevented from buying and selling, but may act as broker between producer and consumer, collecting a commission from the seller, but not adding a commission to the set price. The market remains quotable: Billets $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys

Ferroalloys—Ferromanganese is only moderately active, and with heavy production little fear is entertained of a shortage. Spiegeleisen is quiet. We quote 70% ferromanganese at $250 delivered, with [illegible] per unit for additional manganese, and 16% spiegeleisen at $75 f.o.b. furnace, with rumors of slight shading in a few instances.

Coke

Coke—Beehive-oven production has been tapering off a trifle, but byproduct output continues to increase. Supplies seem to be approximately sufficient for blast furnaces, but afford no opportunity to accumulate reserves against the winter. If the Fuel Administration can find more outside coal for byproduct ovens after Lake shipments are taken care of, it will be possible to allow more Connellsville coal to remain in the region and be coked in beehive ovens that have been forced lately to blow out. Connellsville coke continues quotable at the set limits: Furnace, $6; foundry, 72-hour selected, $7; crushed, over ¾-in., $7.30, clean screenings from old dumps, over ½-in., $5.50, all per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	......	32.361	44.324	......
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(*a*)	207.443	318.875
April	55.910	(*a*)	220.171	329.905
May	63.173	(*a*)	245.114	364.217
June	62.053	(*a*)	242.083	331.925
July	62.570	(*a*)	242.181	360.347
August	62.681	(*a*)	243.978	380.900
September	61.542	(*a*)	244.038	343.905
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(*a*) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	.....	6.650	......	30.500	...
November	6.249	....	6.187	......	30.500	...
December	6.375	......	6.312	......	30.500	......
Year	8.787	.....	8.721	.....	30.500	..

Spelter	New York		St. Louis		London	
	1917	1918	19 7	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8. 73	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	. . .	7.813	....	54.000	...
November	7.847	....	7.672	....	54.000	....
December	7.685	. . .	7.510	. . . .	54.000	. . .
Year	8.901	. . .	8.813	......	52.413	....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.15
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.10	36.60	42.24	33.40	48. 5	34.40
October	37.25		33.95	.	33.95	. . .
November	37.25		33.95		33.95	. . . .
December	37.25		33.95		33.95	. . .
Year	$43.57		$39.62	. . .	$40.83	. . . .

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N.Y. EXCH.†	Oct. 15
Alaska Gold M.	3½
Alaska Juneau	1⅞
Am.Sm.&Ref.,com.	82⅛
Am. Sm. & Ref., pf.	104
Am. Sm. Sec., pf., A.	89
Am. Zinc	14¼
Am. Zinc, pf.	46½
Anaconda	71⅛
Batopilas Min.	1
Bethlehem Steel	73½
Butte & Superior	24⅛
Butte Cop. & Zinc.	9¾
Cerro de Pasco	35⅜
Chile Cop.	21
Chino	39⅝
Colo.Fuel & Iron	42¼
Crucible Steel	56
Crucible Steel, pf.	89
Dome Mines	10⅜
Federal M. & S.	10⅛
Federal M. & S., pf.	38½
Great Nor., ore ctf.	31½
Greene Cananea	51½
Gulf States Steel	71
Homestake	80
Inspiration Con.	54¼
International Nickel	30½
Kennecott	35¼
Lackawanna Steel	74¼
Mexican Petrol.	144½
Miami Copper	27⅞
Nat'l Lead, com.	58
National Lead, pf.	103
Nev. Consol.	20⅛
Ontario Min.	7¼
Ray Con.	24
Republic I.&S.,com.	88¼
Republic I. & S., pf.	99½
Sloss-Sheffield	55
Tennessee C. & C.	16⅞
U. S. Steel, com.	108⅜
U. S. Steel, pf.	110¼
Utah Copper	83½
Va. Iron C. & C.	70

BOSTON CURB*	Oct. 15
Alaska Mines Corp.	‡.12
Boston Ely	.95
Boston & Mont.	.44
Butte & Lon'n Dev.	.13
Calaveras	.50
Chief Con.	3¼
Contact	‡.15
Corbin	.25
Cortez	.12
Crown Reserve	.18
Crystal Cop.	.47
Eagle & Blue Bell	2¼
First Nat. Cop.	1⅝
Houghton Copper	.40
Intermountain	‡.05
Iron Cap	18½
Mexican Metals	.30
Mines of America	.90
Mojave Tungsten	.09
Nat. Zinc & Lead	.09
Nevada-Douglas	.38
New Baltic	.60
New Cornelia	17½
Oneco	.15
Pacific Mines	‡.35
Rex Cons	.06
Yukon Gold	.80

SAN FRAN.*	Oct. 15
Alta	.03
Andes	.02
Best & Belcher	.01
Caledonia	.01
Challenge Con.	.03
Confidence	.08
Con. Virginia	.08
Gould & Curry	.01
Hale & Norcross	.01
Jacket-Cr. Pt.	.05
Mexican	.06
Occidental	.40
Ophir	.09
Overman	.01
Savage	‡.02
Sierra Nevada	.06
Union Con.	.14
Utah Con.	‡.01
Belmont	2.30
Jim Butler	.48
MacNamara	.19
Midway	.07
Mont.-Tonopah	.09
North Star	.03
Rescue Eula	.08
West End Con.	.96
Atlanta	.02
Booth	.03
Comb. Frac.	‡.02
Florence	.09
Jumbo Extension	.09
Kewanas	.02
Nevada Hills	.02
Nevada Packard	.13
Round Mountain	.16
Silver Pick	.02
White Caps	.09
Big Jim	‡.75
United Eastern	3.25

COLO. SPRINGS*	Oct. 15
Cresson Con.	4.62½
Doctor Jack Pot.	.03½
Elkton Con.	.05
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.67
Granite	.18
Isabella	.04½
Mary McKinney	.07½
Portland	.85
United Gold M.	.10
Vindicator	.37

BOSTON EXCH.*	Oct. 15
Adventure	‡.60
Ahmeek	78
Algomah	‡.15
Allouez	‡49
Ariz. Com., ctfs.	15¼
Arnold	‡.20
Bingham Mines	‡9¼
Bonanza	‡.16
Butte-Balaklava	‡.25
Calumet & Ariz.	‡67
Calumet & Hecla	456
Centennial	‡11½
Copper Range	47½
Daly West	‡2½
Davis-Daly	5¼
East Butte	10¼
Franklin	‡4
Granby	‡79
Hancock	6
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	26
Keweenaw	‡.70
Lake	5¼
La Salle	‡3
Mason Valley	‡3¼
Mass	‡4¼
Mayflower	‡2
Michigan	‡2¼
Mohawk	54
New Arcadian	1¼
New Idria	‡13
North Butte	‡13¼
North Lake	‡.40
Ojibway	‡.75
Old Dominion	41¼
Osceola	‡55½
Quincy	66
St. Mary's M. L.	48
Santa Fe	‡.60
Seneca	13¼
Shannon	4
Shattuck-Ariz.	‡14
So. Lake	‡1
So. Utah	‡.12
Superior	‡4¼
Superior & Bost.	3¼
Trinity	3
Tuolumne	.95
U. S. Smelting	43¼
U. S. Smelt'g, pf.	43¼
Utah Apex	‡1¼
Utah Con.	9¼
Utah Metal	2
Victoria	2¼
Winona	‡1
Wolverine	22¼
Wyandot	‡.50

N. Y. CURB†	Oct. 15
Big Ledge	⅜
Butte & N. Y.	‡.75
Butte Detroit	.06
Caledonia	.49
Calumet & Jerome	
Can. Cop. Corpn.	1¼
Carlisle	‡2
Cashboy	‡.03
Con. Ariz. Sm.	1⅛
Con. Coppermines	5⅛
Emma Con.	‡.03½
Goldfield Con.	.21
Goldfield Merger	‡.01½
Greenmonzter	
Hecla Min.	5⅛
Howe Sound	‡4
Jerome Verde	⅞
Louisiana	⅛
Magma	‡32
Majestic	.19
Marsh	.03
McKinley-Dar-Sa.	‡.41
Milford	‡.75
Mother Lode	.34
Nixon Nevada	.33
Ohio Cop.	
Rawley	‡2½
Ray Hercules	4
Richmond	‡.56
Rochester Mines	.35
St. Joseph Lead	14
Standard S. L.	.25
Stewart	.14
Success	‡.12
Tonopah	2¼
Tonopah Ex.	1⅛
Tribullion	⅛
Troy Arizona	‡.09
United Verde Ext.	37
United Zinc	‡⅛
Utica Mines	‡.08

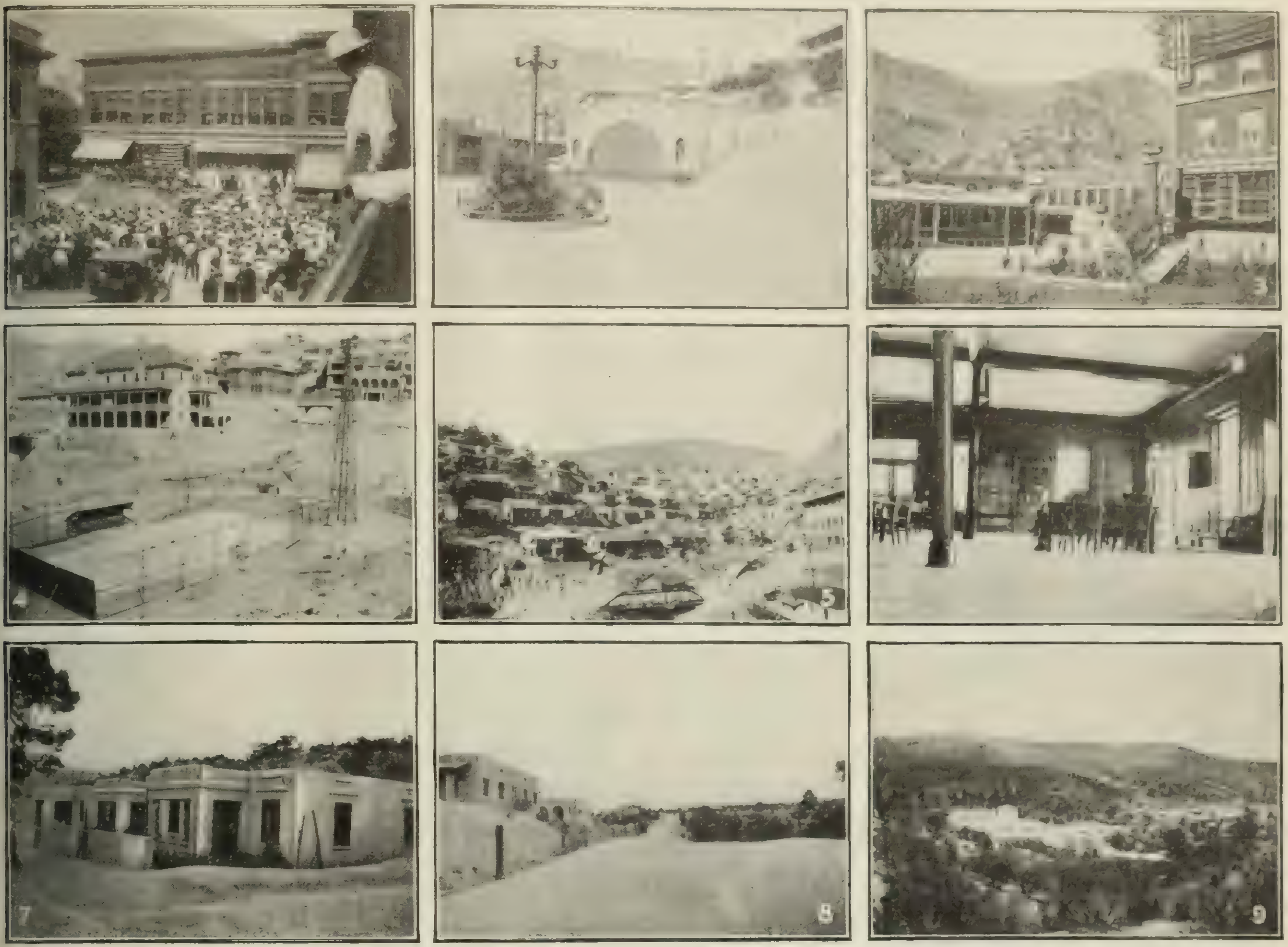
TORONTO*	Oct. 15
Adanac	.09
Bailey	.03
Beaver Con.	.27
Chambers Ferland	.08
Coniagas	2.00
Hargraves	.02
Kerr Lake	5.87½
La Rose	.48
Min. Corp. of Can.	2.00
Nipissing	8.37½
Peterson Lake	.07
Temiskaming	.28
Wettlaufer-Lor.	.03
Davidson	.25
Dome Exten.	.17
Dome Lake	.10
Hollinger	4.87½
McIntyre	1.37½
Newray	.09
Porcu. Crown	.13
Teck-Hughes	.20
Vipond	.14
West Dome	.08

* Bid prices. †Closing prices. ‡ Last quotations

Engineering and Mining Journal

October 26, 1918

Volume 106 *Number 17*



VIEWS FROM MINING TOWNS OF ARIZONA AND NEW MEXICO

1—Band Concert in Business Square, Bisbee, Ariz. 2—City Park, Bisbee. 3—Y. W. C. A. Tennis Court, Bisbee. 4—Tennis Court and Morenci Club, Morenci, Ariz. 5—A Residence Section, Morenci. 6—Reading Room, Morenci Club. 7—Type of Mexican House, Tyrone, N. M. 8—American Houses, Tyrone. 9—Plaza and Business Section, Tyrone

The Life of a Mining Community

BY CHARLES F. WILLIS*

The development of the mining community should proceed simultaneously with that of the mine. Labor troubles spring from bad living and working conditions, and often give a property or a camp a bad name, which it is difficult to rehabilitate. Special reference is made by Mr. Willis to the community work long pursued at Bisbee and Morenci, in Arizona, and Tyrone, N. M.

VOLUMES have been written on the life of the mine, but little has ever been said about the life of the mining community. Of course, the life of the mine and that of the community are generally of equal duration, but their development varies greatly, and it is as interesting to analyze the progress of the latter as to study the development of the former.

The early stages—those of discovery and initial exploration—offer no community problems, because, as a rule, there is no community. As exploration and development proceed, however, with the necessary additional labor, these problems begin to arise. Little difficulty is usually encountered at first, owing to the fact that small community bodies act as a unit in regard to their social, recreational and civic activities. As a small unit, the men work together; they eat together and play together. It is only when the unit is too large for personal and intimate intercommunication, when the growth of the camp is such that several units or cliques are formed, that the problem begins to assume definite proportions.

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*Consulting supervisor, Phelps Dodge Corporation, Bisbee, Ariz.

Problem Increases With Growth of Company

About the time that a company boarding house, bunkhouse and store are needed questions of communal policy and management arise and demand solution. This stage has little or no relation to the labor situation, for although there may be no intimate contact between the men themselves, there is still a reasonably personal one between the bosses and the men. As the organization increases in size, however, and this last personal touch is lost, complaints and grievances seem to grow more frequent—not because the occasions for them occur more often than when fewer men composed the community, but because they are not voiced and settled as quickly as is possible in the more intimate associations of the smaller camp, and are allowed to smolder in the minds of the workmen until they burst into flame. Evils may be corrected as soon as they are made known, but some resentment that unsatisfactory conditions should have been permitted to exist often remains.

As the development of the mine progresses ore is struck and production is in sight. This is the time when things usually begin to happen. Men and houses are needed. The bosses are so engrossed with production possibilities that they have no time for civic problems—for the equal and consistent development of the community along with the mine. Everything is needed quickly. Instead of houses, shacks are built; instead of streets, one finds alleys and trails; instead of sewers, there are latrines, and instead of decent and civilized recreation, the red-light district and the saloon.

In many instances, community problems are given some consideration and thought, but the operators are at a loss what to do. They cannot know at that time that the camp is to be a permanent and paying one; they know nothing as to the size and extent of community influence. As a rule, they do not realize that money spent in the development of the town is in any way related to the success of the mine. It is not until some pressure is brought to bear that the operator begins to understand that he is not only developing a mine but a city as well, and, somewhat reluctantly, he begins to provide a few of the things necessary to a well-organized community.

Labor Troubles Spring From Bad Conditions

It is usually during this period that labor troubles have their inception. Living conditions, as a rule, are bad, and working conditions are not as good as they might be. The camp is unhealthful. Then, too, the mine is not yet on a paying basis, and wages are consequently low and the management is slow to spend money not directly related to immediate production of more money. Troubles are frequent, and grievances numerous and often real, and from this time on the feeling grows that the camp is operated in the interest of the company only. Workmen become disgusted and leave, and in this way the community gets a bad reputation in the mining world.

It matters little whether or not these grievances are later corrected. The reputation remains, and often will remain for a generation. Traditions are hard to live down. Even in the present day, one hears occasionally in camps of the West: "Don't go to Bisbee; they have typhoid epidemics regularly." This, in spite of the fact that the conditions causing typhoid have been removed for many years, and that the disease is now almost unknown in that camp. Bisbee is one of the most clean and healthful mining camps in the country, and yet occasionally this feeling against it, which is a purely traditional one, finds expression.

The next stage in the life of the mine is that of stable production and consistent profits. Mining operations have now become so systematized that attention may be given to the study of town problems. Occasionally the sudden realization of the need of this brings a bad condition of hastily thought out and poorly devised remedies, which, in some cases, are worse than the original conditions. The normal procedure, however, is the slow and laborious development of the community, a process often much more costly than if it had been developed simultaneously with the mine. Faulty living, social, recreational and civic conditions are changed, one by one, as the operating heads have the time to devise correct methods.

Hard to Convince Men of Company's Good Will

The feeling of the average laborer in the town is not changed, however, for in the short time spent in the place he has not seen enough of the corrections to be convinced that the company really does desire to make conditions good and to improve his lot. A miner seldom witnesses the entire development of a camp. As a rule, he works a few years here and a few there. He hears disagreeable things and often goes to a camp with a prejudice against it—and he is the man with whom the company has to deal.

The last stage of development comes with old age, the deposit worked out, the camp moribund, and the community likewise. Even here, however, some development may be going on, and the satisfaction of the men during this period is dependent upon the conditions that have existed in the previous stages.

It would be entirely possible to derive from the situation described a system of classification of mining communities, based on the relation between the stage in the life of the mine and the first attention given to community problems, and thereby measure the comparatively harmonious condition of the community and its relative freedom from social dissatisfaction and labor disturbances. A common exception to the normal procedure described is the case of a mine coming into existence in a community already organized and partly developed. Another is that created when a new company acquires a developed mine. In instances of this sort, the tradition feature is of necessity ignored.

A few specific examples may well illustrate the relation between the start of the period of community development, the length of time that it has been going on, and the results accomplished, as well as the relation to the labor situation. It is also significant to note the relative strength of labor unions under different conditions. The strength of unions is dependent largely upon the factors mentioned, weak unions usually indicating the lack of need of strong organizations. When this need develops, a forceful and influential union will take form.

COPPER QUEEN LONG ACTIVE IN COMMUNITY WORK

The Copper Queen branch of the Phelps Dodge Corporation, situated at Bisbee, Ariz., started community work soon after reaching the producing stage. This work has been going on for so many years that little has been left undone, except those things that are brought about by changing conditions and the constant increase in the size of the town. The company pursues the policy of endeavoring to foresee the needs of the community and providing for them, and for this reason its traditions, for the most part, are favorable and creditable. It has provided the best living, working and social conditions. Good homes, good schools, excellent clubs, a fine library, good baseball and other athletics and good music are included in the social advantages to be found in Bisbee. Pension, benefit and bonus systems provide additional remuneration and security. Safe and well ventilated mines, with the latest sanitary conveniences, assure good working conditions. The result is a satisfied community of loyal workmen, where there is a feeling of security and stability, with little likelihood of labor disturbance. Labor has found it unnecessary to organize, and consequently the unions are not strong and include only a small percentage of the employees. This condition, however, is the result of years of painstaking consideration and diligence.

An example of the simultaneous development of the mine and the town is that of the branch of the Phelps Dodge Corporation at Tyrone, N. M. At this camp, the mine was partly developed before it was acquired by the company. Complete plans were made for the development of Tyrone as a place to live as well as a place in which to mine copper. Parks were started before streets were laid out, because they took longer to make. Low rents and low cost of living were featured, with the result that a model, stable community has been established at far less expense than was necessary at Bisbee by the Copper Queen. All this has taken time, and is not yet completed, but the company has demonstrated to the workman that his living conditions are as important to his employer as is his work, and this feeling has led to the conviction that he is going to get a square deal.

DIFFERENT METHODS PRODUCE DIFFERENT RESULTS

The policies of the Phelps Dodge Corporation in its relation to the miner are the same at Tyrone as elsewhere, although different methods of carrying them out have produced different results. At the Morenci branch, the process of community improvement started much later in the life of the mine, and was carried on spasmodically, dependent upon the attitude and willingness of different managers. For this reason, although many things have been accomplished, the effect on the labor situation has been slight. There are instances of men who have been in the camp for 20 years or more who still harbor resentment owing to the fact that some perhaps very minor things that were wanted have not yet been secured and others took years to get. Less has actually been done in Tyrone than in Morenci, but in the latter place it is neither seen nor appreciated. This is due partly to the fact that much of the work was done many years ago, before the question of community development had assumed its present importance. Tradition, and without good reason, hurts Morenci as a place to live and work in, although the company is doing everything in its power to better conditions by means of a consistent program of development.

The matter of community improvement, as it presents itself, is not so much whether it is done, as when it is done. Mine managers have learned that they have responsibility to the community as well as to the mine, and that a part of the profit derived during the life of the mine is to be attributed to the pleasure and comfort put into the life of the community.

Magnesium as a Substitute for Tin

A correspondent in *Metal Industry* draws attention to the possible use of magnesium as a substitute for tin in brass or bronze valve bodies. This is a comparatively new use for magnesium, and though it is not a substitute for tin in all particulars, it is effective in producing a dense metal free from oxides and blowholes. The amount of magnesium used in this work varies from 0.05 to 0.1%, and 1 lb. of magnesium will deoxidize from 100 to 2000 lb. of brass or bronze.

Though the principal action of magnesium is to deoxidize, it has the additional effect of making a denser casting and a stronger metal. It is introduced into the mixture after the brass or bronze has been removed from the fire and is plunged by means of iron tongs or a "phosphorizer." Slow stirring should be continued after the metal has melted from the tongs, to insure a uniform mixture and to give the oxide of magnesium an opportunity to rise to the surface.

Magnesium also makes a more fluid metal, so that more difficult castings can be poured than without its use. Its deoxidizing qualities also eliminate the necessity for the addition of phosphorus.

Peruvian Borax Deposits

The exports of borax from Peru in 1916 and 1917 amounted to about 2000 tons in each year, writes a correspondent in the *Statist*. The Peruvian government derived from this product an export tax of only 2s. per ton. The deposits are extensive, and are situated in the southern part of the republic, in the neighborhood of Arequipa, and are owned and worked, at least in part, by an English company. The great difficulty has been and is the question of transportation, as everything has to be conveyed over a great range of mountains to get to and from the coast. This obstacle has hitherto proved an effective barrier to the development of the district.

Just before the outbreak of the Great War, the English company concerned was in negotiation with the Peruvian government with a view to building a railway to facilitate the development of this area. It was estimated that the line would cost about £300,000, but the project had to be abandoned at the outbreak of the war. It is sincerely hoped that when the war is over the railway scheme will be reconsidered. It would have the effect not merely of developing the borax deposits, but would enable various enterprises to be started in a highly promising region of Peru.

Communism in Practice

SO FAR as can be judged, the Bolshevist rule is nearing its end, and with its fall will disappear the great plan for the immediate establishment in Russia of a communistic millennium, says the *Ironmonger* of Aug. 31, 1918. As set forth in the innumerable decrees issued by Lenine and Trotzky, the scheme for the confiscation of all property and the carrying on of the country's industries for the sole benefit of the proletariat looked remarkably simple, but when it was sought to put it into practice it suited nobody except the robber gang who call themselves the representatives of the soldiers and workmen. The Bolshevist idea of conducting business was that no one should pay his debts and that all undertakings for producing wealth should be managed by the least-instructed classes, who were to compel the better-educated minority to do their bidding on pain of death.

In its early days the Soviet "government" established a national monopoly of foreign trade and appointed a special "soldiers' and workmen's committee for foreign commerce," to conduct it. This committee consists of delegates from the central committee of Russian industries, from government departments, and from coöperative societies, with some representatives of the professional and trading classes, who may have been added, in spite of their being bourgeois, because they can read and write. A body of statisticians was distributed throughout the country to collect particulars of goods which it is necessary to import, and of others that are available for export. When the selling prices of the last named are fixed. the rest is apparently to be done by barter.

Foreign trade relations having thus been settled to the Bolshevists' satisfaction, and other national committees, each controlling a special branch of Russian home industry, such as textiles, tobacco, petroleum and matches, having been set up, the Bolshevists issued a decree, dated June 28, for the nationalization of industry, of course without compensation to the dispossessed. This decree confiscates industrial undertakings generally on behalf of the Russian Federal Republic of Soviets, but at the last moment Lenine and his associates seem to have recognized that it would be impossible, or inadvisable, to rob every small manufacturer of his property outright, and for that reason certain classes of businesses to be appropriated by the state in each particular industry are specifically mentioned, the inference being that those not named, such as small privately owned factories, are not to be interfered with for the present, although, if the Bolshevist "government" should survive, the small capitalists no doubt would be swallowed up also in due course.

It is artfully provided that all the undertakings which by virtue of the decree are declared to be the property of the republic are provisionally to be regarded as "gratuitously leased" to their previous owners. They are to be financed by the old proprietors—a concession they are likely to view with alarm—and the profits are to be distributed as hitherto, while the managers must remain at their posts. The directors and managers are made responsible to the Soviets for the efficiency and the regular working of the business, under pain of confiscation of all their private property and of prosecution before the "people's tribunal." Directors, staff and workmen are to consider themselves as the servants of the republic, and will continue to draw the pay they were receiving when the decree came into force. Coöperative societies are exempt from the decree. The immediate object of these provisions, which are inconsistent with the pure theories of communism, is no doubt to prevent the owners of a confiscated business from winding it up, perhaps in agreement with their employees, and dividing the assets, but the ultimate aim is to convert all trade, manufacturing industry and agriculture in the country into coöperative undertakings. The decision to compel the directors and managers to continue in office is clearly due to the experience that the original plan of running all factories by committees elected by the workmen has broken down in practice, as, in fact, Lenine has admitted it to have done.

Recognizing that no country, however vast, can afford to cut itself off from all business intercourse with the outer world, and that there is no immediate prospect of any other nation adopting communism—especially since Russia has given an object lesson in the miseries it spells—the Bolshevist decree begins by laying down the future status of the organizations which form the principal commercial link between nations, the banks. All Russian banks are nationalized; and no foreign banks will be permitted to trade in Russia, nor may foreigners hold any interest in Russian undertakings or concessions for the development of the resources of the country. But as Russia cannot dispense with foreign manufactured articles, or even with foreign engineers and other specialists, a system of exchange is to be devised under which Russia will pay for such services in kind with her produce. In the meantime, as all outstanding foreign loans and obligations have been repudiated (with the exception of those due to subjects of the Central Powers, the validity of which is recognized by the peace treaty of Brest-Litovsk), it does not seem probable that other nations will show any anxiety to enter into business relations with the Russia of the Soviets.

After ordering all industrial companies to make up their balance sheets at June 30, the decree of nationalization passes to the enumeration of the various undertakings to which it applies. These include all limited companies engaged in boring for petroleum and in iron and copper mining and all undertakings, whether carried on by companies or by private owners, engaged in the winning of silver, lead, zinc, platinum and wolfram. The gold and salt mines which are declared national property are mentioned by name; they include most of the large companies. In the manufacturing branches of the metallurgical industries the decree confiscates companies and private businesses with a capital of one million rubles or more, and all undertakings, no matter what their capital or by whom owned. which are the sole manufacturers in Russia of any specialty. The nationalization of cotton mills is restricted to companies with a capital of at least one million rubles; whereas for woolens, flax, silk or jute mills half a million, and for hemp factories 200 000 rubles are the limits. All electrical and electrotechnical companies with a capital of not less than one million rubles come under the decree.

Some time ago the Bolshevist government had decided
nationalize "Prodameta," the Russian steel syndicate,
d "Krovlia," the roofing-sheet syndicate. An order
this effect has now been issued. The Russian iron
d steel industry is to be conducted under the super-
ion of the metallurgical section of the Supreme Eco-
mic Council, and all iron and steel works in the
ntry, whatever their size or ownership, may sell their
oducts only through the intermediary of the two na-
nalized syndicates in question, all of whose assets
d liabilities are taken over by the state, the employees
ng ordered to continue in their respective positions
civil servants. As the shares in the two syndicates
d by the Russian banks were confiscated last January,
present order completes the nationalization of the
n and steel industry, but seeing that most of the roof-
-sheet works are in the Urals, where the writ of the
viets runs only in places and intermittently, it is
ubtful whether the order will be of much effect.

The Bolshevist leaders have found it expedient to
e a sort of explanation of the glaring contrast be-
een their professions of devotion to the public good
d the carnival of murder, theft, and general rascality
t is the only visible outcome of their ideals. They
ve accordingly supplied a friendly German newspaper
respondent with a semi-official account of the "Prog-
s of the Nationalization of Industry" under their
e, which has been printed in his paper. This curious
ologia admits that the administrative and economic
building of the Soviet republic is an extremely diffi-
t and slow process, made more so because of the great
e of the country and the disorganization of the whole
ric of the state by the overthrow of Czarism. But
machinery has now been set up, and the present
oblem is how to utilize it effectively. Great difficulties
the way of the realization of factory control were
ated in the beginning by the technicists and en-
eers, who boycotted the workmen's committees, but
a conference held in March the representatives of 38
hnical and engineering societies decided to resume
rk, "reserving the right to maintain their political
victions," and workmen's control is now everywhere
force. At first it led to much unpleasantness and
ny misunderstandings, but it is now the rule that
orders relating to technical matters must be obeyed,
hough the men may complain to the committee.

The nationalization of industry is still in embryo.
ere are at present three groups of industrial enter-
ises: first, the numerous factories which are still pri-
te property, though the distribution of dividends has
en suspended, and all profits go to the state. The
ond group, which forms the majority, consists of
rks which have already become public property but
ve not yet been centralized and which are controlled
the workmen's organizations. The third group, which
is hoped to make the common type, consists of fac-
ies which have been taken out of the hands of private
ners and of which the control has been centralized.
ese are classified according to industries, and already
manufacture of paper, sugar and tobacco has been
ialized throughout the country. There are 43 paper
lls in Russia, but as 13 of them produce 80% of the
al output, the 30 small works are being closed down
d a central accountancy is to be established for the
mainder. This is comparatively simple, "because private interests are no longer considered." "Nevertheless," the Bolshevist statement concludes, "the position of the Russian industry is still very difficult and grave." So grave, indeed, that under the rule of visionaries and knaves whose one idea is the abolition of all property, except what they themselves can lay hands on, it is certain that there can be no hope of orderly progress.

The Tata Iron Works

American engineers have always had a particular interest in the Tata Iron Works, of India, which were built by an American engineer, Charles P. Perin, who has long continued to be the consulting engineer of the company. There has been a general impression that these important works were the investment of a foreign company, which was in no way the case, the inception of them, the financing, and the management generally having been due to a native, the late Jamsetjee N. Tata, who may be correctly characterized as the pioneer of India's industrial development. He died in 1904, but his work has been carried on ably by his sons, Sir Dorab and Sir Ratan. Sir Ratan died recently in Cornwall, at the age of 47. In recent years he had made his home in Great Britain.

The two great engineering projects that the Tata family initiated are the Tata ironworks and the Bombay hydro-electric power scheme. The former, at Sakchi, has made such remarkable progress that, although it was only in 1912 that the first ingot was rolled and the first rails were produced, it was able to render valuable assistance in 1915 in providing the material with which the railway workshops turned out shell cases which were for a time sent to England. In addition to shell cases, the firm has sent many tons of rails to Mesopotamia, and its contribution to the supply of war materials has been a not inconsiderable one.

Great as were the obstacles which confronted Mr. Tata, senior, when he first conceived the idea of building up a great iron and steel industry in India, those which he had to surmount in connection with the Bombay hydro-electric power scheme were even greater, says the *Ironmonger*. His failure to interest British capitalists in the venture served, if anything, to increase the determination to carry the scheme through. India provided the money, and so saved the Bombay scheme from what befell the Victoria Falls power scheme when the Germans secured such a large proportion of the orders for the plant by taking a financial interest in it, after British capitalists had turned it down.

The Indian Institute of Research at Mysore is another result of the foresight and generosity of the Tata family, the two sons again faithfully carrying out their father's wishes. Sir Ratan Tata, who bought York House, Twickenham, in 1906, was also a remarkable benefactor of Indian reform. He was a lavish supporter of the work of the Salvation Army in India; he founded the Ratan Tata Department of Social Science and Administration in the London School of Economics, and also established the Ratan Tata fund in connection with the University of London, which provided £1400 per annum for the study of the prevention of poverty. He was an ardent advocate of political reform in India, and belonged to the more advanced section of the Moderate party.

Notes on Mining in Alaska

By C. CARLETON SEMPLE*

The status of the mining industry in Alaska is not such as to warrant popular assumptions regarding opportunities and possibilities in that field. Profitable exploitation of mines situated inland is hampered by lack of transportation, high cost of power and scarcity of native labor, and although deposits near the seacoast can be operated to advantage, their number is small. Fishing is by far the most important industry in the country today, and offers the greatest promise for the future. Pulp woods abundant on the coast.

THE mining industry in Alaska is experiencing, in common with all other industries in the territory, a shortage of labor, which first began to be felt last season, but which now has reached such proportions as to threaten a reduction in the output of producing mines and seriously to handicap the development of others. Steamers which heretofore at this season of the year have been bringing people in, are now overcrowded on the return trip to Seattle, and the exodus is general from all places in the territory. In fact, it is difficult to secure outgoing reservations even a month or six weeks prior to the sailing date. In former years, travel southward did not reach steamer-carrying capacity until after the first of September, but since spring this year all southbound steamers have had full passenger lists.

Fishing Is Principal Industry of Alaska

The Alaskan fishing industry is now of greater importance than ever before, especially the salmon canning, as great quantities are being demanded by the Government for part of the ration for the Army in France. The season's catch promises to be a record breaker, and fishermen are making so much money that men are leaving the mines to join their ranks. Earnings of $15 a day are not unusual, and some hauls have brought in as much as $300 per diem for the men making them. Cordova has 11 canneries, and the town is so crowded with people in the fishing business that rooms and houses command high rentals and are difficult to secure. It is said that the Government has ordered the steamers to carry salmon in preference to ore until all the salmon thus far packed has been transported, and the result is that 5000 tons of Kennecott ore at Cardova is waiting shipment.

Activities of Kennecott Copper Corporation

The most important event of the year in the Copper River district was the taking over by the Kennecott Copper Corporation of the Mother Lode property, adjoining. This transaction assures the development and operation of a good property, which has produced high-grade ore in a small way and will add materially to the longevity of Kennecott. The Mother Lode adjoins the Jumbo and Bonanza mines of the Kennecott company, but lies on the other side of the mountain. The Mother Lode company built a 14-mile wagon road from its property to McCarthy, and used both horses and auto trucks for haulage. Some ore was produced for shipping by crushing and washing in a bull jig after preliminary sorting. The company built a power plant at McCarthy and developed electric power by steam using fuel oil. A two-phase generating installation serves a three-wire three-phase transmission system connection with the latter being made by means of T connected transformers, which effect the transposition with rather a heavy loss.

The Kennecott Corporation is now completing a 650 ft. drift from its Bonanza mine into the Mother Lode and, when completed, the ore from the latter will be hauled into the Bonanza mine and from there sent to the mill or loading pockets at the railroad terminal. Kennecott products comprise high-grade ore sorted at the mine; screenings, which contain about 16% copper and comprise all material coming into the mill that will pass a 9-mm. trommel after preliminary crushing in Blake crushers; Hancock jig and table concentrates, and precipitate from the ammonia leaching process. All these products are shipped in sacks, and as storage space at Kennecott is restricted, delays in operation of the railroad necessitate storage along the railroad right of way at convenient points, with the attendant labor of rehandling.

Developments of the North Midas Copper Company

The only other mining activity in the Copper River district is in the Kuskulana Valley outside of Strelna about 14 miles east of Chitina. For many years operations have been carried on in this district in a desultory way on a number of claims where a little copper ore was found, but nothing of promise resulted. Some time ago the North Midas Copper Co. discovered the outcrop of an auriferous pyrite vein in a porphyry intrusion at a point some distance down the hill from the site of the exploratory drifts which it had driven in searching for copper ore. Assays of the outcrop showed sufficient gold to warrant development work, and the property now promises to develop into a good mine.

The vein dips at an angle of about 45° and appears to be a persistent fissure in the porphyry, mineralized with massive and crystalline iron pyrites which carries gold, with a maximum width of 5 ft. It has been developed by a drift about 200 ft. along the strike, and by winze and a lower crosscut tunnel to a depth measured along the dip about equal to developments laterally. The ore averages $35 per ton in gold and silver, although a shipment of 25 tons made this spring from the upper part of the vein brought a return of $80 a ton. The company, of which O. J. Berg is manager, is building a 10-ton mill under the direction of C. N. Anderson.

Treatment will consist of reducing the ore, first in a Blake-type crusher, then to ½-in. size in a roll-jaw crusher, and grinding to 150 mesh in solution in a ball mill, with a Dorr classifier in closed circuit. An Oliver filter will be used, and the gold from the cyanide solution will be precipitated in zinc boxes. During the season when water is abundant the mill will be driven by water power, and either steam or oil engines will be used throughout the rest of the year. It was expected that the mill would be ready for operation this summer, but work is proceeding slowly.

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OTHER DEVELOPMENTS IN COPPER RIVER DISTRICT

Adjoining the North Midas, Thomas Lynch, of Strelna, owns a group of claims on which he has found ore at the surface, the character of which is identical with that found on Berg's property, and the surface exposures so far uncovered seem to be in the line of strike of the North Midas vein. The ore assays $25 per ton in gold and silver. No work has been done, other than a little prospecting, but the holding, by virtue of its situation, is one of the most interesting in the region. The Chitina-Kuskulana Copper Co. owns property near that of the North Midas. Louis Kleyle, of Pittsburgh, is manager. Work is progressing on a small scale, consisting mainly of the driving of a tunnel.

The Alaska Copper Corporation development is situated on the opposite side of the Kuskulana River from the holding above mentioned. Last year this company built a 20-mile road from Strelna, on the Copper River & Northwestern Ry., to its mine at Nugget Creek. This road crosses a large expanse of swampy tundra, and, with the idea of preventing the thawing of frozen gravel, it was built on top of the moss. It has been found in Alaska that, if the moss is removed, summer thawing takes place with greater rapidity than the winter freezing, or, in other words, the depth to permanently frozen ground increases year by year. Building the road on top of this moss has resulted in an irregular surface, which is now being put in condition by surfacing with gravel. As the gravel will sink through the underlying moss until it rests on the frozen ground, several seasons' work will be required to put the road in good condition. All the hauling for the properties on the south side of the Kuskulana River is over this road, and previous to its construction transportation was over a trail swamped out through the timber, the ground for the most part being soft and swampy, making frequent changes of route necessary. Heavy hauling was possible only in the winter, when the ground was frozen.

The Alaska Copper Corporation has two three-ton Packard motor trucks with Troy trailers, a Franklin and a Ford car for light service. No hauling by the trucks is to be attempted until the first graveling of the entire road has been completed. For 18 miles the road has easy grades, but the grade on the last two miles to the mine is so steep that the purchase of a caterpillar tractor is being considered.

EXPERIMENTAL MILL OF ALASKA COPPER CORPORATION

The Alaska Copper Corporation is developing a copper deposit which occurs as the filling of a fault fissure in greenstone. The vein filling is calcite in which bornite exists in irregular bunches and masses. Last spring, when I was in charge of operations, I built a small experimental mill of about two and one-half tons per hour capacity. The mill comprised a 10 x 16-in. Blake-type crusher, roll-jaw crusher, roughing jig and Wilfley table. Both high grade and waste are sorted out before the ore goes to the crushers, which break it to jigging size. The jig makes a 35% copper concentrate and a hutch product which goes to the table for cleaning, the table concentrates containing over 50% copper. Steam is used for motive power. The mill is operated two eight-hour shifts and treats about 50 tons of ore daily.

EXPLOITATION OF COAL DEPOSITS FORMERLY WORKED

At Cordova it is announced that work will be started soon by the Bering River Coal Co. at Katalla. Falcon Joslin is president of this company and also of the Chilcat Oil Co., at Katalla. N. R. Van Campen is superintendent of the coal company; George C. Hazelet is manager of the oil company, and Allan M. Bateman is geologist for both companies. The coal company is building roads, establishing camps and bringing in supplies, and a telephone line will be built to Katalla.

The first property on which work will be started is that of an old English company situated on Shepherd Creek, 10 miles above Bering Lake and 20 miles from Katalla. Several entries were driven by the former company, one of which is 480 ft. long and the other 450 feet.

PRESENT OIL PRODUCTION INSUFFICIENT FOR LOCAL NEEDS

The oil company has seven wells, which are producing about 600 bbl. per month, and the company also operates a small refinery producing gasoline and other products, but the quantity is so small as to fall far below supplying the requirements of the immediately adjacent vicinity. Katalla is not a suitable place for ocean shipping, as the bay on which it is situated is unprotected, and attempts at dock building are unsuccessful, foundations being quickly washed out.

Should the production of this field ever become large enough to warrant it, a railroad connection would be built to the line of the Copper River & Northwestern Ry., and Cordova would become the port for the Katalla field. The railroad at present runs northeasterly from Cordova, following a line parallel to the coast and in the direction of Katalla for a distance of nearly 60 miles before turning up the valley of the Copper River toward Chitina and Kennecott.

MIDAS MINE PRODUCING 3000 TONS OF COPPER PER MONTH

At Valdez, things are quiet, as there is only one cannery at that settlement, and the only mine is the Midas, of the Granby Consolidated Mining, Smelting and Power Co., situated on the shore opposite Valdez. This mine produces about 3000 tons of copper ore per month, which is shipped to the Granby smeltery at Anyox. A Riblet five-mile tramway has been completed, and exploration work on the property is being done by drilling.

ACTIVITIES ON PRINCE WILLIAM SOUND

The Ellamar mine, on Prince William Sound, is being operated by about 100 men and is producing auriferous copper ore. Ships are loaded in the bay at a loading pocket some distance from the shore, which is supplied by an aërial tramline carrying the ore from large storage bins.

The La Touche mine, owned by the Kennecott Copper Corporation, is situated on Prince William Sound, and is producing between 1300 and 1400 tons of ore daily. The ore contains 2% copper and is milled, concentrates only being shipped. Crushing in gyratory breakers and in Symons disk crushers is followed by grinding in Marcy ball mills. All concentrates are produced by flotation, Janney and K. & K. cells being used. Diesel engines furnish the power. Concentrates from the mill are stored in a large bin. Conveyor belts below the bins are so arranged that concentrate is delivered to a chute directly over the hatch through which it drops into the hold of the vessels, all shipments being made in bulk. The adjoining copper property has just been sold to the company operating the Ladysmith smeltery, on Vancouver Island. Some development work has been done, and a small dock and ore pocket have been built.

Chrome Deposits Under Development

One of the most interesting properties in Southwestern Alaska is that of Capt. George Whitney, at Port Chatham, at the entrance to Cook Inlet and near Seldovia, where a deposit of chromite is being developed. The existence of this ore has been known for a number of years, but little work was done, although a few shipments had been made. This year 600 tons of ore containing not less than 40% chromic oxide has been shipped to the California Electro-Metallurgical Co. The ore is at present netting about $60 per ton after payment of transportation charges. All ore thus far mined has been taken from the outcrop close to the water's edge; in fact, some of the exposure is covered by water at high tide, and from this point the ore has been traced on the surface for some distance inland. Captain Whitney has purchased the machinery in the old gold mill at Snettisham. Ten stamps and a number of vanners have been delivered at the chromite mine and will be installed when the mill building is erected. A coast survey party is now surveying the waters around Port Chatham to chart the channel, but steamers can already approach within lightering distance of the mine.

Anchorage Affected by Decrease in Railroad Work

The town of Anchorage has experienced a decided drop in population. When railroad work was in progress, the number of residents there was between 6000 and 8000, but it is now estimated at not more than 1500. The railroad line from Anchorage to Seward has been built excepting for 16 miles, and as a Government appropriation has lately been made for continuing the work, it is thought that an attempt will be made to complete the road to Seward, but labor shortage may preclude its being done this season. Some parts of this branch of the road are situated on poor ground and will probably be carried out by slides.

There is no industry at present near Anchorage, and, consequently, little prospect of the settlement developing into a place of commercial importance. The Willow Creek gold district is reached by way of Anchorage, but so far has not developed to the point where it can support a larger seaport town than Anchorage. At Willow Creek a number of gold-quartz properties are under development, the ore being high grade in narrow stringers that are rich at the surface but of unknown content beyond moderate depth. Developments have not yet shown persistence of the veins for considerable distance along the strike. Ohio and Colorado people have recently bought the Gold Bullion property for $50,000 and intend to carry out systematic development work to determine what it can produce. Labor is in great demand, the Gold Bullion mine alone needing 50 more men to carry on its development program.

Conditions in Broad Pass and Broad River Districts Do Not Justify Construction of Railway

Another district entered through Anchorage is that of Valdez Creek, where George Sias is developing placer deposits. Aside from activities at Willow Creek and Valdez Creek, there is no prospective industry in the region of the projected railway line to support it when built. It is indefinitely stated that "there is lots of copper in the Broad Pass and White River country," but nothing exact as to its occurrence is ascertainable. Copper stains and nuggets of native copper are found generously distributed over a great extent of territory in more than one place in Alaska, but enough copper concentrated in one place to make a mine is difficult to find. Alaskans themselves, even some of them from Seward and Anchorage, confess that they fail utterly to see what business there is in sight or in prospect of development to support the railroad if it is built.

Gold Mining and Shortage of Labor

At Juneau and vicinity the shortage of labor has caused a marked curtailment in gold mining. The margin of profit at these gold mines is so small that they are unable to pay the wages that miners can obtain in other places either in Alaska or outside. The Ready Bullion mine and mill are running steadily on Douglas Island, but on the other side of Gastineau Channel the big mine and mill of the Alaska Gold Mines Co. at Thane are now operated at less than full capacity and for only one eight-hour shift. At Juneau, the Alaska Juneau Gold Mining Co. is making use of the stamps in its old pilot mill for the preliminary reduction ahead of the tube mills in addition to the ball mills, as it has been found that the latter alone did not satisfactorily crush all of the ore and that the tough slaty material especially escaped reduction.

Fishing Predominant Industry and Promises Most for the Future

The fisheries which extend along the coast from Ketchikan to Bristol Bay and the Bering Sea rank foremost in value of production and offer the greatest promise for the future of Alaskan industrial development. Foremost in production is salmon, the greater part of the catch being shipped canned, although some is dried and salted. The Government this year is taking 65% of the catch, and the season promises to be an extraordinarily good one, the question of tin plate apparently being more of a limiting factor in production than run of fish. It is said that in Bristol Bay especially the runs have been good and that some canneries have already made their full season's catch. Herring fishing ranks second to salmon, and a number of salteries are now making a large output of salt herring packed in barrels. There are also a few clam canneries, and a considerable catch of cod and halibut is made to supply Pacific Coast demand.

laska's great mineral wealth has been so grossly ggerated as to be disappointing to one who is acinted with the centuries-old fields of Mexico and tral America. There is no question that the country so far been only scratched and that vast territory ains unknown, but the obstacles to development are nt. New gold mines, either placer or quartz, are ng discovered, and, when the deposits are of sufficient and the grade of the ore is high enough, the culties of transporting in machinery and supplies in general be overcome, for there will be no ques- about getting the product out. Base metals, on other hand, present problems that will restrict operas for a long time. In fact, it can be said that mines opper, lead and other base metals, when situated he interior, to be profitably developed must be of e size and produce either exceedingly high-grade or ore amenable to those concentration processes ch will give for shipment a product rich in those als.

he transportation problem is difficult of solution constitutes a serious obstacle to industrial developt. Most Alaskan rivers are not navigable, building ailroads requires large capital, and usually the mine which the railroad is built will provide the only fic it will haul. Road building for motor truck or ling by teams is expensive and feasible only for paratively short hauls, so that the only optional eeding is to confine hauling to the winter time, n the ground and rivers are frozen and covered n snow, so that haulage by means of horses is cticable.

ower from water can be developed in a few places, for several months of the year would be unavail-, on account of the prevailing low temperatures; s often difficult or impossible to obtain water for ing purposes, as all streams are frozen up, and ess springs that flow the year round are found, re is no recourse except that of thawing ice and w. Again, there is no large native population to w on for laborers, and what little white labor is ainable demands and receives good wages in addi- to board, which ranges all the way from $1.25 2 per man per day. Even were Alaska's coal fields ducing a good grade of coal in abundance and aply, its transportation to a mine situated in the erior would be costly.

n idea of the cost of fuel oil may be obtained from figures of a mine operating 20 miles from one of railroads. The oil is brought from Seattle in 108- drums and at Seattle costs 5½c. per gal. Upon arrival at the mine, the oil has cost 35c. per gal., uding return freight on the empty drum. Of course, ere oil can be shipped in quantity and handled in k cars, the transportation cost is less, but it requires opper mine such as the Kennecott to warrant provi- of such transportation.

IINES SITUATED NEAR COAST OFFER OPPORTUNITY FOR PROFITABLE OPERATION

'or mines situated on the coast close to deep water, ditions are good. There it is entirely possible to rate at costs that will compare favorably with those aining in any other mining field. The winter is so severe as in the interior, and the proximity of the ocean solves the one great problem of transportation. A mine the ore from which yields 2% copper, situated on salt water, is now being profitably operated, for it can turn out a good grade of concentrate for shipment by the all-water route, and only one handling between mine and smeltery is required. Of two mines having large and equal resources in terms of tons of metallic copper, one situated on the coast and having 2% ore, the other in the interior but having 40% ore, the profitable working of the former would be assured, whereas the high-grade mine, unless well situated and close to a railroad, would be a questionable investment.

SHORTNESS OF GROWING SEASON RESTRICTS AGRICULTURE

Some enthusiasts have written in glowing terms of the possibilities of agricultural pursuits in Alaska. Such boasting is ridiculous. Though it is true that some produce is grown, the amount is small. There are vast stretches of land rich in plant food and favorable topographically for farming, but winters in Alaska are long and bitter, and the summer season is short and uncertain, and few crops would mature. Farm labor also would be costly, but the greatest of all obstacles to farming would be disposal of any crop grown. Caring for livestock through the long winter would be so expensive as to preclude its being practiced; shipment of crops as harvested would be out of the question, and local consumption would not provide a sufficient market. With great areas of good farm land in the South still undeveloped, Alaska is the last place on the continent for the successful promotion of agricultural pursuits. The only business of the kind that seems to have a future is the raising of reindeer. The herds the Government brought in have increased and done so well that 35,000 are being exported this year for meat, and an abundant supply of reindeer meat would certainly find a ready market for years to come.

GOOD POSSIBILITIES FOR PULP-WOOD PRODUCTION

Of all Alaska's potential resources, there is one that offers a profitable field for investment which has so far not been exploited or developed. From Ketchikan northward and westward along the coast lie thousands of miles of timber land covered with spruce, fir, hemlock, larch and cedar, some of which is suitable for lumber and all of which, except the fir, will make excellent pulp wood. Water power can be developed in certain parts of the coast line, and where that possibility exists conditions are almost ideal for paper making. Several paper-making plants are now in operation along the coast of British Columbia, which enjoys no advantages that cannot be found in a score of places along the coast of Southeastern Alaska.

Stone Tube-Mill Liners have been obtained from three districts in the United States, one near Iron City, Tenn., where the "Fort Payne chert" is utilized; a second in Florida, in the region of the outcrop of Ocala limestone running from Suwanee County to Hillsboro County; a third at Jasper, Minn. The flint, or chert, and quartzite from these districts are almost pure silica, tough and hard, and are worked into dimension blocks, which have proved wholly satisfactory, according to U. S. Geological Survey reports, all manufacturers claiming increasing business with repeat orders.

The Distinction Between Extraction And Recovery*

By A. W. ALLEN

Standardization is the need of the times. Its adoption leads to the systematization of operations and the concentration of effort. It promotes elimination of wasteful variation, and assists in the clarification of ideas by disregarding the unnecessary. The method of statement of result in many metallurgical operations is an example of the ambiguity of the phraseology in common use—an ambiguity that often obscures the net economic result and renders the disseminated information valueless. This paper deals with the standardization of the terms "extraction" and "recovery," and defines and limits their use in connection with many metallurgical operations and processes.

SOME years ago I had the temerity to say[1] that "extraction and recovery are terms which are not necessarily interchangeable, and the time is ripe for the recognition of the fact." The distinction is being recognized in some quarters, although custom still makes it difficult to use the words in their true sense without an appearance of meticulous precision.

The fundamental idea underlying the word "extract" is "withdrawal"; its definition in a technical sense is "to withdraw by treatment with a solvent or other means." Thus, copper may be withdrawn or extracted from the crushed ore by flotation or by means of an appropriate acid solution; mercury may be extracted from cinnabar by heat; or gold may be extracted from its ores by amalgamation with mercury. The amount extracted is usually estimated by an analysis or other determination of the ore before treatment, and the residue, or tailing, after treatment. The extraction is obtained by difference.

EXTRACTION IS USUALLY THE FIRST STAGE OF THE PROCESS

Metallurgical processes are usually divisible into two principal stages. The first is concerned with the preparation of the ore and the extraction of the valuable metal, preferably in a concentrated form. The product sought is sometimes associated in nature with a mineral or minerals having physical characteristics which differ from those of the surrounding rock material, and this facilitates extraction. In other cases a solvent is added to withdraw the metal in dissolved form. In some instances heat may be used to extract it. The second stage is for the purpose of obtaining a final product from the concentrated mineral, solution, or gas; and usually in metallic form. The actual amount obtained indicates the "gain," or, to use a more appropriate word, the "recovery." Both extraction and recovery are customarily estimated as percentages of the original metal content of the ore. Extraction invariably ceeds recovery, but the amount recovered is the cru the matter—it is the determining factor as to whe the process is suitable and is being efficiently perfor Extraction is an indication as to how the first s is progressing; it shows how much is being los the tailing or residue, but it tells nothing as to much is being gained or recovered in the final proc

PARALLEL EXAMPLE OF DIFFERENCE BETWEEN EXTRACTION AND RECOVERY

The difference between extraction and recover best shown by a simple illustration from those busi operations which are usually considered so far rem from technical work. A storekeeper marks with sa faction the depletion of the goods on his shelves as month advances. He has a system which enables hi keep an accurate check on the wholesale and r prices of everything sold. At the end of the mont compares these figures, and estimates the theore profit made; but he is far from content with thi a final appraisal of the net result of the work. find out exactly where he stands, he needs a n tangible factor, so he checks the cash received bases his profit on that. When there is a big differ between theoretical estimates and actual returns, looks to see where the discrepancy occurs, and endea to eliminate the errors and mistakes, the losses thefts. The final result is measured by cash recei not cash that would have been received if the w series of operations had been carried through wit a hitch, mistake, or loss. The need of close and log accounting in metallurgical work is just as impor as it is in commerce—perhaps more so. To disting properly between extraction and recovery is the step toward realizing the vital importance of net nomic result, and the secondary, though helpful, v of the theoretical estimate.

AN ALMOST COMPLETE EXTRACTION MAY BE OBTAI BY AN IMPRACTICABLE PROCESS

I was once called upon to report on the treatm of a highly refractory auriferous ore. At that t the volatilization process was attracting attention, I made a number of tests to determine what resul could get by roasting with salt. To my surpris found no difficulty in obtaining a residue that indic an extraction of 97%, and this on a comparati low-grade ore. The results were encouraging, but more important stage of the process was yet to co The volatilized gold had to be collected in salable fo and this is where the process failed; for nearly of what had been extracted was lost in all attem to condense and collect. There was no trouble ab withdrawing the gold from the gangue—the extract was high; but the net gain was so small that process was deemed infeasible—the recovery was too

Cyanidation has often been adopted because h extractions of metal could be obtained in experime gment. The day of reckoning has come later when tual yield is obtained, and when it is realized that are a thousand and one opportunities to lose the l after it is extracted and before it is recovered. stimate of extraction is always an excellent guide eliminary work and also in connection with full- operations; but the superiority of a process is mined by ultimate net result, and comparisons e fairly and satisfactorily made only by consider- he controlling factor of actual gain or recovery.

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*The first of a series of articles on the standardization of terms used in hydrometallurgical operations.

[1] "Descriptive Technology," *Trans.* A.I.M.E., Vol. XLIX.

Extraction No Gage of Efficiency in Many Instances

e leaching treatment of copper ore is analogous anidation as far as the foregoing considerations concerned. After the metal has been extracted ssolved form, there is a possibility of loss at every of the subsequent process. If actual recovery e made to approach closely to theoretical figures, uch the better. The results are commendable, and t alike on equipment and operation. If there is nsiderable difference, which is often inexplicable, let the recovery figures indicate the final result. the product is obtained as a metal, these figures lways obtainable, and are alone of significance. tate that an extraction of so much per cent. is ned usually leaves the reader mystified as to her the recovery process is a success or a failure.

Extraction a Phase of a Recovery Process

e question may be raised as to whether an incom- metallurgical treatment can result in a recovery product. Recovery treatment may be said to when the mechanical preparation of the ore is leted; or the two may overlap. Extraction may be dered as a phase of a recovery process, although everse is not true. If the winning of the metal when it is obtained in the form of concentrate se bullion, it is obvious that something is recovered. haracter of the recovered material should be stated, ddition to its metal content. The worth of the estimate depends on the accuracy of the figures —the more concentrated the final product the easier e the task of arriving at a correct estimate. Hence erm "recovery" is best used when refined metal is uced, and "extraction" when the product is in a ntrated but not a melted and refined condition.

further distinction is seen between the words when understood that recovery of metal can be based on actual yield in metallic form. Extraction, on other hand, may be based on the assays of ore e treatment, and residue or tailing after treatment; may be calculated from the net weight of con- ate or base bullion produced, in terms of metal nt. Hence the difference between assay extrac- and actual extraction, which has already[2] been de- as follows:

e *assay or theoretical extraction* is the amount of l which is indicated by assay results as having removed from the ore during treatment.

e *actual extraction* indicates the amount of metal ved from the ore and isolated in concentrated . Such actual extraction is based on figures representing the actual metal content in the concentrate, base bullion, or other material produced.

To summarize:

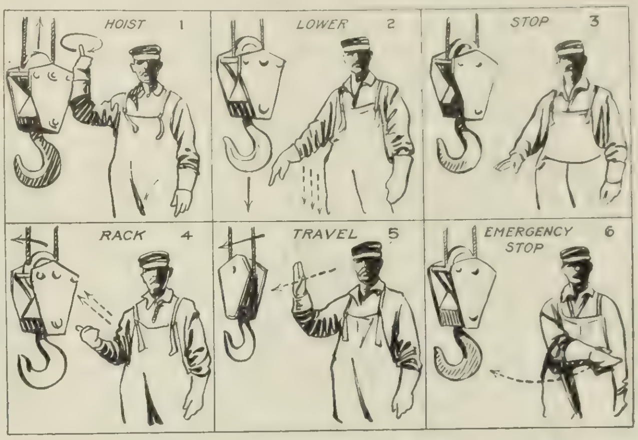
1. The final product of metallurgical treatment should be estimated and reported as a *recovery*, in percentage of the original content of the ore, when the yield is refined metal.

2. When metallurgical operations are incomplete, and a concentrated but not a refined product is obtained, the metal content should be reported as an *extraction*, also in percentage of the original content of the ore.

Uniform Crane Signals

The Industrial Board of the Pennsylvania Department of Labor and Industry has adopted, among other safety standards, uniform crane signals. The same signals, which are illustrated in the accompanying cut, have also been recommended as a standard by the Safety Engineering Board of the Emergency Fleet Corporation. The signals are described as follows:

1. Hoist—Forearm vertical. Make small horizontal circles with the hand.



UNIFORM CRANE SIGNALS, AS RECOMMENDED

2. Lower—Arm extended, hand below hip, wave forearm downward.

3. Stop—Arm extended, hand level with hip. Hold position rigidly.

4. Rack—Arm extended, hand just above hip, fingers closed, thumb extended horizontally, jerk hand in direction of racking.

5. Travel—Forearm vertical, hand open. Wave forearm in direction of travel.

6. Emergency Stop—Arm extended, hand level with the hip. Move hand quickly to right and left.

The signals should be posted in all crane cages and should be observed only when they are given by the proper person.

Tin Production of Bolivia.—It is expected that the tin production of Bolivia in 1918 will be equivalent to a yield of 28,000 to 30,000 tons of pig tin. The major part of this is derived from seven mines, which in 1918 are expected to produce about 26,000 tons. The chief producers are Llallagua and Patiño. Bolivian official statistics calculate tin concentrates on the basis of an average yield of 60%, but in commercial opinion the present average is nearer 62%. Llallagua is supposed to get about 70%, and the Patiño mines about 65 per cent.

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The Manufacture of Zinc Oxide At Monteponi[*]

By F. Sartori

The idea of making zinc oxide directly from ore was first advanced in Monteponi as early as 1881, by Mr. Ferraris, who was the original investigator and who assigned to the Societa di Monteponi a patent based on the use of ammonia. Interesting experiments were made between 1890 and 1900, but none of these was on a large scale. About 1905 some experimental treatment of zinky lead slag was undertaken in small blast furnaces of special design.

It was not until May, 1906, that, in view of the necessity of treating the zinc-bearing ores of dolomitic gangue of the type predominating in the Monteponi mines, the idea of using a converter instead of a blast furnace originated. The first series of experiments, although encouraging, were abandoned, for several reasons, but were resumed in 1908. The time required to get this far may seem long, but many tedious, tentative efforts were necessary in order to devise a process meeting satisfactorily the special conditions of Sardinia, where coal is poor and costly. This indicated the need for something different than the Wetherill process, used in the United States, which requires from 1 to 1.5 ton of good anthracite per ton of ore.

The new patent assigned to the Societa di Monteponi describes a process of reducing zinc ore mixed with lean coal in a converter lined with refractory material and blown with air at high pressure. The converter is placed under a combustion chamber wherein the zinc vapor and carbon monoxide are burned, the products of combustion passing first through the flues of a steam boiler and thence to a baghouse. As an alternative process, the converter is started under a separate hood until all the moisture in the charge is eliminated, after which the operation is continued under the combustion chamber, as first described. The first converter was installed at Bellavista, about the end of 1908, and was followed by three more converters, which were provided with a separate cooling and filtering system. For the treatment of fine material it became necessary to build a plant to briquette the mixture of ore and fuel.

Eventually a new plant was erected at Scalo, near the Monteponi station of the Royal Sardinian railway and the Portovesme-Monteponi railway. In this plant the steam boilers following the converters were omitted, the experience at Bellavista having been unsatisfactory. The space between the boiler tubes choked up after a few hours' run. The question of the utilization of the heat produced in the combustion of the vapor and gas is therefore still open.

The Scalo plant is divided into two sections, the first having been put in operation in 1914, and the second in 1917. Each section consists of five furnaces, with supplementary oxidation chambers, cooling pipes and baghouses. The converters are brought from the hoods to the furnaces by means of electric trucks. The blowers, exhausters, and all other machinery of the plant are electrically driven.

The baghouses are of reinforced concrete, but t rest of the plant is comprised in a light steel stru ture roofed with galvanized sheet iron, the north si only being closed. The plant is operated continuous with three eight-hour shifts.

For fuel, anthracite from the mines of Corung developed and operated by the Societa di Montepo is used. This coal carries from 16 to 20% of as which is a cause of serious trouble in the producti of zinc oxide; wherefore means for washing the co are now being installed at Corungio.

At first the Monteponi zinc oxide was regarded susp ciously in the market, owing to its being a new thi and also because it is not quite so white as the produ obtained by burning metallic zinc. However, the tra soon discovered that the paints prepared with it we excellent, the zinc oxide being of extremely fine chara ter and capable of a perfect mixture with oil witho the need for further grinding or classifying. The paints possessed high covering qualities, rapidly dr ing character, great durability, and high enameli properties. The zinc oxide contains about 8% of lea which is present entirely as sulphate.

The total production of zinc oxide in the Montepo plants has been about 13,000,000 lb. A production 3,500,000 lb. in 1917 was expected, and might ha been obtained if the fuel supply had been adequa

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[*] Abstract of a paper in Resoconti delle riunioni dell' "Associazione mineraria sarda," December, 1917

Mercury Losses in Retorting[*]

By A. Thomas

I am inclined to think that estimations as to the lo of mercury during retorting are exaggerated and th the retorting plant is debited with deficiencies whi really are due to the presence of water in the amalga To determine the actual mercury loss which takes pla the water present in the amalgam must also be e timated.

Some time ago tests were made, under working co ditions, to find out the amount of water present amalgam. A receptacle was placed at the discharge e of the condensing chamber to receive the moisture whi came off from the retort some time before the mercur and from 39,163 oz. of amalgam, 421 oz. of water w recovered, equal to 1.07%. Results from more rece tests indicated that 12,612 oz. of amalgam yielded 80 o of water, equal to 0.634%, which indicates that t percentage of water in the amalgam is not constant.

Usually the amount of mercury called for after r torting is the difference between the weight of retort bullion recovered and the weight of amalgam. I regr that at the present time I am unable to give data sho ing what the actual mercury loss is while retorti amalgam, as it should to be taken over a period be of value. There should be little loss of mercu while retorting if due care is exercised in conducti the operations, sufficient heat and time being allowed f the complete vaporization. Close-fitting joints on t retort doors, and proper condensing chambers are i peratively necessary.

Gold Nuggets are still being found in Australia. O recently picked up at Castlemaine, Victoria, weighed 17 c and was valued at $320.

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[*] Excerpt from Journ. Chem., Met. and Min. Soc. of South Afri

Smelting and Lead Refining at the Bunker Hill Plant*

By C. T. Rice

Details of the design and operation of the blast furnaces and types of blowers used. The arrangements for lead tapping, the sizes and types of sundry equipment, and modes of conveyance of the various products about the plant, are described, including the pumping, by centrifugals, of molten lead. Details of the Parkes process, and the use of Faber du Faur furnaces in refining the products, are accompanied by a number of illustrations.

An ADDITIONAL blast furnace is to be added to the smeltery at the Bunker Hill & Sullivan plant. Separate spurs lead to the top of each of the existing furnaces, placed at 36-ft. centers (see Fig. 1). As the furnace gases are taken off by a "downcomer" at the back of the furnace and underneath the feed floor, the latter is unobstructed. It is partitioned off from the rest of the blast-furnace building so as to keep out the furnace gases as much as possible, but individual partitions do not separate the charge floor of one furnace from that of another, as at Tooele. The charge doors of the furnaces are carried on wheels from tracks inside the charge-car tracks; and under each door is a 6-in. angle-iron spreader for distributing the charge properly in the furnace. Each spur extends out behind in a tail track, so that the charge can be dumped at any point along the furnace. One man attends to the feeding of the blast furnaces, and there are two men on each charge car.

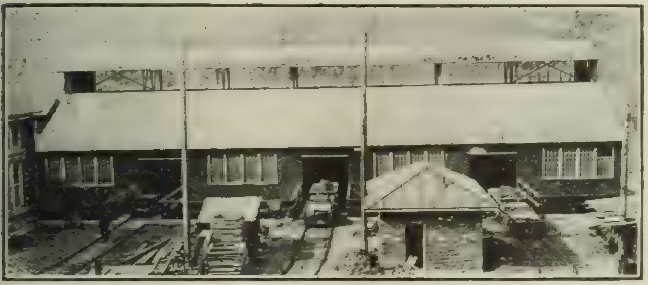

FIG. 1. SPURS TO BLAST-FURNACE BUILDING

The blast furnaces are 48 x 180 in. at the tuyeres, and were made by the Traylor Engineering Co. The feature of the Bunker Hill furnace is that, like a copper blast furnace, it has two tiers of water jackets above the crucible. Except for the fire bricks in the crucible, the only brickwork about the furnace is the 6-in. layer separating the water jackets from the top plates. Five jackets run lengthwise with the furnace, each jacket having two tuyeres, so that there are 20 to a furnace.

The water, which is pre-heated in the top jackets, goes to the lower bank, and a warmer-running furnace is obtained, and the extra set of overflow pipes that would otherwise be required is unnecessary. A comparatively low furnace results, the distance from bottom of crucible to top of furnace being only 25 ft. The blast for the furnace is furnished by two Ingersoll-Rand turbo blowers, each having a capacity of 12,000 cu.ft. of free air per min. at 48 oz. per sq.in. pressure. These turbo blowers operate at 4700 r.p.m., and are driven by herringbone gears from 200-hp. induction motors running at 1800 r.p.m. Fig. 2 gives an idea of the small floor space occupied.

The lead is taken by a launder, Fig. 3, to a ladle at the front of the furnace, and the slag is tapped into two receivers placed in series, Fig. 4. The first of these settlers is 6 ft. in diameter by 3½ ft. deep, and the second is 5 ft. in diameter and 2½ ft. deep. Simple cast-steel slag spouts are used, without water jackets. Being comparatively small, and as the blast furnaces are served by a 20-ton traveling electric crane (Fig. 5), the settlers are changed whenever they begin to slag up, and others put in. In this way their effective settling

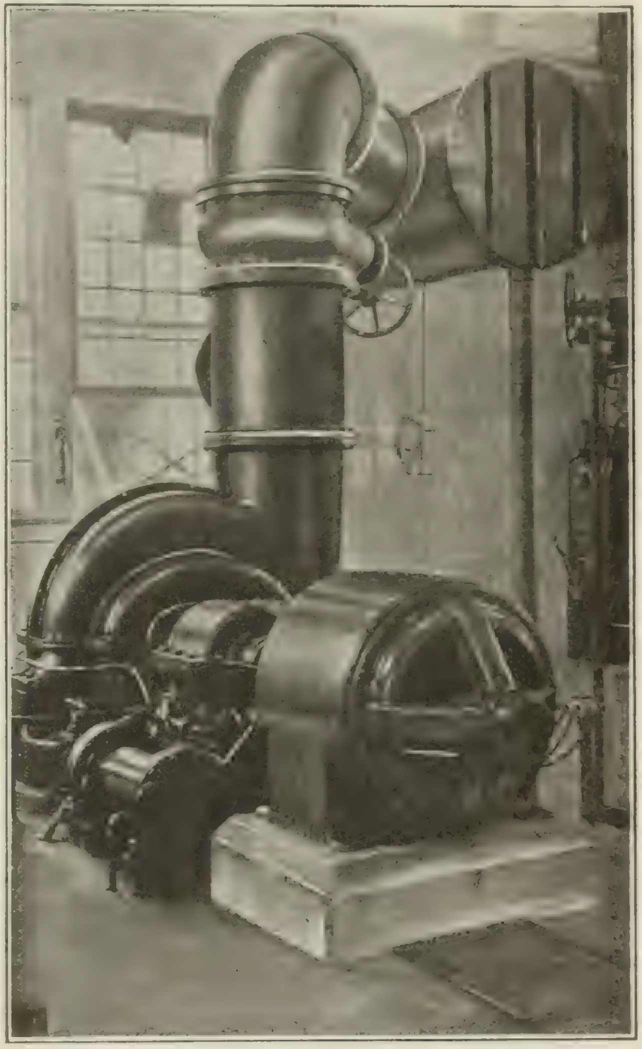

FIG. 2. TURBO BLOWER

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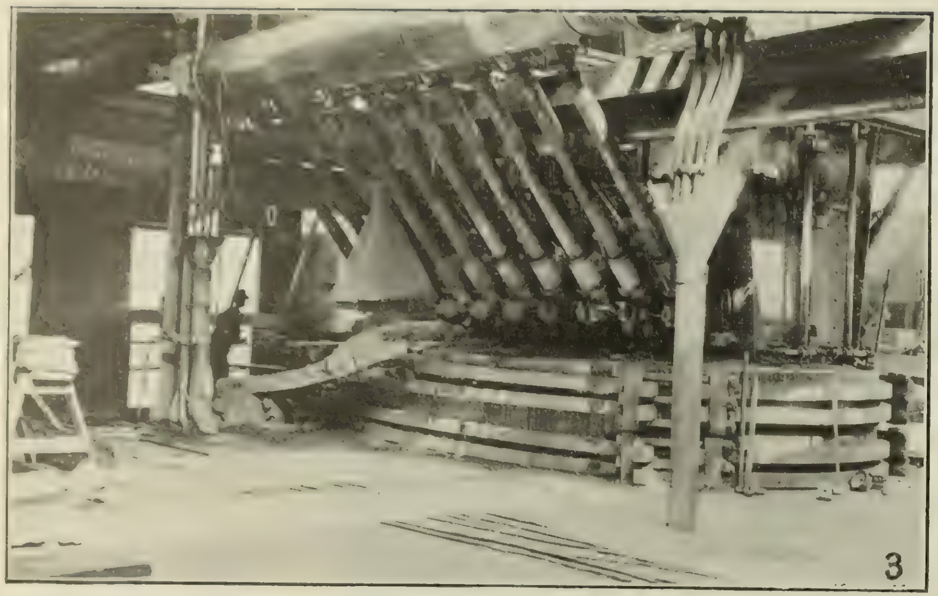
*The fourth of the series of articles describing the design and operation of the Bunker Hill & Sullivan smeltery and refinery, that began in the July 20 issue.



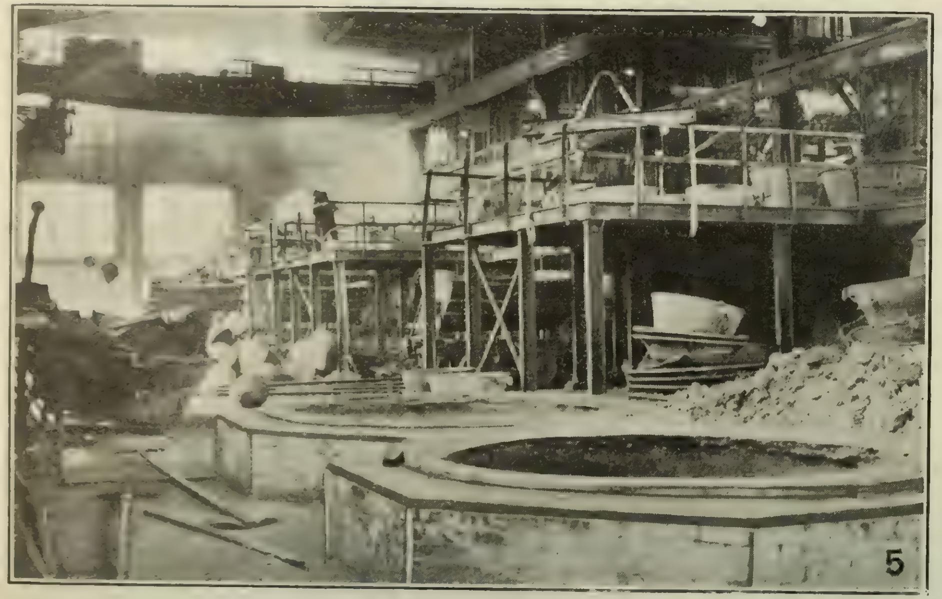
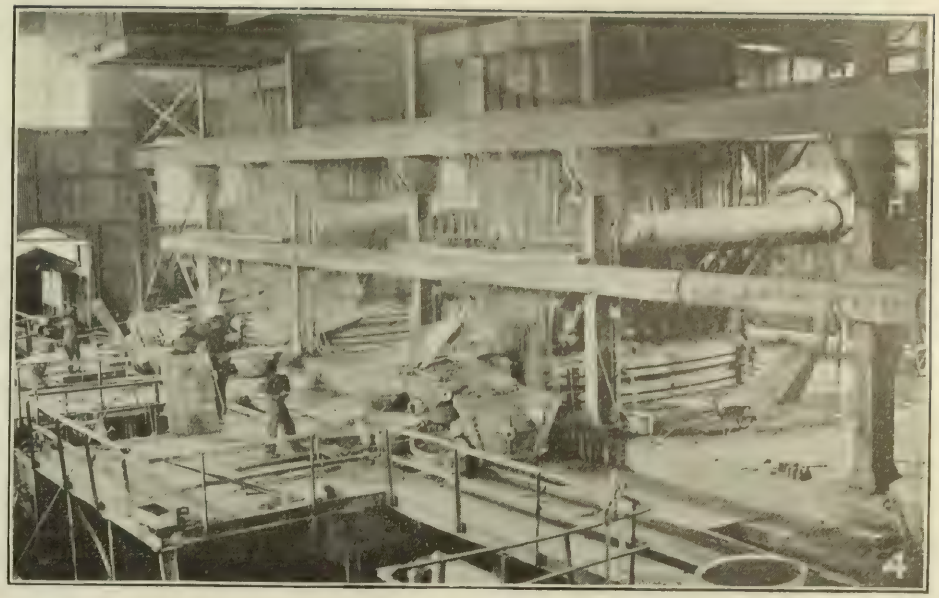


FIG. 3. BLAST-FURNACE JACKETS AND TUYERES
FIG. 5. BLAST-FURNACE AISLE AND KETTLES



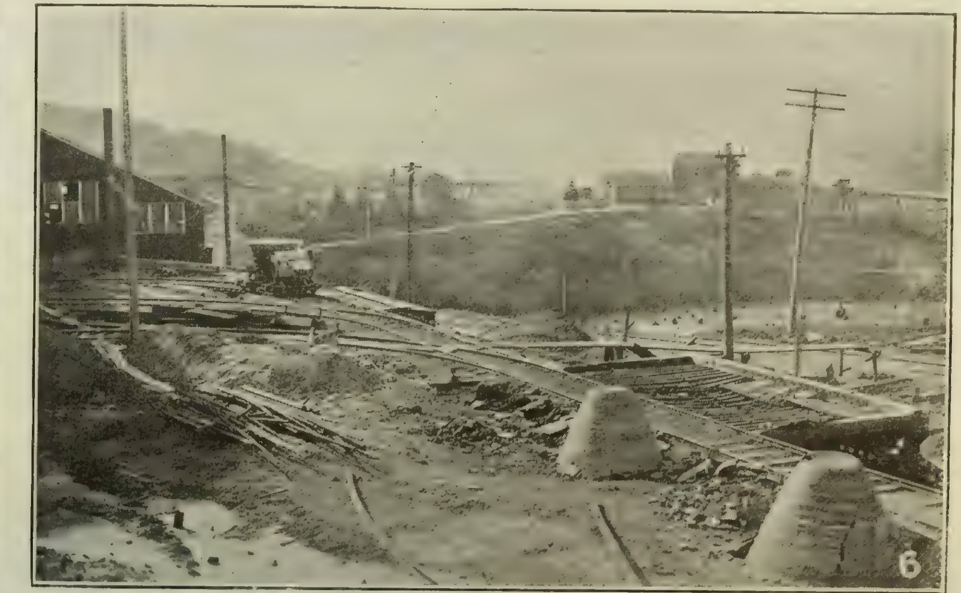


FIG. 4. FRONT OF BLAST FURNACES
FIG. 6. SKULL GRIZZLY

capacity is kept at a maximum, and all matte in the slag is caught in them. The shells from the slag pots are, nevertheless, dumped on a skull grizzly (Fig. 6) and broken up for return to the blast furnaces. This is done partly to recover the matte which may possibly have found its way into the shells, but mainly because of the benefit arising in speeding up the furnace by the addition of slag. The matte is tapped from the settlers into small ladles (Fig. 7), handled by the crane, which also takes the lead ladles and pours the contents directly into the drossing kettles of the lead refinery. The slag from the blast furnaces is caught in 130-cu.ft. motor-dumping Treadwell slag pots (Figs. 8 and 9), and taken to the slag dump, a few hundred feet away, in the neighboring gulch, by a 10-ton Baldwin-Westinghouse electric motor. As the blast furnaces are placed at 36-ft. centers, and roomy platforms are provided in front of them, the working space around the furnaces is ample.

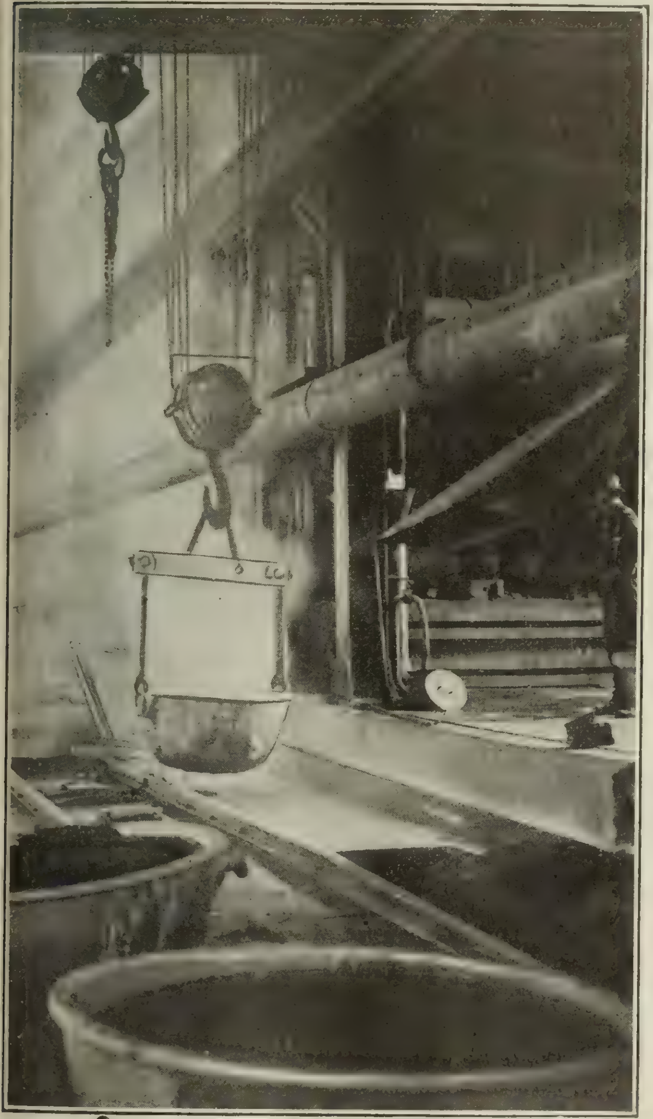


FIG. 7. HANDLING MATTE WITH CRANE

The furnace charge carries from 35 to 40% lead, being nearer the higher limit more frequently than the lower, and there is only from 1 to 3% zinc in the charge. This is mixed so as to obtain a slag analyzing 32% FeO, 2 to 4% ZnO, 32 to 33% SiO_2, 16% CaO, and, incidentally, 3% MnO. The slag from the blast furnaces carries 1% lead (by wet assay). Owing to the richness of the charge, and its freedom from zinc and other slag-stiffening elements, from 200 to 250 tons of ore is smelted by each furnace per 24 hours. The matte fall has been 12%, but this will be diminished considerably when the ore is given a double roast on the Dwight & Lloyd machines. From 120 to 150 tons of drossed bullion is obtained at present from the two furnaces. Fig. 4 gives a good idea of the layout.

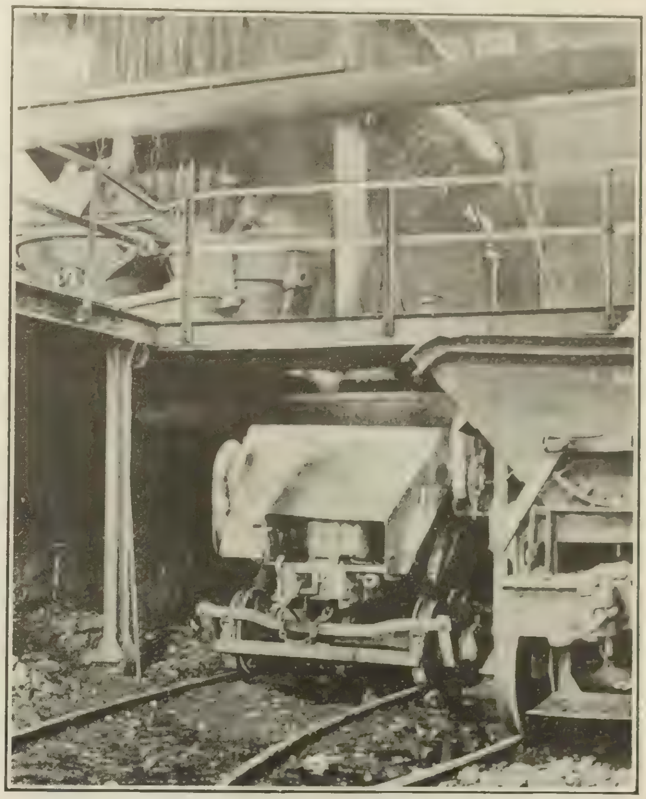


FIG. 8. TAPPING SLAG WITH SLAG CAR

The only details in which the blast-furnace arrangement is to be changed will be to put larger hoods in front and to install a larger draw-off pipe and fan, so as to take the sulphur smoke and fumes away more completely when slag is being tapped or matte drawn. But even without adequate hoods, both the blast-furnace building and the lead refinery are remarkably free from smoke and fume, as may be seen from the accompanying illustrations, which I took in the course of the usual running of the plant. There is a concrete floor both in the blast-furnace building and in the lead refinery.

THE LEAD REFINERY

The lead-refinery building is an extension of the blast-furnace building, the two joining on the side. Consequently, the molten bullion can be taken directly by the traveling electric crane to the drossing kettles of the lead refinery (Figs. 10 and 11), of which there are two (Fig. 12), each having a capacity of 50 tons. In these the lead feed for the softening furnaces is accumulated, and dross is taken off for return to the blast-furnace charge. After this operation, the molten metal is sent by centrifugal pump through pipes to one of two softening furnaces (Fig. 13), having a capacity of 80 tons

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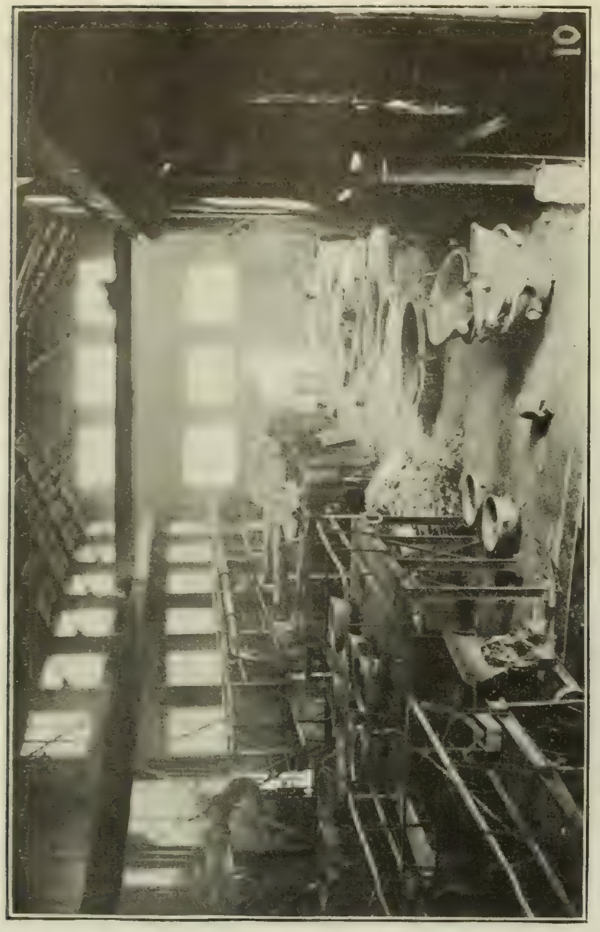
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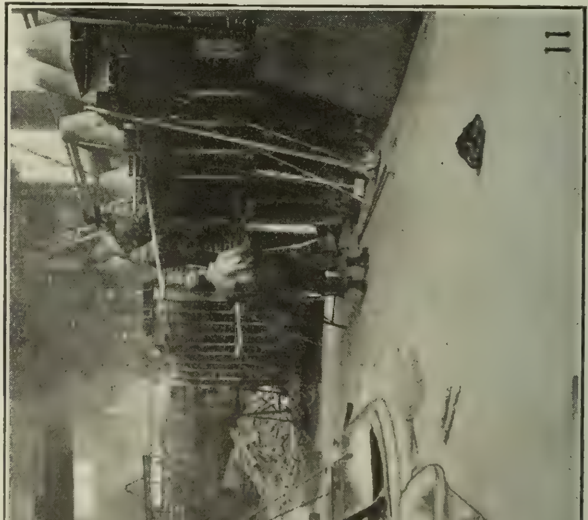
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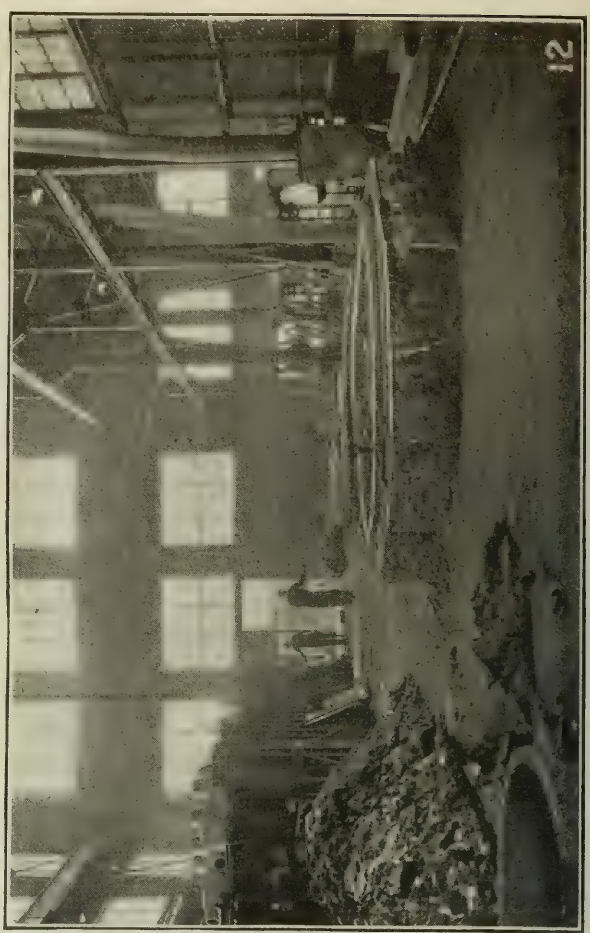
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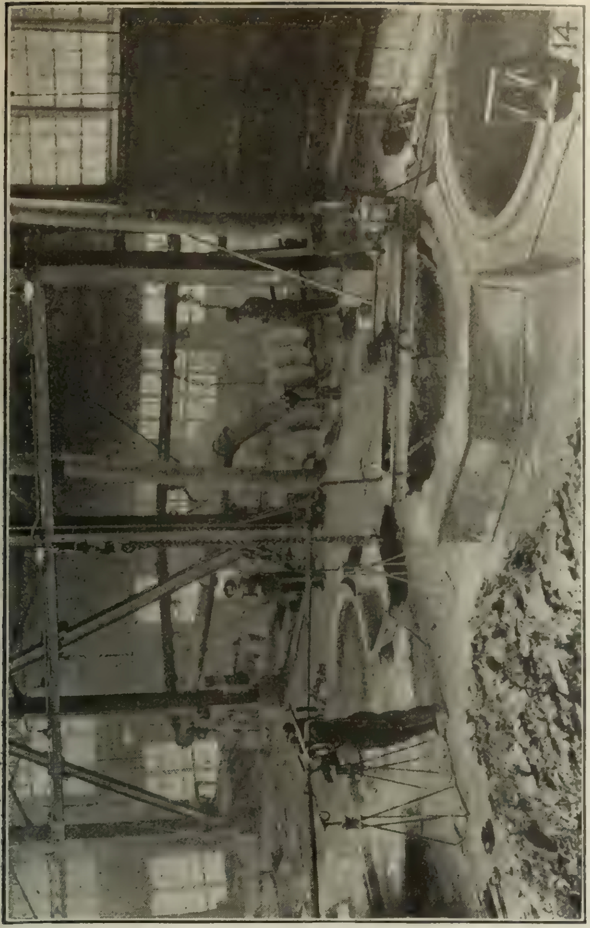
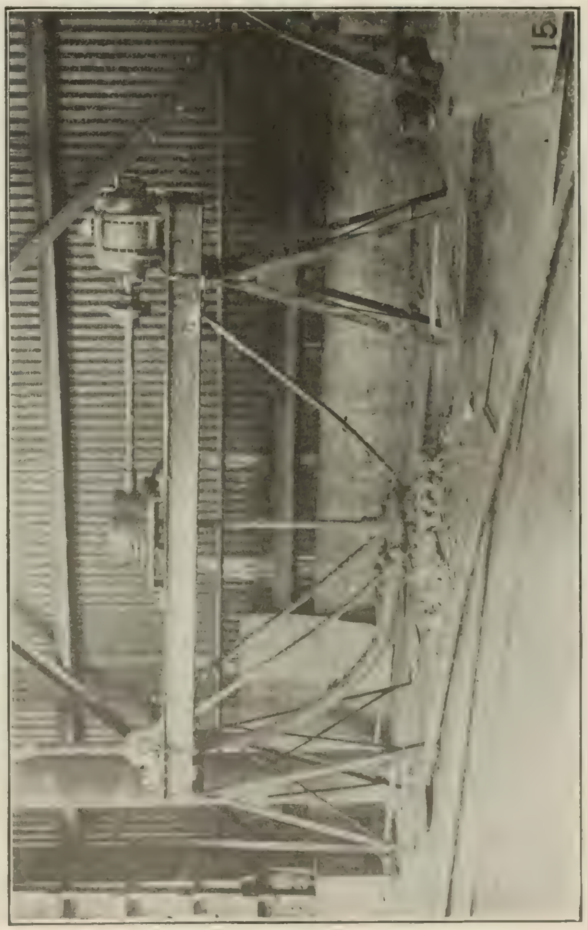
FIG. 9. DUMPING THE SLAG POT

FIG. 11. LOOKING FROM LEAD REFINERY

FIG. 10. LOOKING DOWN AISLE TOWARD REFINERY

FIG. 12. DROSSING KETTLES, LEAD REFINERY





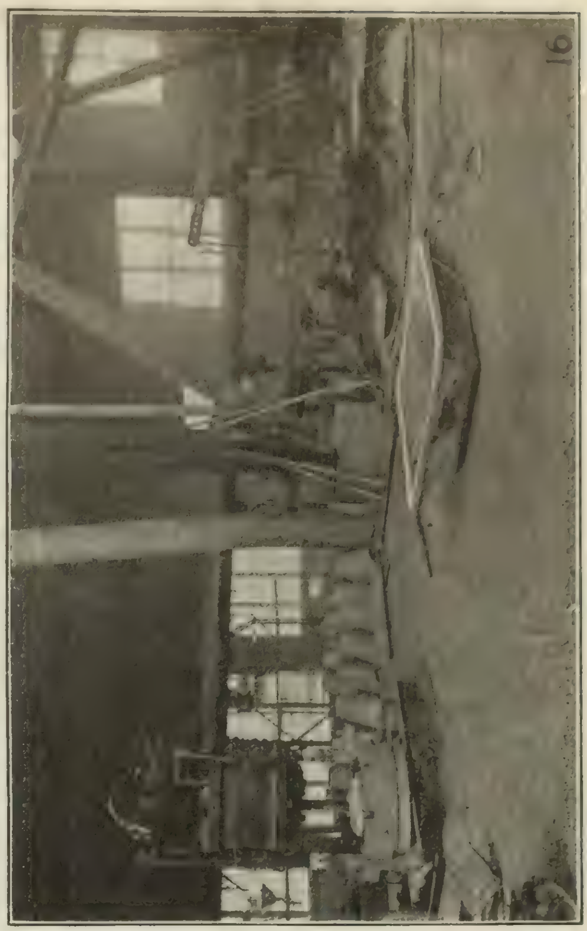
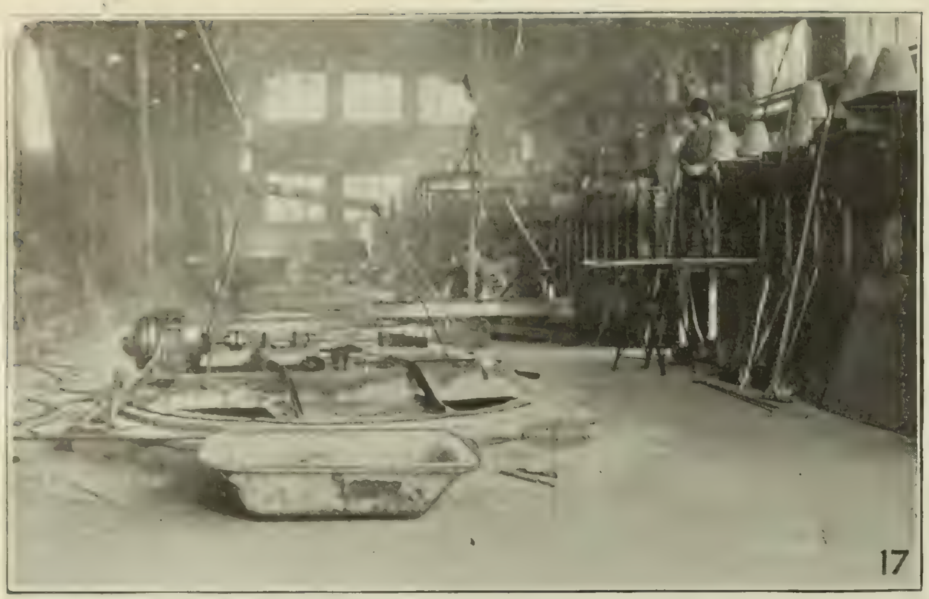


FIG. 13. SOFTENING FURNACE AND ZINCKING KETTLES
FIG. 15. RUMSEY LEAD PUMP

FIG. 14. PUMPING LEAD FROM DROSSING KETTLE
FIG. 16. **HOWARD PRESS AND HOWARD MIXER**



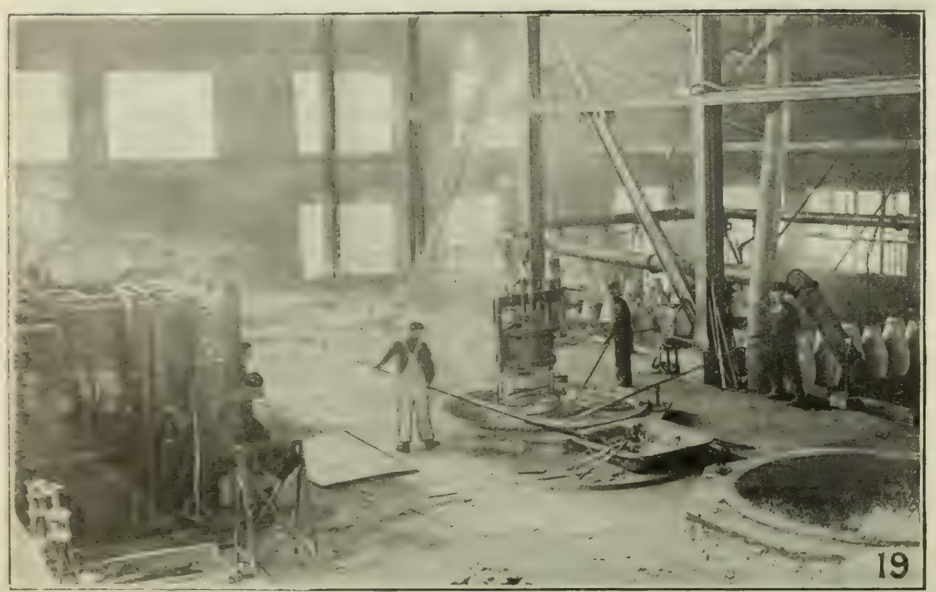
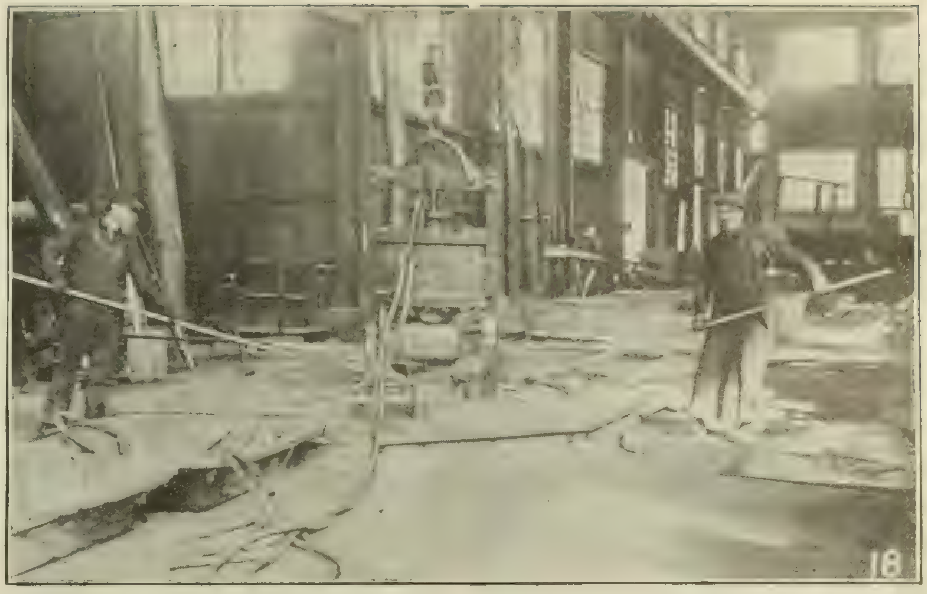


FIG. 17. MIXER IN LEAD REFINERY
FIG. 19. FIRST SKIMMING OF GREASE



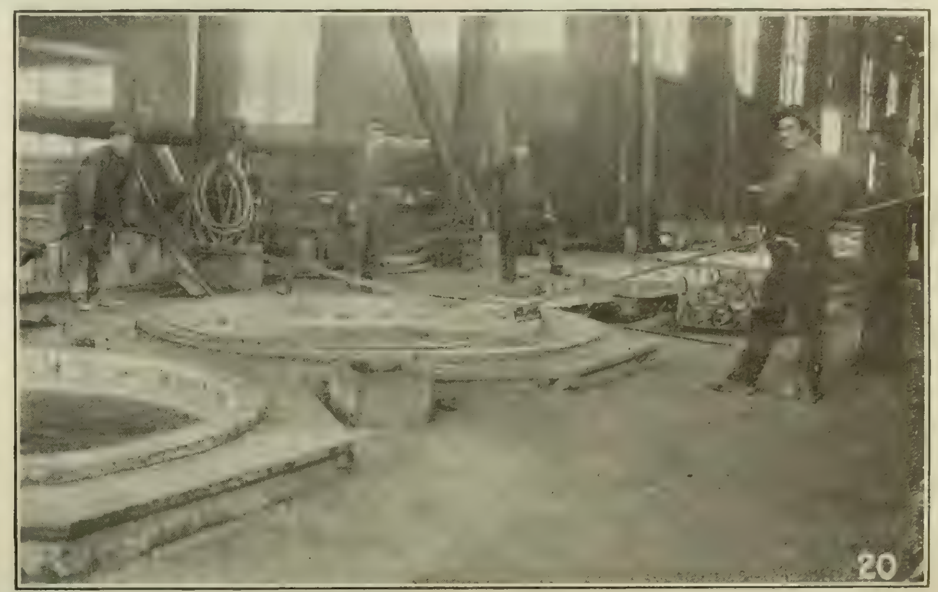


FIG. 18. FIRST SKIMMING OF ZINC DROSS
FIG. 20. SECOND SKIMMING OF ZINC DROSS

each and fired with powdered coal. One burner that gives a flame from 7 to 8 ft. long is used in each furnace, with an effect similar to oil or producer gas.

Fig. 14 shows the molten bullion being pumped from a drossing kettle to one of the softening furnaces, and Fig. 15 the Rumsey pump that is generally used for this purpose. In addition, a pump specially designed by Bradley, Bruff & Labarthe, and manufactured by the United Iron Works, of Oakland, Calif., is used. Although the driving motors are mounted directly on the frames of these pumps, and are immediately above the molten lead, they do not heat up noticeably, even when the pumps are run continuously for several hours, and the upkeep is not great. It takes about half an hour to empty one of these 50-ton drossing kettles.

A 10-ton traveling crane equipped with a two-motion winch, which has been electrified at the smeltery by mounting a motor on it, so that the horizontal and vertical travel can be regulated by switch cords from the floor of the refinery, is used in moving the pumps, mixers, and press from one kettle to another, and about the refinery. At the softening furnace the molten bullion is raised to a temperature between 1100 and 1200° F., when the antimony begins to rise to the top, and is drossed off, together with some of the lead. This dross carries about 19% antimony and 65% lead. The operation takes from 10 to 24 hours. At present, the dross from the softening furnaces is being held until another furnace is erected for converting it into hard lead.

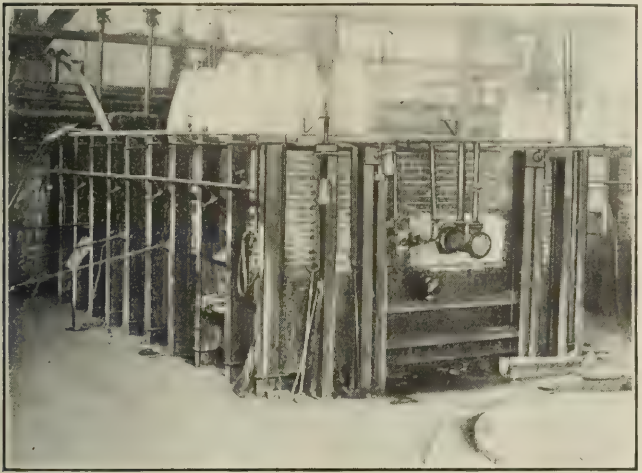


FIG. 21. LEAD-REFINING FURNACES, SHOWING POWDERED-COAL BURNER

PARKES PROCESS USED

From the softening furnaces the lead bullion flows by launder to the kettles, where it is treated by the Parkes process of mixing with zinc to collect the gold and silver. The first skim goes to the silver refinery, and the second skim to the next kettle, to supply the zinc for collecting the first skim in refining the next kettle of metal. Thus by using two skimmings a richer zinc dross is obtained for treatment in the silver refinery. The zinc for the second treatment is added in bars of either new or old metal. The first skimmings are squeezed in a Howard press (Fig. 16), and the zinc is mixed with the bullion by means of a motor-driven Howard stirrer (Fig. 17). In Figs. 18 and 19 the first skim is being taken off and squeezed in the Howard press while it hangs over the kettle; in Fig. 20 the second skim is being made.

FABER DU FAUR FURNACES

The second skim is accumulated in a steel pan by the side of the kettle to form a cake, but the first skim, after having the excess lead and zinc pressed out of it, is worked around on an iron plate coated with oil to keep the dross from sticking, and cooled into a granular product that can easily be charged into the retorts of the Faber du Faur furnaces in which the zinc is driven off and the lead-silver-gold bullion is left. At present these furnaces are in the silver refinery, but, in order to provide more room, they will soon be set up on the lower floor in the extension of the lead refinery. Owing to the increased amount of lead which is to be made by the blast furnaces, another cupel furnace must be installed at once. At present the retort metal from the Faber du Faur furnaces is cast into bars before going to the cupel furnace, but in the near future this retort metal will be taken in a molten condition directly to the cupels.

The bullion is skimmed until a crust of lead begins to form over the molten metal; then the kettle is heated slightly and the lead pumped to one of the two refining furnaces, each having a capacity of 80 tons (Fig. 21), placed on the lower floor of the lead refinery, together with the merchant kettles and the casting machines.

Each softening furnace is served by two kettles. About one-quarter of the zinc is added in the first treatment and about three-quarters in the second operation of a kettle. It takes about 12 hours to zinc a kettle. Pyrometers are used in measuring the temperatures of the bullion bath during the different steps of refining.

Between 0.5 and 0.6% zinc still remains in the soft lead as it leaves the kettles; so in the refining furnaces the last of the zinc, together with the copper and the trace of antimony which may have come over from the softening furnaces, is drossed off. The two refining furnaces are exactly similar to the softening furnaces, being heated with pulverized coal, and have a capacity of 80 tons each. It takes about 12 hours to remove the last of the antimony, zinc and other impurities which may be in the lead. At present the zinc-lead-antimony-copper dross obtained at the refining furnaces goes back to the blast furnaces for re-treatment; but as soon as the antimony byproduct furnace has been completed, this material, together with that obtained at the softening furnaces, will go to the byproduct furnace for refining.

Superintendent's Accident Insurance

BY A. L. H. STREET*

Where decedent took out an accident-insurance policy based on occupation as "ore-mine superintendent, supervising only, inside and outside duties," the fact that he had been temporarily employed as timberman for several weeks before he was killed in a snowslide while traveling on a pleasure trip did not invalidate the insurance, holds the Colorado Supreme Court in the recent case of Anderson *vs.* Midland Casualty Co., *172 Pacific Reporter, 1067,* it appearing that decedent intended soon to resume his regular occupation as superintendent.

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*Attorney at law, 820 Security Bldg., Minneapolis, Minnesota.

Temperature Conditions in Deep Mines

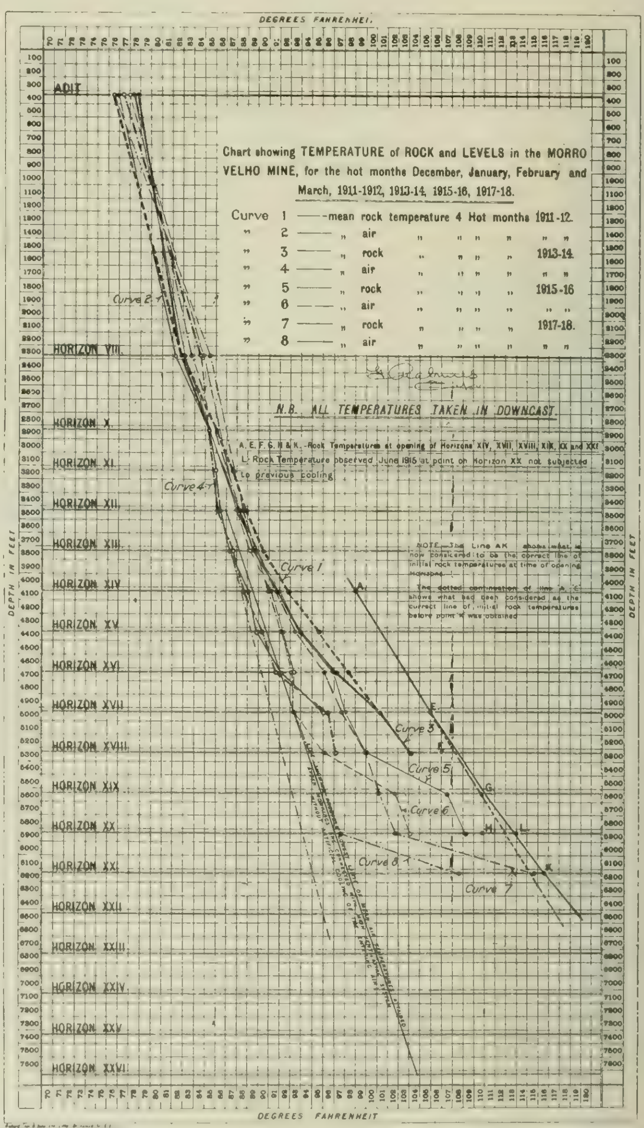
THE 87th annual report of the St. John Del Rey Mining Co. contains interesting data as to the ventilation problem at that company's mine—the deepest and possibly the most notable gold mine in the world. According to the superintendent, G. Chalmers, the usual investigations with reference to rock and air temperatures have been carried out, as in previous years.

By referring to the chart, it will be noted that the most interesting feature, the rock temperature at the time it is opened, represented by the line extending from Horizon 14 to Horizon 21, varies only slightly from the dotted continuation of the line *A E*, which was determined by recording the rock temperature at those two points. The deviation of the solid line from the dotted, showing a little more than one degree over that anticipated, is not a serious increase, and is possibly due to discrepancies in the rock temperature readings at *A* and *E*, arising from local mining conditions at the time the readings were taken; and the irregularities that occur in the other lines representing both rock and air temperatures are probably to be accounted for in the same way. It will be noted, however, that gradual cooling of both rock and air is going on. Nevertheless, in the absence of a cooling plant, it is slow, as will be seen at Horizon 21, where the temperature of the rock in November was 115.7°, and now, six months later, is standing at 114.4°. The highest air temperature so far reported at this horizon has been 109° F., dry bulb. The exceptional heat encountered in the exploratory driving in the lower sections of the mine naturally impairs efficiency; and if miners can get positions at manganese and other mines that are practically on surface they naturally prefer them.

It is uncertain when the cooling plant will be received. In the meantime, the only available means of improving the atmospheric conditions in which the miners have to work is by increasing the volume of circulating air. On Jan. 5 it was possible to remove the 150-hp. motors driving the Sirocco fans, and substitute 200-hp. motors. This brought the speed of the fan up to 415 r.p.m.; and in the fan drift the volume of air circulating was raised to 72,800 cu.ft. per minute —a much higher reading than has hitherto been taken. A distinct benefit has since been noticeable underground. The next addition to air volume will be effected by fans in tandem, driven from the top of the No. 17 winze by one of the 150-hp. motors removed from the Sirocco fans.

The only work which it has been possible to do recently in connection with the cooling plant has been that appertaining to the large building which will be necessary to house the ventilating apparatus. The original designs were discarded, as they called for materials that cannot now be obtained, because of the war. Others were substituted, the cost of which has risen enormously. Steel pipes purchased in Brazil have been tried and discarded. An aroeira[1] structure has also been thoroughly considered, and may possibly be finally adopted; but there is a great deal of iron work in the design, as the aroeira at our disposal is not of great lengths or girth, and consequently a large amount of building up to obtain the sizes is unavoidable. Columns of concrete reinforced by old steel rails with timber craneways appear to be the most suitable, despite the fact that cement is now selling at the enormous price of £2 ($10) a barrel. About six miles of old rails will be required for the reinforcing, but fortunately these were purchased locally second hand, and at below pre-war prices.

The plant has increased considerably as regards the general outline arrangement at first contemplated; and the estimates of cost have risen correspondingly. The building alone is a large undertaking, under existing circumstances. Originally the intention was to build it at the top of the shafts, but in view of the inevitable delay, owing to transportation difficulties (the plant is now estimated to weigh about 500 tons), it was finally decided to place the structure at the quarry at the adit level; and though this change compelled the driving of a level 800 ft. to the "D" shaft, the economy in time and cost of erection will more than compensate



TEMPERATURE CHART OF NOTED BRAZILIAN GOLD MINE or this, as the tramway system from the central railvay and the shops runs to the site.

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[1] Aroeira is the name of a Brazilian shrub or tree

It will be realized that a month saved in the starting up of this plant will be a matter of great importance f it be possible to reduce to a more reasonable degree he excessive temperature to which the miners in the ower sections are subjected. The study of the chart vill enable any one to realize at a glance that the day nust come when operations in the mine must cease if he workings cannot be artificially cooled.

Safety Precautions and Results*

Under present conditions, and largely on account of he shortage, inefficiency and migratory character of a roportion of available labor, the prosecution of mine afety work sometimes leads to discouragement. The ontinuance of the campaign is urgently needed in order:

1. To conserve human life.

2. To conserve man-power. Every accident in which miner is injured incapacitates him for a certain length f time, possibly permanently. At this time, when men re needed on the fighting front and in the essential ndustries, it is the patriotic duty of all to make an ffort to conserve man-power.

3. To reduce costs. The reduction of injuries to niners must eventually result in a reduction of insurnce rates; but it is only by a concerted and sustained ffort that this condition can be brought about. It is vell known that whenever a miner is killed or injured, he particular work on which he is engaged is more or ess demoralized. Frequently much repair work is necesary at the scene of the accident. There is seldom an ccident that is not the cause of financial loss to the perator.

Without duplicating what has been written in former afety bulletins, it is desired to direct special attention o the chief causes of accidents in and around mines.

1. Fall of ground. This is the most common cause of nine accidents, and the resulting injuries are usually f a serious nature. The injured man is, in most cases, emoved from the ranks of the physically fit, and much uffering is brought to his relatives or dependents. Also, ccidents of this kind are costly to the operator. A serious or fatal injury from falling ground usually auses a cessation of work in the place where it occurs. Frequently, accidents of this type demoralize work hroughout the whole mine. The prevention of accidents rom falls of ground is largely in the hands of the nderground bosses. They should be repeatedly cautioned to exercise vigilance, and frequently to warn miners of the necessity of picking down loose rock. The eduction of accidents of this kind will go a long way oward cutting down the total of accidents from all auses.

2. Handling explosives. The careless handling of xplosives is the cause of many injuries to miners, and great loss to the operator. For the prevention of ccidents of this kind, careful attention should be lirected to the proper making of primers, in order to revent misfires. Great care should be used in the hanlling of misfired holes. The danger from misfires is well understood, but it is probable that their cost to the operator is sometimes overlooked. The improper breaking of a round of holes in a drift, crosscut or stope means less rock or ore, possibly a day's work to do over again, and more powder to be used.

3. Falling down open places. Many miners are killed and injured from falls down unprotected raises, chutes and bins. A certain company in Michigan, in studying its accident record, found that a great number of men were being injured from falls. A campaign was at once begun to guard all open places, with the result that the following six months showed a reduction of more than 50% in accidents of this class. It is a simple matter to guard open places, and bosses should be instructed to give close attention to this phase of safety work.

4. Unguarded machinery. The dangers from unguarded machinery are well understood, and certain regulations are prescribed in the mine safety rules. The proper guarding of machinery is largely a matter of common sense. Where a belt or pulley is exposed, it is not difficult to devise a suitable guard for it. Precautions of this kind are imperatively necessary.

Recording Experimental Flotation Tests

By Arthur F. Taggart*

There has been much loose talking and writing concerning the "mystery of flotation," particularly with regard to so-called "laboratory tricks." This phrase has been used to connote a laboratory flotation experiment incapable of repetition in the mill, or even in the laboratory by any experimenter other than the particular one who reported the original work. Such talk is, of course, utter nonsense. Any man with a scientific or technical education knows that the phenomena of flotation function according to definite, fixed physical laws; and that, if the conditions of any given experiment are repeated, the result previously obtained will be duplicated. The following form was devised to guide investigators in the Hammond laboratory in the performance and recording of flotation test work:

ORIGINAL RECORD OF FLOTATION TEST

Test No. . . . .

Feed:
Origin . . . .
Method of treatment from time of cutting sample until used for test . . . . .
. . . .
. . . .
Approximate mineral composition . . . .
. . . .
Total weight of charge, solids . . . . gm.
Assay analysis:

Number	% Cu	% Zn	% Fe	% Insol
. . . .	. . . . .	. . . . .	. . . . .	. . .

Reagents, Oils:

Name	Laboratory Number	Per Cent.	Sp.gr.	C.c.	Lb. Per Cent
. . . .	. . . .	. . . . .	. . . .	. . . . .	. . .
. . . .	. . . .	. . . . .	. . . .	. . . . . .	. . . .
Totals		. . . .	. . . .	. . . . .	
Other reagents	.	. . .	. . . . .	. . . . . .	.

State order of adding . . . .
. . . .

Water:
Source . . . .
Litmus reaction . . . .

Machine:
Type used . . . .

Record of manipulation:
Pre-agitation period
Duration . . . . min
Speed . . . . r.p.m.
Quantity of water added . . . . c.c.
Per cent. solids . . . .

---

*Excerpted from bulletin No. 13, by Edwin Higgins, issued by he California Metal Producers' Association.

*Sheffield Scientific School, Yale University, New Haven, Conn.

Cleaning—concentrate period (underline which one):
Duration.................min.
Speed.................r.p.m.
Quantity of water added.................c.e.
Weight of concentrate, wet.................gm.
Weight of tailing, wet.................gm.
Weight of untreated material (wet)........gm. (Added to cleaner tailing.)
Froth (underline proper descriptive term):
Texture: Even, uneven, coarse, fine

Bubbles:
Size at water line.................in.
Size at lip line.................in.
Character: Elastic, effervescent
Quality: Viscous, tender
Mineralization: Heavy, medium, light; gangue, sulphide

Persistence of froth in collection pan:
Thickness of froth layer.........in. After.................min.
Thickness of froth in machine.................min. after
Frothing starts.......in. (Measure thickness from lip to water line.)
Microscopic examination.................

Litmus reaction.................
Pulp:
Litmus reaction.................
Degree of flocculation.................
Rate of settling in spitzkasten.................in. per min.
Per cent. solids.................
Note anything remarkable not specified above.................

Cleaning—Middling period (underline which one)
Duration.................min.
Speed.................r.p.m.
Quantity of water added.................c.c,
Weight of concentrate, wet.................gm.
Weight of tailing, wet.................gm.

Froth (underline proper descriptive term):
Texture: Even, uneven, coarse, fine

Bubbles:
Size at water line.................in.
Size at top of froth.................in.
Character: Effervescent, elastic
Quality: Viscous, tender
Mineralization: Heavy, medium, light; gangue, sulphide

Persistence of froth in collection pan:
Thickness of froth layer after.................min.................in.
Thickness of froth in machine.................min. after frothing starts
.................in. (Measure distance from lip to water line.)
Microscopic examination:.................

Litmus reaction.................
Pulp:
Litmus reaction.................
Degree of flocculation.................
Rate of settling in spitzkasten.................in. per min.
Per cent solids.................

Temperatures:
At beginning.................Degrees C.
At end of pre-agitation period.................Degrees C.
At end of rougher period.................Degrees C.
At end of cleaner period.................Degrees C.

Metallurgical results:

	Weight of Product, Gm.	% Cu	% Zn	% Fe	% Insol.
Heading					
Tailing					
Concentrate					
Cleaner tailing					
Ratio of concentration					
Per cent. indicated extraction					
Pounds oil per ton					
Pounds per ton					
Remarks					

Date................. Calculations by.................
Operator................. Checked by.................

Experience with several thousand tests has shown that the record furnishes sufficient data for the repetition of any test, with a certainty that the results of that test can be duplicated. I have, further, taken tests so recorded as guides for mill runs and found that proportional quantities under mill conditions gave results which duplicated laboratory indications. This fact seems almost too obvious to dignify by definite statement, but is related here in the hope that it may impress the directors of the many commercial flotation laboratories in the country with the importance of adopting a similar form of record, to the end that their data may be available for their own (and eventually for others') intelligent use, when the memory of the operator is no longer available to supplement the meager record usually made.

Mine Smithy Reverberatory Furnace *

By R. Craib

Owing to scarcity and abnormal cost of materials, considerable attention is being paid to the reverberatory furnace as an adjunct to the smithy, by which means forgings, stems, shoes, dies and similar parts are made from scrap. Most mines have scrap heaps which in pre-war days were looked upon as worthless, but today they have become a valuable asset.

A furnace was installed at the Simmer & Jack Proprietary Mines about four months ago, and its initial operation was accompanied with the usual failures incidental to most new undertakings. An improvement was effected, however, by the addition of forced draft below the fire grate, which is produced by a jet of steam that injects air into a closed ash pit, and that can be regulated to suit any temperature required. The running cost of this furnace is $14 per shift of eight hours, which includes supervision, white and native labor, coal and steam. The following is an account of some of the work which has been accomplished, and which would never have been attempted on the forge, on account of the prohibitive cost:

BATTERY SHOES

Battery shoes which have had the shanks broken off are heated in the furnace, usually five at a time, and by means of hammer and die are reshanked. Sixteen shoes can be reshanked in this way during the shift, and 152 have been treated in this manner. It is also interesting to know that not one of the shoes so treated has since broken. A novel method in making complete shoes from two old cam bosses and one broken tappet is as follows: The tappet is cut in halves, which provides center plugs for the cam bosses. Each set is then welded, drawn down, and shanked, forming two complete shoes 9 x 10½ in. long. The time in making shoes in this way is 3½ hours each.

BATTERY DIES

Battery dies are made from five old ones by placing one above the other, welding into a solid mass, and forming under the hammer. One complete die can be turned out per hour by this method. Another method of making dies is by cutting a broken tappet in halves and filling the center holes with worn-out shoes; this forms the material for making two dies. It is found that the life of these dies compares favorably with that of the imported article.

BATTERY STEMS

Battery stems are made by fagoting small pieces of iron—the largest piece being not more than 14 lb. weight—and drawing down to the required diameter. Owing to the hammer serving this furnace being too small, it is impossible to fagot a bloom sufficiently large to form one complete stem; therefore it is necessary to weld short pieces together. One complete stem was made by using the previous bloom as the foundation for the next, and in this manner an unwelded stem was produced at a cost of $35.50. This stem is now working, and apparently it is fully as good as anything ever imported.

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*Excerpt from the *Journal* of the Chem., Met. and Min. Soc. of South Africa.

Bushes for battery heads are economically made by means of the furnace, as a great number can be heated at one time. Not only has the furnace been of value to the mill, but it has actually become a necessity to other departments, and all smaller forgings required at the Simmer & Jack properties in future will be made from fagoted iron produced on the property. One complete set of loading box forgings was made from this iron a few weeks ago, which previously had always been made from mild steel, or "Lowmoor" iron, on account of the number of square holes which had to be punched in them. The fagoted iron stood the test of forging splendidly.

Two tons of scrap iron was made into chair plates for 60-lb. rails. This, by the usual method, would have been impracticable on account of cost. The furnace has also been of service in the annealing of skip connections, such as draw-bars, shackles, pins and like accessories, giving the article an even temperature, which cannot be procured by means of the forge.

Boilermakers also welcome the furnace for flanging, dishing and working of plates. A smart piece of work was performed the other day in the dishing of a ⅜-in. plate to form the rose of an 8-in. foot valve. The job was completed in five hours, though in the ordinary way it would have taken three days. Sixty pieces of 1-16-in. plate, 14 in. in diameter, were flanged to a depth of 1 in. by means of furnace, die and hammer in five hours.

The fagoting of wire ropes has not been as successful as was anticipated. on account of slight flaws in the apparently solid bloom, and this also applies to the fagoting of broken jumper steel. A few of the Jackhamer pistons which have been made from these blooms, however, show that in all other respects this would be splendid steel for the purpose. Probably when production in quantity is required. a remedy will be found to overcome this difficulty.

Substitute for Corrugated Iron *

Efforts to practice economy in the use of steel and iron have resulted in the production of a satisfactory substitute for corrugated iron and sheets. It is an asbestos-cement roofing material. During the last year a large plant has been built in England for manufacturing this product. The method of making it is as follows: After being finely ground and freed from extraneous matter, the asbestos, which acts as the reinforcing agent, is mixed with portland cement in the proportion of about 1 to 6, and made into a paste with water. This paste is then taken to a machine of the paper-making type, where, on a large revolving drum, it is formed into sheets or felts. After the sheets have been trimmed to size, the corrugations are impressed on them. The important condition for this operation is to insure that the tops of the corrugations are as strong as the other parts of the sheets. Finally, the sheets are subjected to a "seasoning" process. The corrugations are made to the 3-in. pitch which is usual with corrugated iron sheeting, not to the 2½-in. foreign pitch, and they can therefore readily be used to repair roofs of corrugated iron. One of the chief advantages claimed for the material is its durability and resistance to climatic conditions, especially to an acid-laden atmosphere, which rapidly destroys corrugated iron. The sheets are also fireproof and are poor conductors of heat.

Jus' Minin'

By D. E. Charlton

Now, pardner, it 'ardly seems fittin',
  W'en tha 'ole bloody worl's upside down,
For me an' you 'ere to be sittin'
  An' cursin' at each bloody roun'.
Coorse now I ain't sayin' nothin'
  Bout 'ow cost of things 'as gone 'igh,
For, damme, m'son, there's no bluffin',
  As to wot a man's pay check will buy.
W'en they talk of the 'igh cost of livin',
  We'll h'agree that tha h'argument's true,
But tha wages is 'igher they're givin'
  So tha h'old's just tha same as tha new.

My feyther, in ol' days in Cornwall,
  'E'd perch me on top of 'is knee
And tell that a gert bloody mud ball
  Never gathers no moss if it be
That its pitchin' and rollin' and tumblin'.
  So tha same 'olds as true for us both;
If we start h'out a-grumblin' and stumblin',
  To once settle down we'll be loath.

I naws that they're payin' gert wages
  In tha shipyards and places like they,
But, damme, tha right sort of stages
  Is 'ere; and it's 'ere that we stay.

'Tis minin', m'son, that we're doin',
  So why should thee bother your 'ead,
W'en we naws that tha shif' boss is stewin'
  For 'twas only today that 'e said:
"Boys," says 'e, as we piled on tha cages,
  "We mus' cut out tha 'five' on tha shif',
"For thee naws that tha conflic' that rages
  "Will not cease 'til they've driven a drif'
"Clean through, an' they've mucked up tha Kaiser
  "An' the rest of 'is 'ideous crew.
"I'm dependin' that thee'll answer 'Aye, sir,'
  "W'en tha fussin' and fightin' is through.
"For each bloody one 'as a duty
  "Jus' tha same as a fightin' man now,
"An' copper these days is some beauty
  "For it's 'ammerin' Fritz in tha row."

So 'and me that there bloody drill bit,
  An' turn on tha h'air good an' strong,
An' we'll sen' all tha 'uns to tha 'ell-pit
  If it's copper they wants. Gos' along.

Natural Grecian Cement

The volcanic island of Santorini, in the Ægean Sea, produces a natural cement called Portselana, which, mixed in certain proportions with lime and sand, is an excellent substitute for the best cement, states a consular report. Portselana has been used for many centuries and is still being utilized throughout the Near East in the construction of bridges, harbor works, breakwaters, forts, lighthouses, and similar structures, in the Mediterranean, the Black Sea, and the Adriatic. With it the Venetians constructed the great fort of Monemvasia and Nauplia, the then Gibraltar of the eastern Mediterranean, the foundations of which are in the sea, intact and immovable now after many centuries. The forts of Crete and those of the Dardanelles are also built with Portselana.

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*Abstracted from the *South African Mining and Engineering Record*.

Correspondence and Discussion

Labor Trouble in Reduction Works

In the Oct. 12 issue of the *Journal* there appeared an article, by Paul T. Bruhl, which had for its purpose the improvement of the morale of an essential group of workers in the metal-mining industry—the milling crew. As an attempt to raise the efficiency of operations by increasing the *camaraderie* that may in isolated instances exist, or to bring such a spirit into being in the majority of cases, the paper was welcome; and it will doubtless give rise to expressions of opinion from some who may view the question from another standpoint, as well as from those who may be in agreement with the sentiments advanced.

The contributor expresses the opinion that an apparent lack of enthusiasm among the reduction-works staff may be remedied to some extent by making things easier for the millmen—by improving the conditions of those who receive orders from the shift bosses. Metallurgical nomenclature is in a state of uncertainty at all times, and is governed by no generally accepted law. The use of the term "millman" is arbitrary, and, in this instance, apparently refers to those who may enter as unskilled helpers, and may become, under the direction of the shift bosses, competent workmen.

With inexplicable solicitude this body of helpers is singled out for special consideration. No objection will be made to the contention that their pay, if only a living wage, must be increased; but it is doubtful that there will be unanimous agreement with the sentiment that waning enthusiasm, arising from conditions which must often be patiently borne by many other classes of educated and trained men in positions of responsibility, must be stimulated with bonuses. Such a suggestion presents points of similarity to the practice of prescribing habit-forming drugs, where dosage is subsequently increased (at the sole desire of the patient) to an almost unbelievable point, and the net result is usually nil or even negative.

Millmen, it is averred, have no stake in the welfare of the concern. In the majority of instances neither have their bosses, nor their bosses' bosses, for that matter; and no particular reason is evident why they should be singled out for special consideration. The shift bosses above them, the roustabouts below them, are equally worthy of attention; and any scheme of profit-sharing should be mutual and comprehensive, and should include all the employees—those working in the humblest capacity as well as those who are carrying out their duties in executive positions under binding legal agreements.

Reference is made to the constant shifting from job to job on the part of the millman; but this fact must indicate irresponsibility as well as individual independence, even if discontent is justified. What other class of men in a mill are able to flit from camp to camp, earning sufficient at intervals to live during the periods of leisure that intervene—who are carefree enough to let the morrow take care of itself? What other reduction-plant worker can be certain to find employment with equal facility? Among the superintendent class, such improvidence would be impossible, or, if indulged in, would lead to financial ruin and professional suicide. Even foremen are usually too dependent on their wages to risk unemployment, and seldom leave their positions unless for sound reasons.

The question is open for discussion, but it is doubtful if any permanent good can result from the practice of subsidizing a favored section of workers whose preparatory training, in order to obtain what is generally conceded is a satisfactory and adequate wage, is usually negligible, and whose personal effort and expenditure in this connection are seldom conspicuous.

In those instances where extra payments on account of improved results are justified, it is certainly reasonable to insist that prizes given shall extend to all concerned. Too often has the absurdity occurred, in mill work, of unskilled men receiving bonuses for higher output or better returns which have arisen almost entirely as a result of the untiring efforts and self-acquired mental and technical efficiency of the mill superintendent or his immediate subordinates, who, being salaried officials, may, according to the rule with many companies, receive no share. Under such conditions the trained man in the responsible position has everything to lose and nothing to gain. The unskilled worker's position is the reverse.

As a class, technically trained and experienced plant superintendents and their assistants are equally deserving of better treatment and of remuneration more in keeping with their responsibilities. A considerable advance in the average emoluments will be necessary to place the mill superintendent in a position as comparatively independent of worry and anxiety over financial matters and the uncertainties of the future as is the millman of today at his present rate of wages.

Morale can be improved by a radical increase in the loyalty of employees toward their bosses, as well as by improving the working and living conditions of all classes. Additional and frequent grants of money and bonuses to those who care nothing for the risk of immediate dismissal and who can growl with impunity because they are free of responsibilities, will act only as a temporary soporific which must inevitably lead to ultimate if not immediate dissatisfaction. If the element of personal loyalty is not present among all grades of the mill crew, it is absurd to talk about *esprit de corps*, for the men do not realize the meaning of that or any equivalent phrase.

An example of the amazing offers made to technical men looking for positions of responsibility in milling plants is given in the current Bulletin of the A. I. M. E. A mill superintendent is required for an African development company. He must be experienced in modern metallurgical practice, presumably of copper, and a capable manager of native and other labor.

The aspiring applicant is expected to find the money and take all the risks of a voyage to Africa and a long railway journey to the mine, as there are no deposits near the coast. Delays in times like the present are inevitable, but the company will lose nothing by this, as it is stipulated that salary will begin on the day of arrival. If the applicant is a married man, he will receive about $600 when he gets to Africa, to go toward a reëstablishment of his finances, this sum being provided to compensate for all expenses incurred. He will be allotted an unfurnished room or house at the mine at which he and his family can camp, and where such elementary comforts as free light, water, and sanitary service will be provided. His salary will be about $300 a month, and the company will make a six-months' contract with him, at the termination of which he can or must return to his home at his own expense.

The absurdity of the whole proposition makes the appeal laughable, but it affords an insight into the attitude of too many mining companies toward men of technical training and experience that they are anxious to obtain, whom they would entrust with positions of the highest responsibility, and from whom they expect loyal support and unceasing effort.

It is to be hoped that, when fairness is being dealt out to the milling crew, the superintendent and his associates will not be forgotten. "TECHNICIAN."

New York, Oct. 20, 1918.

Enticing Labor Away From Work

The papers this morning contain display advertisements inserted by the U. S. Employment Service, of free excursions, free transportation and free meals. On the front of the Government Employment office there is a big placard reading "Free Excursion to Nitro Today."

In other words, in the effort to recruit labor for the shipyards and munition plants, the Employment Service is playing on the love of excitement and adventure of the people; and by so doing encouraging the tendency to wander from job to job, which is destroying the efficiency of workers throughout the country. This in a state where a large proportion of the mines are threatened with the necessity of closing down, on account of the shortage and inefficiency of labor.

It may be that labor is needed even more urgently for the nitro plants than for the mines, and it is conceivable that it might become necessary to close down some of the latter. But it is inconceivable that either munition plants or mineral production will be benefited by a policy which encourages men to drift from West to East and back again, or from one mine to the next, spending two-thirds of their time in "free excursions."

It is not so much a question or hours, wages, or conditions of work, as the desire for novelty, that induces the laborer to change from one place to another. He is being educated, by this mistaken policy, to drift from job to job, at the expense of the Government or of private employers. I know of no greater danger confronting this country today. Our armies can beat the Huns, but this condition threatens to beat America.

Denver, Colo., Oct. 10, 1918. X.

The Iron Ore of Brazil

The summary of E. C. Harder's remarks on the Brazilian iron-ore situation published in the *Journal* of June 1, 1918, contains some statements and inferences not justified by the facts. First and most important of all, the iron-ore district mentioned by Mr. Harder refers only to that field at present the most accessible. Its ore content aggregates about 3½ billion tons, and the deposits extend along the Central R.R. around Congonhas, Burnier, Bello Horizonte, Ouro Preto, Caraça, Sabara and Santa Barbara. These cities are all served by the Central R.R., whose traffic capacity is estimated at about 2,000,000 tons annually. Manganese ores are being transported from this same district by this railway at the rate of 55,000 to 60,000 tons *monthly*, and such traffic could be doubled, as night trains are run, as yet, on only one section.

The deposits bought by foreign concerns are situated around Itabira do Matto Dentro, 80 miles from Ouro Preto, the center of the deposit referred to, and an authority in this matter has said that they will furnish ores for 50 times 50 hundred years. But the Victoria à Minas Ry. is a narrow-gage, single-track, badly constructed road, totally unable to take such traffic at normal rates, or even the transportation of cereals, metal pigs and hardwood logs. Its last station is now 100 miles from Itabira. Neither could Victoria harbor accommodate the necessary fleet for the transportation of ores.

The future double-track broad-gage electrically operated railway will go to Santa Cruz harbor, near the mouth of the Rio Doce. The state government, it is said, desirous of developing commercial activity at the capital, Victoria, asked the Federal government for the concession of Santa Cruz harbor, to facilitate the exportation of iron ores, as no plans had been made by the Federal officials for developing that fairway.

So things stand. Everything points to the fact that, in order to build the railroad and the harbor, a large expenditure of money will be required, moderate estimates of which run to $60,000,000. Of course this same railway, by means of branch roads extending 40 to 80 miles on either side, will tap other and equally important iron-ore fields. The Federal government recently signed a decree providing for the construction of branch railways to the mines, and for the issue of a loan at 5% for 12 years, provided adequate samples of the ore are submitted to the government and the project is approved as warranting the expenditure involved. The extensive coal fields in southern Brazil are now being explored with the support of the Federal government, and it is probable that coke will be available.

As to the mineral resources of Brazil, they are incalculable. This will be readily comprehended if it be considered that Brazil equals continental United States in area, though practically unsurveyed. The great authority on Brazilian mineral resources is Baron Eschwege, who went through the country in 1812! The ascertainable facts lead to the conclusion that, as regards iron ores, three districts at least are of equal value and importance to the field—in Itabira do Matto Dentro—in western Minas Geraes, Goyaz and Matto Grosso.

E. JACY MONTEIRO.

Riacho das Vares, Minas Geraes, Brazil, Aug. 14, 1918.

A Suggestion to Mining Companies

While I was in Denver, I went to hear L. H. Knight, a member of the Foreign Legion of France, deliver an address at the members' council of the Denver Civic and Commercial Association. Knight is no orator, but he is an inspiring and effective speaker after he gets warmed up and forgets himself and lives again through his experiences. I believe that he is most effective in making his hearers realize how much the soldier over there depends upon the worker over here. Mr. Knight is a graduate of Princeton, an ordained minister, but a man who believes in killing Germans as fast as he can, and who is proud that he has killed several. He does not seem to be a fighter, but when he gets started he makes his hearers realize what war is.

Knight says: "Ah, my friends, it is the shoulder of the next man up even with yours that gives you the courage over there when going under fire, but I wonder how many of you really understand how much the fire and vim of the soldier over there are kept up between fights by the knowledge that you over here have got your shoulder also up against his, backing him up with all your power. I wonder if you workers realize as you should how important it is for you over here to work shoulder to shoulder six days of the week to keep us over there fighting shoulder to shoulder."

If the copper and lead operators would get Knight, and a few others like him who have gone through the mill over there, to tour the mining camps and speak to the workers at the mines, I am confident that inside of two months of such campaigning (having about five speakers follow each other up in the course of two weeks, to establish the viewpoint and maintain it long enough so that it sinks home) the number of men who do not work six days a week will be cut 75 per cent.

Cripple Creek, Colo., Oct. 1, 1918. C. T. R.

The Ford Mine Locomotive

My attention has been called by the California Mine-Inspection Service to an article which appears on page 223, of this volume of the *Journal*, describing the Ford mine locomotive. The Mine Inspection Service states that "this kind of thing is causing considerable trouble because it makes mine operators want to install gasoline engines underground." The operators cannot seem to realize how much of an air current is required for this installation.

As you may know, there have been numerous deaths caused by the use of gasoline locomotives and engines underground, on account of the exhaust containing large amounts of carbon monoxide. To use such locomotives safely requires a very strong current of air, and the gravest difficulty appears to be that, when there is such a strong current of air in the main road, owing to mechanical ability of the locomotive to be used in side tunnels and chambers where there may be little or no movement of air, it happens at certain times that locomotives are misused, endangering the life of the locomotive engineer and the men who may be working in such places.

In many of the progressive states the use of gasoline locomotives has been forbidden in coal mines by the state inspection departments. The minimum quantities of ventilating currents which will dilute the haust gases of engines of this kind are given in Bull. entitled, "Gasoline Mine Locomotives in Relation Safety and Health."

I am bringing this to your attention, as I kn you feel the *Journal* has certain responsibilities to t mining public. GEO. S. RICE,

Chief Mining Engineer, U. S. Bureau of Mines.

Washington, D. C., Sept. 24, 1918.

[We agree with all that Mr. Rice has said in t above communication. In Bull. 75 of the U. S. Bure of Mines, "Rules and Regulations for Metal Mine the greatest caution in the use of gasoline undergrou is advised, and the employment of gasoline locomoti is deprecated. However, gasoline locomotives may used safely and advantageously on the surface of min The article that inspired Mr. Rice's comment did sufficiently distinguish between these uses.—EDITOR.]

Suggestions to the Editor

I wish you would put just a few funny pictures the *Journal* and a few more real good stories so as sort of camouflage (I think that is the proper wor some of the real good advice that you are offering the boys.

When I come into the reading room of an evenin *Life*, *Judge*, *Saturday Evening Post*, and the rest them are all being read, while the *Journal* is oft waiting for two or three of us who have found so pretty good things in it.

Just as sure as one of the boys does read it, you c count on hearing him get off something sensible ne day, either quoting you, or giving it as an origin idea.

When the boys see *Engineering and Mining Journ* they just naturally think: "There's that high-br paper" and are sort of ashamed to be seen reading it.

You offer us some mighty good pills occasionally, b lots of us miss them altogether. Now if you would on sugar-coat them with more of those Cousin Jack stori and a few cartoons, and Berton Braley's live-wire poem the pills would be swallowed by the very boys who ne them and the *Journal* would be doing more of the go that it is intended for.

Please tell the boys in your next why they shou be saving more of the high wages they are getting t day rather than spending it like drunken sailors, a oblige, A MINER.

Tonopah, Nev., Oct. 15, 1918.

Assay Practice Economies

In addition to the assay economies given on pa 584 of the *Journal* for Sept. 28, I would direct atte tion to the practice of H. L. Glenn, of the Seattle offi of the mint service, who saves up his parting ac during the busy season, and, when work is slack, ve carefully precipitates the silver with hydrochloric ac being absolutely sure that a slight excess of silver r mains in the acid. The gravity of the acid is th adjusted and the chloride of silver allowed to settl when the acid is ready for use again.

FREDERIC P. DEWEY,

Assayer, Bureau of the Mint.

Washington, D. C., Oct. 8, 1918.

Events and Economics of the War

The rapid retirement of the German right wing in elgium followed closely upon the capture of Roulers, ported last week, and the Belgian coast was quickly eared of the enemy. The German retreat progresses, ith the Allies approaching Ghent. Lille, in France, and ouai were evacuated, the foe's lines holding further uth. Grand Pré, north of Argonne Forest, was taken American troops.

Stories of turmoil continue to come out of Austria-ungary. The Magyar kingdom is said to have proaimed itself independent and the Czechs to have seized rague, the capital of Bohemia. Vienna's bid for peace as received at Washington and answered, this Governent declining to enter into negotiations. Berlin's third te to the President, seeking an armistice, arrived on ct. 21. Germany is reported to have ceded 21,000 tons ships to Spain, to compensate for U-boat sinkings. the Balkans, the reoccupation by the Serbs of their ative land continues; the French have reached the anube, 60 miles from the border of Hungary; Durazzo, ecently bombarded by the Allied fleets, was captured the Italians.

In the United States, all efforts were concentrated uring the week on the final drive for the Fourth Librty Loan, which is said to have been oversubscribed, hough the total has not yet been determined. The ar and excess-profits section of the War Revenue Bill as re-written by the Senate Finance Committee. ecretary Daniels asked $600,000,000 for new warships. he ban on the use of gasoline on Sundays in the East as removed by the Fuel Administration.

Lens Region Much Damaged

With our knowledge of German methods, it was to be xpected that nothing would have been left undone to ender the coal region about Lens of as little value as ossible to the Allies, when the recapture of what was ne of France's main sources of coal supply was seen to e inevitable. From Paris word now comes that it will e from eighteen months to two years before any coal an be taken from the mines in the devastated area, wing to the damage done by the enemy before his etirement. After an examination of the properties, has been estimated that five years will be required restore the normal production of the pits.

The inspection was made, according to the dispatch, y Albert Lebrun, the Minister of Blockade, and Louis oucheur, the Minister of Munitions, together with M. erier and M. Basly, chairman and vice-chairman, repectively, of the Committee on Mines of the Chamber f Deputies. They visited Lens itself and the adjoinng mining towns of Sallaumines and Lievin. They ound the mines flooded in these localities, and although very posible measure to restore the operating plants as been taken by the state, it will be two years, it is stimated, before the mines can be cleared of water. The mining plants have been systematically destroyed, the destructive process having been carried to the limit.

At Courrières, northeast of Lens, the Germans had blown up the mines before retiring. Of the 10,000 houses in Lens the visitors found not one left standing, the town having been completely razed.

Steel Situation Improved

Improvement in the steel situation is shown by a survey just completed for J. Leonard Replogle, director of steel supply of the War Industries Board, but in disclosing this condition on Oct. 16, officials of the board said production was still far behind war demands and the outlook for supplies for non-war industries for the remainder of the war was not bright.

Pig iron is now being produced in the United States at the rate of more than 42,000,000 tons a year, and steel plates at the rate of nearly 6,000,000 tons, both records in the industry. The plate production is more than 40,000 tons a week greater than ever before. Production of all steel is running at the rate of only approximately 33,000,000 tons a year, however, and the demands of the Government and the Allies are at the rate of about 50,000,000 tons.

Daylight Saving Extension Fails

No further effort will be made by Congress to continue the existing Daylight-Saving Law, and the hands of the clocks will be turned back an hour on Oct. 27, as planned originally. This decision was reached after a conference between Congressional leaders and Chairman Baruch of the War Industries Board, who had recommended that the law remain in force for the period of the war.

The Senate passed a bill recently to continue the law in effect indefinitely, as announced in the last issue, and it is now pending in the House. Senator Calder, of New York, author of the original daylight bill, said after the conference that difficulties of the Railroad Administration and other Governmental agencies in arranging schedules and anticipated difficulties in getting final action on the bill by the House contributed to the decision not to continue the existing regulation. The War Industries Board had urged continuation of the law because of its value in saving fuel.

Reconstruction Plans Made

The creation of a Federal commission on reconstruction is proposed in a bill recently introduced by Senator Overman, chairman of the Judiciary Committee. The bill provides for the appointment of five commissioners by the President, at $10,000 a year, not more than three of whom shall be members of the same political party. This body will choose a chairman from its own membership. It will cease to exist two years after the termination of the war unless Congress otherwise provides.

The duties of the commission will be to examine into the problems and conditions arising out of the war and that may arise during the period of transition from war to peace in the National economic, industrial and social life. It is to recommend to Congress legislation necessary to meet such problems before their solution is actually forced upon the Government. The commission will also be required to investigate and report on any such question referred to it by either house or by the President. It is particularly provided in the bill that it shall investigate and report on the following:

(a) The financing, regulation, control, and development of the merchant marine.

(b) The development, regulation, expansion, and direction of foreign trade.

(c) The reorganization, financing, and readjustment of industries engaged in war work, by way of reconverting them to normal production.

(d) Technical education and industrial research as a means of developing and strengthening of industry.

(e) The redistribution and employment of labor in agricultural and industrial pursuits, and the problems of labor growing out of demobilization.

(f) The supply, distribution, and availability of raw materials and foodstuffs.

(g) The conservation and development of national resources.

(h) Inland transportation by rail and water.

(i) Communication by telephone, telegraph, and wireless.

(j) The reorganization of Government departments, bureaus, commissions, or offices, with a view to putting the Government on an economical and efficient peace basis.

(k) The consolidation of such acts and parts of acts of Congress which relate to the same subject matter, but which now appear at various places in the statutes.

An appropriation of $500,000 is provided for in the bill to carry out its provisions.

A pamphlet entitled "Economic Reconstruction, With Analysis of Main Tendencies in the Principal Belligerent Countries of Europe," has just been issued by the Government, through the Bureau of Foreign and Domestic Commerce. At the outset, this report states that in all belligerent countries there seems to be a unanimous opinion that the war will bring about a great extension in Government control of, or participation in, trade and industry. This is true, it holds, even in circles where such extension is deemed harmful.

More Labor for Gold Mines

SAN FRANCISCO CORRESPONDENCE

Protection of metal and non-metal mines, in respect to high costs of mining, may possibly be better served by the U. S. Bureau of Mines in its efforts toward the conservation of man-power than by all the propaganda literature sent out by the American Gold Conference. The high cost of labor is a large factor in the excessive total cost of gold mining. If this evil can be cured, the others can be more easily overcome.

The position of the Bureau of Mines may preclude its action in the interests of any one branch of the metal-mining industry; but its efforts in behalf of the labor of both the metal and non-metal mines cannot fail to be of benefit to the gold mines. The action taken by Director Manning resulted from a conference of the Bureau officials and those of the American Institute of Mining Engineers and the American Mining Congress, and is based directly on the approval of the formal organization effected by this conference, which is composed of advisory boards which will assist in securing deferred classification of miners and furloughs for miners who have been drafted.

The boards will be guided by the coöperative action
George J. Salmon, chairman of the labor committee
the Bureau, and of J. Edward Spurr, chairman of t
man-power conservation committee. Advisory boar
have been appointed in the several mining states of t
West as well as in the Middle and Southern states.
California and other Pacific Coast states these appoir
ments are as follows: California—Edwin Higgir
chairman, 625 Market St., San Francisco; P. C. Knap
district representative, San Francisco; N. S. Kelse
Jackson; T. E. Graff, Redding. Washington—Conr
Wolfle, chairman, 217 Symons Building, Spokan
W. R. Rust, Tacoma; George S. Bailey, Republic; Geor
Turner, Spokane; W. J. C. Wakeford, Spokar
Arizona—L. D. Ricketts, chairman, Warren; Joseph
Hodgson, Bisbee; B. Britton Gottsberger, Miam
Robert E. Tally, Jerome. Utah—Walter Fitch, chai
man, 304 Boston Building, Salt Lake; John M. Hay
and G. W. Lambourne, Salt Lake. Idaho—Frederi
Burbidge, chairman, Wallace.

Engineers Wanted

The Construction Division of the Army needs
chiefs of survey party; 50 transitmen; 25 levelmen; 1
rodmen; 150 chainmen, and 50 topographic draftsme
These positions are open to men only, except the dra
ing positions, which are open to both men and wome
All of the positions are in the civil, not the militar
service.

Persons interested should apply to the U. S. Ci
Service Commission, Washington, D. C., or to the se
retary of the local board of civil service examiners
Boston, New York, Philadelphia, Atlanta, Cincinna
Chicago, St. Paul, St. Louis, New Orleans, Seattle
San Francisco. The examination will be of the "no
assembled" type; that is, the ratings will be based up
education, training, experience and physical ability
shown by the applications and corroborative evidence.

Graphite Restrictions Modified

Restrictions on the importation of graphite have be
modified by the War Trade Board in the followi
order:

No licenses for the importation of amorphous graphite (plu
bago) shall be issued hereafter, except such shipments as are
Canadian origin and come overland or by lake from Canada, or
Mexican origin and come overland from Mexico.

Licenses may be issued for the importation of graphite of cr
cible grade when the applications therefor are otherwise in ord
and where the chemical section of the War Industries Board h
approved the issuance of said license, and has certified that
ultimate consumers of the said graphite have been using at lea
20% of domestic or Canadian flake graphite in the manufactu
of their products.

British Attack Gold Problem

There is a more optimistic feeling among gold-mini
interests, according to a dispatch from London, owi
to the appointment of a strong Treasury committe
with Lord Inchcape as chairman, to consider the i
creased cost of the production of the metal and to sti
ulate its output. An early report is expected. T
producers are said to be desirous of arranging for t
purchase by the government of their output over
period of years at a price liberal enough to encoura
a maximum production.

The Twenty-Seventh in Action

"The Yanks are dinkum fighters," or "The Yanks are bonza," is the testimony of the Australian "diggers" or "Aussies" as to the way our men give account of themselves. So a London friend informs us. The mining regiment is doing its part in pushing the Hun back where he belongs, if, indeed, there is such a place. A letter has just arrived from Lieut.-Col. O. B. Perry, in which he says:

> Our men have participated in the three offensives with which the Americans have had mostly to do and have gained a lot of experience at the expense of a very few casualties. Just now our first three companies are busily engaged in helping lick the Germans, and we haven't much time to visit around. The boys take a whirl at anything that comes along.

"As to comforts, etc.," adds Colonel Perry, "there are never enough chocolates and cigarettes, and cigars are hopeless."

There's a reason for the Comfort Fund, which, incidentally, is not going to go out of business because of Berlin's latest camouflage about peace. Silently through the Fund a real good has been effected and whether this will continue is up to our friends to decide. Large or small, all contributions help and will be promptly acknowledged in these columns. Send in yours today.

HOW THE COMFORT FUND STANDS

Previously Acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
Total	$18,667.77

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

John Hamilton Troutman*

John Hamilton Troutman, announcement of whose death was recently received, was born on March 3, 1856, at Philadelphia, Penn. When he was fifteen years old his father died, and it became necessary for him to go to work in a country store in the anthracite region. While there, he continued his studies, and, four years later, passed an examination, receiving a teacher's certificate, but he decided to remain in business. About this time, he became associated with John Price Wetherill and August and Richard Heckscher in the management of coal properties, and formed close friendships with these gentlemen that lasted for the rest of their lives.

In 1881, when the Lehigh Zinc Co. was organized, Mr. Troutman entered its employ, and, in the course of time, occupied several positions of responsibility, in which he contributed largely to the success of the organization. He continued with the company until it was taken over by the New Jersey Zinc Co. in 1897. Those who remember the uncomfortable first year of the consolidation will always retain grateful memories of Mr. Troutman's kindliness, helpfulness and absolute fairness. He remained in the New York office only for about a year, and then went to Chicago as the general manager of the Mineral Point Zinc Co. While there, he made many new friends, and, among other things, started the manufacture of leaded oxide from the mixed sulphides of the West. In June, 1900, he left Chicago for Denver to take charge of the Empire Zinc Company.

This position proved to be the greatest opportunity of Mr. Troutman's life, and he met it worthily. No one who has not traveled in the West can begin to appreciate the high esteem in which he was held there by every one with whom he came in contact, business associates, miners, mine operators and competitors. He was, always and everywhere, absolutely fair, and there was hardly a mine operator in the West who did not prefer to do business with Troutman. The reputation which his unfailing courtesy and fairness gained for the company is one of its greatest assets.

Of late, Mr. Troutman had felt the severe strain of his many years of hard and continuous work for the company, and was forced to take a less active part than formerly. He died suddenly at Denver on Oct. 2. In his death, the company has lost one of its oldest, most faithful and most valuable employees. One of his oldest associates says: "J. H. Troutman, single-minded always in his devotion to his employers and his associates, was a man of unusual gifts and of dynamic working ability. It was a common saying of ours that his pencil was always sharpened for the most thoroughgoing investigation of any proposition brought to his attention, and that he never failed to state his well-grounded conclusions." But more than the energy, ability and conscientious performance of every duty was the fine character of the man, his kindliness, fairness and consideration for every one with whom he came in contact. Mr. Troutman's death leaves a gap that can never be entirely filled.

Coast Artillery Officers Needed

The Coast Artillery School at Fort Monroe, Va., has announced that officers are needed for the U. S. Heavy (Coast) Artillery. To encourage the application of educated men who would be fitted to obtain commissions after proper training, a scheme of instruction has been worked out.

In each of the five geographical districts, into which the activities of the service are subdivided, men inducted will be grouped in a fort of that district and there given a six-weeks' course in the school of the soldier and in mathematics preparatory to taking the examination for admission to the Coast Artillery School, there to be trained for commissions. However, the entrance examination may be taken immediately, if so desired, without the preliminary training; or an inducted man may take a two-weeks' preparatory course in military instruction and mathematical review instead of one of six weeks.

Liberty Loan Quota Exceeded

The subscriptions for the Fourth Liberty Loan placed through the Special Mining Committee, of the New York district, amounted to $58,926,350, so that its quota of $40,000,000 was exceeded by nearly $19,000,000. This is a fine record and, as has already been pointed out, does not reflect what the entire mining industry has done to help the loan, as it includes only the New York district, and even here, no doubt, there are individuals and companies who have placed substantial subscriptions outside of this committee.

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*By George C. Stone.

Following are some of the larger subscriptions received through the Special Committee from October 16 to 19, inclusive:

Chile Copper Co. and subsidiaries	$2,300,000
William A. Clark, for United Verde Copper Co., personal and allied interests	1,850,000
Aluminum Company of America	1,825,000
New Jersey Zinc Co., subsidiaries and employees (additional)	1,393,850
Anaconda Copper Mining Co. (additional)	1,500,000
A. Lewisohn & Sons (additional)	1,030,000
American Smelting and Refining Co. (additional)	1,000,000
W. B. Thompson	1,000,000
American Metal Co. (additional)	1,000,000
Inspiration Consolidated Copper Co. (additional)	1,000,000
J. R. De Lamar (additional)	1,000,000
International Nickel Co. (additional)	750,000
Cerro de Pasco Copper Co. (additional)	500,000
Mohawk Mining Co. (additional)	330,000
Granby Consolidated Mining, Smelting and Power Co.	300,000
Beer, Sondheimer & Co.	250,000
August Heckscher (additional)	250,000
U. S. Smelting, Refining and Mining Co. and subsidiaries (additional)	250,000
Wolverine Copper Mining Co. (additional)	200,000
Homestake Mining Co. (additional)	200,000
Florence Iron Co. (additional)	140,000
Michigan Limestone and Chemical Co.	120,000
Quincy Mining Co.	115,000
Employees, Braden Copper Co.	111,000
D. M. Hyman	100,000
W. D. Thornton	100,000
E. P. Earle (additional)	100,000
Nipissing Mines Co. (additional)	100,000
N. Y. & Honduras Rosario Mining Co. (additional)	100,000
Nichols Copper Co.	100,000
Seneca Mining Corporation	100,000

Foreign Trade in Lead and Zinc

Lead and zinc imports in August, 1918, and the corresponding month of 1917 are reported by the Department of Commerce as follows, in pounds:

	August, 1917	August, 1918
Lead ore, contents	748,462	2,802,856
Bullion and base bullion, contents	13,551,993	12,397,866
Imported from:		
Canada	....	2,678,977
Mexico	13,795,391	12,398,506
Chile	....	112,385
Other countries	505,064	10,854
Lead pigs, bars and old	1,262,264	....
Zinc ore and calamine, contents	12,016,102	3,412,338
Imported from:		
Italy	2,000,000	....
Canada	1,672,827	1,247,740
Mexico	8,343,275	2,164,598
Zinc blocks or pigs and old	33,990	....
Zinc dust	135,714	....

Following are exports of lead and zinc for the same periods of time, also reported by the Department of Commerce, in pounds:

	August, 1917	August, 1918
Lead:		
Pigs, bars, etc., produced from domestic ore	3,810,021	15,194,602
Pigs, bars, etc., produced from foreign ore	178,301	3,141,888
Zinc:		
Pigs, etc., produced from domestic ore	18,322,974	5,565,452
Pigs, etc., produced from foreign ore	1,515,071	2,748,357
Sheets, etc.	4,242,651	2,545,289

Heading Off Spanish Influenza

The rapid spread of Spanish influenza and the number of fatalities resulting has caused concern to most of the mining companies in the West, who are already short of labor. The Climax Molybdenum Co., operating a molybdenum property about 14 miles from Leadville, Colo., realized that, sooner or later, the epidemic was bound to strike the camp, so preparations were made to mitigate the evil as much as possible. The company has a small but splendidly equipped hospital, in charge of a Safety First man, but to be prepared for any event the club house at the mill was changed into an emergency hospital of 20 beds. Two trained nurses and a doctor were sent to the property, and with the First Aid man and the camp nurse, they were prepared to battle with the epidemic, which, in a locality 12,000 ft. above the sea, would be apt to result seriously if not handled in the most vigorous way. It was decided that every man on the job should be at once examined by the physician, and, if he showed any signs of cold or indisposition, immediately sent to the hospital. As a result, 25% of the employees of the company have already passed through the hospital, most of them showing the early symptoms of influenza, but their treatment in the hospital has been so thorough that in not one single instance to date has pneumonia or the later symptoms of influenza developed, and the men have been returned to work in good physical condition in an average of between four and five days. Similar action might well be taken by other companies.

Domestic Manganese Development

Need for opening new supplies of domestic manganese has passed. An announcement to this effect comes from an official who not only has an important voice in matters pertaining to manganese so far as the Government is concerned, but who has been an ardent champion of the policy of developing domestic resources. His comment on the matter is as follows:

> The realization of the vast resources of the United States has, in some respects, been brought about by the stimulation due to war necessities. Previously it was generally agreed that our supplies of manganese ore were trivial, and that we were substantially dependent upon importations. When it becomes necessary to deflect ships from the manganese importing trade in order to use them for direct war purposes, it also became necessary to greatly increase the domestic production; and many of those most familiar with our resources in this connection were pessimistic about the possibility of doing so to the necessary degree. The rapid development of manganese deposits in all parts of the country, however, has been astonishing, and it now appears that, if it was absolutely necessary, we could do entirely without imported manganese. Such a course, however, would require much expense by way of changes in installation; and indications are that it will neither be necessary nor advisable. A considerable amount of ore will evitably be imported, during 1919, from Brazil, coming back on ships which would otherwise return with light cargoes. Sufficient domestic ore is now assured to make up the remainder of the manganese requirements; and, therefore, while it is necessary that the present production should be kept up, there is no longer any apparent need for opening up new supplies. It is a matter for congratulation that the country has shown itself so capable of responding to the threatened manganese shortage for 1918.

Foreign Trade in Copper

Exports of copper from the United States in August, 1918, and in the corresponding month of 1917 are reported by the Department of Commerce as follows, in pounds:

	August, 1917	August, 1918
Ore, contents	351,420	107,120
Concentrates, matte, etc., contents	......	34,000
Unrefined, etc., in bars	......	50,247
Refined in ingots, bars, etc.	95,733,812	45,876,440
Composition metal, copper chief value	8,400	29,477
Old and scrap	29,752	5,531
Pipes and tubes	2,289,320	303,601
Plates and sheets	1,642,529	762,052
Wire, except insulated	1,425,638	1,537,959

The weight of ore exported in August, 1918, was 1371 long tons, and of concentrates, matte and regulus, 149 long tons.

Imports of copper in August, 1917 and 1918, were as follows, in pounds:

	August, 1917	August, 1918
Ore and concentrates, contents	11,814,430	11,211,497
Matte and regulus, etc.	1,632,918	7,334,618
Unrefined, in bars, pigs, etc.	34,546,504	42,519,271
Refined, in bars, etc.	1,395,268	11,708,671
Old, etc., for remanufacture	461,068	168,027
Composition metal, copper chief value	161,376	111,196

Ore imported in August, 1918, weighed 28,145 long tons; concentrates, 20,720; matte and regulus, 7185 long tons.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Editorials

Chrome and Manganese Ores

EARLY in this year, when there was so much discussion respecting the proposed bill for a Mines Administration, the alleged purpose of which was to promote the production of certain minerals, among which were chrome and manganese ores, the *Journal* took the position that the high prices prevailing for those minerals was the best possible stimulus, and indeed, the only stimulus that was necessary.

The passage of the bill dragged on slowly, but it was manifest that the delay was leading to no trouble, for the situation in the minerals of scanty supply was steadily becoming easier. Even before the bill was finally passed, the market reports got into the habit of reporting that chrome ore was unsalable. Now the War Industries Board has officially announced that the chrome ore supply in the United States is sufficient, that the situation is well in hand, and there is no necessity for the present of additional investments being made in this country for the production of chrome ore.

A similar official announcement was made contemporaneously with respect to manganese ore by J. E. Spurr, who has been especially in charge of supplying the needs for that ore. "The rapid development of manganese in all parts of the country," says Mr. Spurr, "has been astonishing and it now appears that if it were absolutely necessary we could get along entirely without imported manganese."

We refrain from any further comments, save to remark that it is gratifying that the hysterical stage has been passed, and also that the law of supply and demand proved to be a safe reliance, as experienced advisers said it would.

Need for Educational Efforts

THE suggestion by C. T. R. that the copper and lead operators conduct a campaign of war education for the benefit of their laborers, is well worth serious consideration.

It is too true that many working men see in the present labor conditions only the opportunity of securing, we will not say earning, the highest wages that they have ever known, and relying on their occupation for exemption, realize to only a small extent the importance of their work in the winning of the war.

In our military training camps lectures are being given explaining fully why it is that we are at war, and the objects that we hope to attain. The young men at our colleges in the Students' Army Training Corps are receiving daily instruction in war aims. If it is advisable to elucidate to the men who are about to go to the front, to the men who are already in close contact with the realities of the war, the reasons for their going, how much more necessary is it to enlighten those who scarcely come in contact with the fighters. It is variously estimated that in the wars of today three to five men are required behind the lines for every man at the front. Whatever may be the number, it includes an army of workers larger than that across the seas, it includes every miner, millman and smelter, educated or ignorant, and all should be given an opportunity to hear and have impressed upon them the importance of the work they are doing, the intimate connection that exists between them and the men at the front, the independence that the fighter must place upon the worker and the utter futility of sending men across without unstinted support from the rear.

These lessons should deal with the practical side by showing the vast amount of raw and manufactured material an army consumes, thus leading up to the patriotism of work; they should deal with the business of loaning to the Government, even in small amounts, thus leading up to the patriotism of buying Liberty Bonds.

They should compare the work and dangers of the men at the front with the work and safety of those behind. And, for those whom we would particularly reach, this may all be done far better through speakers than any amount of printed propaganda.

Advice to Wage-Earners

IN ANOTHER column appears a letter from "A Miner," which we should like to answer as he requests, but we fear for the success of any Sunday School lecture that we might write. Some one, however, should remind the boys, and remind them frequently, that the days of high wages are not with us for all future time. Carpenters, mechanics, miners, and all other laborers are getting high wages, owing to abnormal conditions, and an excessive demand for materials, a demand that permits no delay regardless of cost, because of conditions created by the war.

We do not know whether the existing industrial conditions will disappear gradually or suddenly, but that they will disappear there can be no possible doubt, and with the change of conditions will come less demand for labor, and lower wages, gradually or suddenly, as the case may be.

During the period of the war, non-essential industries have been curtailed, and the destruction of property and the loss of metals have been enormous. Some say there will come a period of restoration, when again there will be work for every laborer and a market for all he can produce, but that day will not be immediately upon the declaration of peace. It will succeed a period of readjustment, a period when there will be many mouths to feed and perhaps but little work to be done right away.

The lean year is coming, boys, just as sure as the end of the war is coming, and the man with a family who has not put some of his surplus away is going to be hard hit, regardless of his willingness to work. If there was ever a time for a man to be frugal it is today, when a little care will enable him to put away nearly as much as his entire wages in ordinary times.

And when we say put it away we mean put it where it will be safe and ready for the rainy day of which we write. "A safe place?" you ask, "where is a safe place?" We do not pretend to know the merits of all bonds and stocks, of houses and lots, but we do know that in times like the present Uncle Sam's bonds are the safest possible place for loose funds.

A few years ago we used to speak of gilt-edged securities. Some of that gilt faded to silver, and now it looks like copper. What it may look like a year hence we don't know, but we do know that among securities Uncle Sam's notes will stand in a high position. If in the period of depression some bonds fail to pay their interest coupons, Liberty Bonds will not be in that class.

Aside from safety there is another and a more important reason why your savings should go into Liberty Bonds. The safety of the world, the safety of the United States, the safety of your own rights, requires the use of vast sums of money. You have a small portion of that money, and Uncle Sam needs it for a while far more than your daughter needs a piano. He needs it more than you need a new overcoat. In loaning it to him you are making life just that much easier for yourself and family in the days not far ahead. Buy Liberty Bonds, not only when a drive is on, but whenever you can save fifty or a hundred dollars.

Economic Warfare

SERIOUS thinkers in Germany have realized since the beginning of the war that economic considerations would, sooner or later, dominate the whole situation. This realization became a conviction soon after Great Britain's entry into the conflict. The full meaning of Allied naval supremacy was appreciated. High German military authorities realized that their country could be provided only for a limited time with an adequate supply of the indispensable materials for carrying on the war. With the advice of the heads of leading German industrial enterprises, there was organized a department for the securing and controlling of raw material supplies. An inventory was made of all the available supplies of iron ore, copper, tungsten, nickel, and other war minerals and metals.

In preparing for the war years beforehand, the German authorities certainly paid attention to economic as well as military considerations, but it is evident that they miscalculated not only the duration of the war but the amount of military material that would be needed in modern fighting. This is illustrated by the fact that the Germans experienced a serious munition shortage in the early part of 1915. During 1916 the German government was severely criticised by some of its prominent commercial leaders for its want of foresight in economic matters and the inadequancy of its preparation. The government's explanation was that preparation had been made, but on the assumption that the war would last not over a year. The important point here is that a shortage of raw materials actually existed and was admitted. One prominent industrial leader described the situation by saying that the country was in a state of siege, and he expressed fears of the danger of the throttling of Germany by economic pressure. The economic life of Germany is built on a foundation of imported raw materials. The natural advantages and resources of the country are limited. Her most important raw materials are coal, iron and potash. The industry and technical ability of her people in working up raw materials into manufactured articles is responsible for her prosperity.

Of the total German imports during the year prior to the war, nearly 60% consisted of industrial raw materials. Many of these materials are vital to the upkeep of her military establishment as well as to the maintenance of her civilian population in peace time. Germany is dependent on foreign countries for fabrics, cotton, wool, silk, flax, hemp and jute, and to a large measure for leather, furs, and rubber; but more important than all these for the metals copper, tin, platinum, aluminum, nickel, manganese and tungsten. The wholesale requisitioning of church bells, bronze statues, and public and domestic metallic ornaments of all kinds shows how important are the metals, and how serious is the situation regarding them.

The theory that Central Europe could made good Germany's deficiency in raw materials has proved to be an extravagant dream. An investigation of the imports into Germany from Austria-Hungary, Rumania, Bulgaria, Serbia, Greece, and Turkey, during a period prior to the war, indicates that in the case of many important commodities imports amounted to a fraction of a per cent. of the total imports of the same commodities. For example, the import of iron ore from Central Europe into Germany during this period amounted to less than 1% of the total imports of iron ore.

It is interesting to speculate on conditions in Germany after the war, and how she will secure the raw materials which she needs for the resumption of her commercial and industrial life on a normal basis. There can be no real reconstruction without a sufficiency of essential supplies. One of the problems of demobilization will be to get the population back to productive work. Without raw materials there can be no industrial employment. Demobilization without employment means trouble. The Allies, by their command of essential supplies, will control the demobilization of the German army and the process of German recuperation.

Germany has declared that she entered the war to safeguard her economic future, but perhaps she has irretrievably compromised it. She desired a position of economic independence, but she will probably be placed in the humiliating position of dependence on a world she has antagonized. Her agents are already trying to buy up supplies for shipment after the war, but opinion is turned against them. It is recognized that even when the initial difficulty of securing raw materials has been overcome, Germany's export trade must suffer from psychological difficulties on which she did not count before the war.

A Permanent Set

THE strongest piece of material, when subjected to a tensile stress, will lengthen uniformly as the load is applied until a certain load has been reached, when the material becomes permanently distended and its capacity to resist becomes greatly lessened. Continued application of the load in larger increments produces a sudden failure. The war strength of the German army has been given a "permanent set." It has been irretrievably weakened. Only by greater and still greater force can it be permanently broken. The President's notes and the replies thereto indicate as surely as the needle on the recording cylinder of a testing machine, the condition of the German war machine. But, we cannot take the time to discuss the situation, nor can we desist from our task of increasing the force that our American boys and the soldiers and workers of our Allies are piling on. It is a critical time and a time for everyone to add their quota to the load. The fourth Liberty Loan has gone over the top, but this is only one of the many things that remain to be done. United in our determination, we can exert force enough to cause the destruction of the German war machine. Guns, explosives, war materials and soldiers over there depend upon us over here to supply them to our utmost.

BY THE WAY

Many who are acquainted with conditions in Russia will appreciate the following from the *Sun*:

Lenine

I think if God should damn you utterly
And drive you naked from His awful gate,
The very void would shudder back in hate,
To let you pass. The stars would pale and flee,
And hell itself lift up a sickened snout,
From its accursed den, to spew you out.
—*Perley A. Child.*

History will surely couple the names of Lenine and Trotzky with that of Judas Iscariot.

Some persons have a curious belief in the powers of engineers over the laws of nature. One representative citizen was heard to say to another, as they gazed from the deck of the little steamer that traverses Lake Tahoe at the 2000-ft. wall of the Sierras rimming Tahoe on the eastern side: "Wonderful work the engineers are doing; wonderful indeed! Their latest proposal is to construct a steel siphon over the mountains that you see over there and draw the water to the crest and run it down upon the plains of Nevada. There it will irrigate thousands of acres. It is quite simple, just as simple as a hose siphon. All that is necessary is to place an up and down pipe of sufficient size to carry the water." "Isn't it wonderful!" replied his companion.

An interesting sidelight on the discovery of noe of the manganese claims recently opened up in the Cowichan district, Vancouver, is provided by the following: The locator of the claim is Private Tom Service, who fought with an engineers' corps in France and who had a part in the tunneling of Hill 60, which was blown up by means of the greatest mine in history up to that time, a strong German fortress being literally obliterated. Service returned to Canada a short time ago. He sa wmanganese samples from another part of the Cowichan district and exclaimed that he knew where there was more of the same ore and could find it without trouble. He went out, staked and recorded the claim, and has named it "Hill 60." So there now is a "Hill 60" on Vancouver Island which gives promise of supplying quantities of the raw material for the production of munitions necessary to drive the Hun out of the fair lands he has invaded and devastated.

"Well m'son," quothe Captain Dick, "I 'ear that 'ol bloody country is goin' dry. Dam-me don't naw but wot may be good thing too. Good for some any'ow, for I tell'e this 'ere drinkin' bizness is ruination o' moor than one fine lad these days. 'Ow some poor devils do 'ate to let gaw. Not sayin' don't like bit o' toddy self naow an' then, but never 'as I made 'og over un. I remember back foor year h'ago 'ow Jan Trevarthan used to 'it un. H'awful, m'son, h'awful. But dam-me, never touches un naow. An' dost thee naw 'ow it 'appened? Well, I'll tell 'e.

"Jan wuz sent down with me an' h'other boys to pull pumps to h'Algonquin mine. No more bloody h'ore left in tha mine, min' you, but pumps h'as good h'as new. So dam-me, down we gaws an w'en we gets there, 'ol bloody place wuz fixed h'up, nice h'as you please, for h'our comfort. Company h'even 'ad doctor there, to see that we didn't get 'urted. Fine fellow too, that there doctor. H'every time ussen come off shif', in we gaws to that h'office, where we 'ad to change h'every bloody stitch we awned 'an put on dry clothin'. For, min' you m'son, it wuz some bloody wet, down in tha bal. Afore we gets 'alf dressed, in comes that there doctor with gert jug o' whiskey, an', if I do say so self, a bit o' she gaws 'andsome when one's wet. But, min' you, m'son, it wuz but a taste 'e give us. Well, one day, Jan 'e figgers as 'ow there mus' be some chance of havin' moor than that there doctor give un, so, dam-me, down 'e brings a gert large jug of 'is h'own an' 'ides 'im in be'ind 'is locker, an' h'each time doctor give 'im a drink from 'is bottle, why, dam-me, Jan'd sneak three or foor drinks from 'is h'own. An' so it go's along till time come for us to win' up that job. Tha las' day—m'son, never shall I forget h'it. As 'ard work as man ever wuz put to an' h'almos' afore we 'ad tha las' of tha pumps h'out, that water wuz roarin' an' rumblin' like tha crater of Vessuveyuss. So h'into that bucket we piled an' h'up shaf' we gaws. Well, m'son, we h'all 'ad h'our bit an' Jan, by way o' celebratin', 'ad 'is share an' moor too an' h'out 'e starts for that pub, afore tha res' wuz dressed. Dam-me, no sooner 'ad 'e started than back 'e come, white h'as a ghost an' tremblin' from 'ead to foot. 'Boys, sez 'e, 'So 'elp me, Go, I'll never take 'nother drink h'as long as I live,' an' down 'e falls on the flure, cryin' like a baby. Believe it or no, m'son, h'out we gaws, an' there wuz the 'ol bloody groun' strewn with snakes. Snakes, min' you. Well, dam-me, we wuz all 'ard put to h'understan' that sort of 'appin' till tha 'oistin' h'engineer tol' us 'ow it wuz. Seems in h'early days, they 'ad put daown bunch o' drill 'oles an' these 'ere snakes 'ad found tha 'oles comfortin' so daown they gaws an' there they wuz, livin' for years. Well, dam-me, when tha water in tha mine started risin' h'out they come, for no bloody h'animal, but 'errin,' can live in water any'ow. Finally we took Jan, cryin' all tha way 'ome, 'e wuz, an' from that day to this, never a drop 'as 'e touched. 'Ere, son, let's 'ave a bit o' that there Peerless. Wot's think on it?"

Personals

Have You Contributed to the Association of the 27th Engineers?

Philip Argall has been examining mining property near Rico, Colo., recently.

Capt. Richard H. Vail, of the Chemical Warfare Service, has arrived in France.

F. R. Weekes has returned to New York from a four weeks' professional trip to California.

G. L. Sheldon of Ely, Nev., is doing some work at the St. Paul mine near Virginia City, Montana.

Frank G. Willis, of Cripple Creek, is making geological investigations in southwestern Missouri.

Maj. M. Robert Guggenheim is in New York on a special mission after a year's absence in France.

Henry D. G. Reynolds has returned from the Irtysh Corporation's properties in the Altai district, Siberia.

A. A. Turner has resigned as consulting engineer for the Goldstone Mining Co., Goldstone, California.

W. C. Schmidt is mining engineer at the Consolidated Arizona Smelting Co.'s Bluebell mine, Mayer, Arizona.

T. W. Cavers, smeltery superintendent for the Tennessee Copper Co., has resigned. Mr. Cavers has been with the company for the last 10 years.

O. McCraney has left the White Caps Mining Co., in Nevada, to become superintendent of the Belmont Shawmut Mining Co., at Shawmut, California.

Prof. Edward E. Bugbee, of the Massachusetts Institute of Technology, has recently returned from a six weeks' professional trip to Colorado and Utah.

E. V. Daveler has resigned as assistant manager of the Alaska Gastineau Mining Co. to become mill superintendent of the Butte & Superior Mining Company.

Chester Gibbs, mining engineer with the Winona Copper Co., Michigan, has taken a position with the Seneca Mining Co. He is succeeded by **Allen B. Sanger**, of Butte, Montana.

Stuart Croasdale has changed his business address to 730 Symes Bldg., Denver, Colo., where he will continue in practice as consulting engineer in mining, metallurgy and industrial chemistry.

A. B. Whitman, mining geologist, formerly of Cobalt, Ont., has given up consulting practice to take up instruction in war topography at Columbia University in connection with the Students' Army Training Corps.

T. Ernest Godson, mining commissioner for Ontario, and **T. F. Sutherland**, provincial chief inspector of mines are investigating mining conditions in British Columbia with a view of obtaining suggestions for the improvement of the mining laws of Ontario.

Frank L. Smale, manager of the Portland Gold Mining Co.'s mine at Victor, Colo., has resigned and will go to California. **George M. Taylor**, manager of the company's milling department, will move to Victor from Colorado Springs, and will take charge of both mines and mills of the company.

Walter Douglas, president of the Phelps-Dodge Corporation, is on an inspection trip in the Southwest. With his assistant, **A. T. Thomson**, he is visiting the company's properties at Bisbee, Douglas, Tyrone, Morenci, Globe and Nacozari; **P. G. Beckett** has been granted a leave of absence to enter the military service.

Henry Krumb, consulting engineer of Salt Lake City, has been in Washington for several months, having been appointed a member of the Priorities Committee of the War Industries Board. Mr. Krumb will handle all applications for priority certificates relating to the equipment and supplies for copper and other nonferrous mines and smelteries as well as for various other supplies.

C. B. Lakenan, general manager of the Nevada Consolidated Copper Co., is leaving to take charge of the Chile Copper Co., and will be succeeded by H. A. Guess, managing director of the American Smelting and Refining Co.'s mining department. C. V. Jenkins, business manager of the Nevada company, has been transferred to the New York office. C. Ziegler, private secretary to Mr. Lakenan, will fill his position.

Obituary

Lieut. Albert Leslie Stephens, mining engineer and a graduate of the Massachusetts Institute of Technology, 1906, died recently of pneumonia at Camp Humphreys, Virginia. He spent several years in Mexico, but latterly had entered business in New York.

William A. B. Walling, a metallurgist with the Minerals Separation North American Corporation, died in New York, on Oct. 20, of pneumonia. He was born in Wandsworth, London, in 1889, and received his technical training in Battersea Polytechnic College of that city. He had been with the company six years, the last three being spent in this country.

Millard Hunsicker, one of the junior partners of the Carnegie Steel Co., died on Oct. 11 at Harrogate, England. He was born in Athens, Penn. For many years he was foreign representative for the Carnegie company, and later of the United States Steel Products Co. Mr. Hunsicker served under Herbert C. Hoover as vice-president of the Belgian Relief Association, during the time that Mr. Hoover was in Belgium.

Edward B. Cook, assistant manager of the blast-furnace department of Pickands, Mather & Co., Cleveland, Ohio, died on Oct. 13 of pneumonia, following an attack of Spanish influenza. Mr. Cook was 39 years old and was a graduate of the Massachusetts Institute of Technology. He was formerly manager of the Warwick Iron and Steel Co., of Pottstown, Penn., now operated by the Eastern Steel Company. Mr. Cook was a member of the American Institute of Mining Engineers.

Thomas Kearns, vice-president and general manager of the Silver King Coalition Mines Co., of Park City, Utah, and ex-United States Senator, died at his home in Salt Lake City on Oct. 18, aged 56 years, following a stroke of apoplexy brought on by an automobile accident. Ex-Senator Kearns was born near Woodstock, Ont., and later followed mining in the West, first in the Black Hills and then at Park City, where lucky discoveries made him a fortune. He was an owner of the "Salt Lake Tribune" and a director of the San Pedro, Los Angeles and Salt Lake R. R. In politics, he was a Republican and served as Senator from Utah from 1901 to 1905.

Societies

Geological Society of America will meet in Boston Dec. 28 to 31.

American Institute of Mining Engineers will hold its spring meeting Feb. 17 to 20, 1919, in New York.

American Association for the Advancement of Science will meet in Boston from Dec. 27 to Jan. 2 next.

Chamber of Commerce of the United States intends to hold meetings of all the War Service committees dealing with the War Industries Board in a conference at Atlantic City on Nov. 19, 20 and 21.

Society of Chemical Industry, New York section, met at Rumford Hall, New York, on Oct. 25. An address was made on "Gas Warfare, Both Offensive and Defensive," by Maj. H. W. Dudley, of the British-American Anti-Gas Service.

Cleveland Engineering Society has passed an amendment to its constitution providing for joint membership with other societies. Under the joint plan about 40 members have become members of the American Association of Engineers.

South African Institution of Engineers recently announced the awards made for the best papers read last year. J. A. Vaughan received the Institution's gold medal for his paper on the "Factor of Safety in Winding Ropes." T. G. Ottley was awarded the Ingham prize for the best short paper.

Industrial News

John A. Roebling's Sons Co., Trenton, N. J., announces the death of its president Charles G. Roebling, on October 5.

Lidgerwood Manufacturing Co. has opened its own branch office in the Union National Bank Bldg. at Cleveland, Ohio, for the better handling of its business in contractor's hoists, mine hoists and cableways in that territory. The office will be in charge of Ernest F. Pegg, who has been handling the Lidgerwood line for the W. M. Pattison Supply Co., the company's former agents.

Draeger Oxygen Apparatus Co., Wilkinsburg, Penn., has applied to the Federal Trade Commission for license to use eight patents for respiratory, resuscitating and breathing apparatus, and the trade mark "Pulmotor," which it claims are enemy-owned. The patents were issued originally to Johann Heinrich Draeger, of Lubeck, Germany, and to other assignors to the firm of Draegerwerk Heinrich u. Bernhard Draeger, of Lubeck, Germany. The commission is considering the merits of the application.

Detroit Graphite Co., paint and color makers of Detroit, Mich., is represented in the Southwest by George S. Thomson, with office and warehouse at 104 Leon St., El Paso. Mr. Thomson travels through southern California, Arizona, New Mexico and Mexico and maintains a warehouse stock of paint at El Paso for immediate delivery. The company manufactures a complete line of paint for all purposes, including metal protective coating, "Superior" graphite paint. A new office has been opened in Salt Lake City at 406, 407 Boston Bldg., with P. D. Whatley in charge, who covers Utah, Montana and Colorado.

Trade Catalogs

Cutters. Cleveland Milling Machine Co., Cleveland, Ohio. Price List, Oct. 15, 1918; 3⅝ x 6; pp. 48.

Tanks. Walter A. Zelnicker Supply Co., St. Louis, Mo. Bulletin No. 252; Oct. 15, 1918; 3⅝ x 8½; pp. 12. New and second hand tanks of all kinds and sizes.

Roof and Iron Paint, Etc. Monarch Paint Co., Cleveland, Ohio. Circulars describing "Hydrocarbonite" a high-grade roof and iron paint; "Sealtite," a plastic roofing and waterproofing compound; also "Sealtite" in liquid form.

Dean Valve Control. Cutler Hammer Manufacturing Co., Milwaukee, Wis. Pp. 8; illustrated. The pamphlet is entitled "Facts" and describes a valve control consisting of a high torque motor, which opens and closes the valve gate, a limit mechanism automatically disconnecting the motor at the end of the gate travel, and one or more remote control stations from which valve can be operated.

Watt Cars. Watt Mining Car Wheel Co., Barnesville, Ohio. General catalog; 8½ x 11; pp. 156; illustrated. This is a handsomely printed book and the most complete catalog yet published on wood and steel mine cars, ore cars, quarry, contractors' and industrial cars, skips, ore buckets, couplings, car wheels, axles and trucks. It is divided into five parts, as follows: Mining cars, Catalog A; industrial cars, K, ore cars, M; wheels, S; and couplings, W. Copy free on request.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alloy. Containing Ni, Zr, Al and Si. Hugh S. Cooper, Cleveland, Ohio, assignor to the General Alloys Co., Cleveland, Ohio. (U. S. No. 1,278,304; Sept. 10, 1918.

Amalgamator, Mercury. Lewis Martin Kellogg, Los Angeles, Calif. (U. S. No. 1,278,163; Sept. 10, 1918.)

Drill, Percussion, John R. Abbott, Council Bluffs, Iowa. (U. S. No. 1,278,084; Sept. 10, 1918.)

Ferromolybdenum, Process of Making. Eric Hjalmar Westling and Carl Andersen, San Francisco., Calif.; said Westling assignor of his one-half to Newton W. Stern, San Francisco, Calif. (U. S. No. 1,278,408; Sept. 10, 1918.)

Furnace, Electric. James H. Gray, New York, N. Y. (U. S. No. 1,278,635; Sept. 10, 1918.)

Furnace, Smelting. Elof Karl Hjalmar Lundberg, Bruzaholm, Sweden. (U. S. No. 1,278,696; Sept. 10, 1918.)

Ingot Mold for Casting Manganese Steel Winfield S. Potter, Pittsburgh, Penn. (U. S. No. 1,278,206; Sept. 10, 1918.)

Manganese Steel, Producing Wrought Shapes of. Winfield S. Potter, Pittsburgh, Penn. (U. S. No. 1,278,207; Sept. 10, 1918.)

Editorial Correspondence

SAN FRANCISCO—Oct. 16

Miners' Wages in Amador County Mother Lode region have again been voluntarily increased by the mine owners. The increase is 25c. and 50c. per day, the lower raise being unconditional and the 50c. raise being paid to men who agree to continue at work not less than 30 days. This makes a maximum day wage of $4.50 for miners and $3.75 and $4 a day for shovelers and carmen. Labor is scarce and not all the mines can be worked full time even at this increase in the wage. The men who have their homes in the several substantial towns on the Lode have no inclination to go to the shipyards or other places of high wages, except in a few cases, but most of the unskilled labor in the mines is of the transient type.

Continued Chromite Production for the first half of 1919 at a rate proportionate to the rate of 1918 production is announced as the present intention of the War Industries Board. The board in a dispatch to Albert Burch of San Francisco advises, if the producers in California and Oregon are unable to find ready market for ore, that he wire the Washington office giving tonnage and guaranteed analysis and price. In giving this information through the press to the chrome producers Mr. Burch adds: "The industry in California and Oregon has been built up at the earnest request of the War Industries Board acting through the Bureau of Mines, but has reached a point where no further extension is desirable. The chairman of the board, however, expressed to me his sense of responsibility on the part of the Government for inducing prospectors, miners and capitalists to engage in the production of chrome ore and his fixed intention to afford those already engaged in the business such reasonable protection for their interests as his department can give."

North Star Mines in the Grass Valley district have yielded but small profit in the last year, owing to war conditions and scarcity of labor. Milling has necessarily been curtailed and now development is ordered stopped. George B. Agnew of New York, president, has advised the stockholders that the company is not justified in paying the usual dividend at this time. During the first six months of 1918 dividends to the amount of $100,000 were paid. Of this sum it seems probable, subject to adjustment at the end of the year, that $30,000 must be considered as having come from the surplus earnings and $70,000 from the reserve for depletion, as a payment in liquidation of capital. Cash resources will enable the mine to be kept in operation and good order although no great profit can be expected. It might be actually profitable to close the mine down, if only the question of profit were considered, but the importance to the Government of the gold production and the dependence of the town of Grass Valley on the mining industry are taken into consideration, so the mines will continue in operation, but with development arrested for the present.

Electric Power Restrictions applied to gold dredges have been rescinded or modified to permit the dredges in the fields where operation had been reduced to half time to now run full 24 hours a day. The loss of time during the period of restriction of the use of electric power was not a great hardship on the dredge owners, because the gold does not get away while it is in the ground, though constant operation is of course more profitable—if it can be said that there is any present profit in gold dredging. The chief hardship fell upon the dredge workmen, who must meet the increased cost of living whether they are employed full or half time. Many of them have their homes and can not afford to go out to seek other employment while waiting for the rains. Indications now are that there will be an abundance of water for the generation of electricity during the season, as the heavy rain in mid September is apparently to be augmented by rain and snow in October. The gold miners, both placer and quartz, in California have less worry over a short rain and snow season than over the heavy costs of operation as applied to essentials other than power.

The Safety Rules for Gold Dredges, issued by the Industrial Accident Commission and effective Jan. 1, 1919, have been completed and are ready for distribution from the office of the commission, at 525 Market street, San Francisco. There are some changes from the tentative rules issued earlier in the year, the minor changes being those that affect general safety and welfare, guards against personal falls and falling objects, and machinery and power transmission. The major changes and additions to the tentative rules affect the electrical department, particularly the rule regarding switches, fuses, automatic circuit breakers, etc., and motors. Provision is made for the appointment, by dredge operators, of persons upon whom notice may be served by the commission through the mine-inspection department. The following named representatives of interests affected by the rules composed the committee which prepared the tentative and the final safety rules: Harold Mestre, consulting engineer, chairman; F. L. Lowell, deputy mine inspector, Industrial Accident Commission, secretary; L. D. Hopfield, department manager Natomas Co. of California; C. W. Gardner, representing Hammon Engineering Co.; A. L. Wilde, district representative International Brotherhood of Steam Shovel and Dredge Men; Carl Brown, manager California Casualty Indemnity Exchange; H. M. Wolflin, mining engineer, U. S. Bureau of Mines, chief mine inspector, Industrial Accident Commission; R. L. Eltringham, electrical engineer, Industrial Accident Commission.

Pumice Deposits in Eastern Siskiyou County are producing commercial pumice stone which is hauled in motor trucks to Bartle on the McCloud River R. R. The situation of the deposits is 28 miles north of Bartle and 7 miles west of Medicine Lake in a mountainous region between Mt. Glass on the eastern edge of Siskiyou County and Black Crater, 35 miles west. The lava in this region is on the direct northwest trend of the lava flow from the Mt. Lassen and Mt. Shasta regions. Pumice has not been commercially valuable in California until the war conditions have brought about a large demand for all the minerals and metals and kindred substances. The fact that there are numerous lava flows in the state and consequently large amounts of lava ash, pumice and other substances produced by volcanic disturbances seems to have been considered by geologists and other technical investigators of State and Government bureaus as sufficient for the information of the public interested in these materials. The contributions of the State Mining Bureau to these subjects would not induce prospecting and development. It remained for the grub-stake prospector and the small adventurer in development to acquaint the public with the fact that in one of the well-known districts of the state there is a mountain top of material carrying commercial quantities of pumice easily and economically marketable. These deposits are being operated by San Francisco interests who are quarrying the rock and washing it in large tanks in which the tailing settles on the bottom and the pumice floats on the surface. The material is dried and sacked for shipment. Thirteen cars have been loaded at Bartle. The deposits were first prospected and partially developed in 1910 under the direction of J. O. Miller.

SALT LAKE CITY—Oct. 17

Coöperation Between the Bureau of Mines and the State is evidenced by the appointment of Carl A. Allen by the State Industrial Commission to be chief inspector of mines for Utah. Mr. Allen has been in charge of the Bureau of Mines demonstration car in the Butte, Mont., section. He will retain his Government position while serving the State in this new capacity, and will supervise the work of the inspector of metal mines and the State coal mine inspector.

A Mill To Treat Rare Metal Ores has been installed by A. E. Custer here. Plant consists of rolls, jigs, ball mill, concentrating tables, and slimers. A flotation unit is now being added. Ores from Utah and Nevada have been treated. Recently several tons of tungsten ore from the Western Utah Copper Co.'s mine in Deep Creek was run through the plant, and a high-grade concentrate obtained. Though the capacity at present is limited, the plant is of interest in that it offers facilities for improving the grade of various ores of the rarer metals, including ores of tungsten, molybdenum, uranium, vanadium, etc., at the same time furnishing data for possible larger-scale operations.

Utah Apex Mining Co., with mines at Bingham, filed suit in the Federal court on Oct. 9 to restrain the Utah Consolidated Mining Co. from extracting ore from certain sections of property claimed to be owned by the Apex Company. Claims involved are the Leonard No. 2, Edna Lode, Nellie Bly, and Handson Lode. A restraining order and damages amounting to $1,750,000 are asked. The Apex claims that 70,000 tons of lead-silver ore have been removed from the property, and at present the Utah Consolidated is extracting 1500 tons of ore from the property each week. "This is being wilfully, unlawfully, fraudulently, and secretly done, and without the license of the owners," the complaint states. The Utah-Apex mine is the largest single producer of lead in the state.

DENVER—Oct. 17

Alunite in Colorado is attracting considerable attention at this time, especially in view of the favorable developments of the White Horse alunite property in the Marysvale district in Utah. Extensive deposits near Rico, in Dolores County, are the objects of investigation by interests that plan the erection of a plant for the recovery of potash, aluminum, and aluminum salts. Alunite is extensively distributed in Colorado. In addition to the large deposits near Rico, the mineral is found near Platoro, in Conejos County; in the Rosita Hills, and on Knickerbocker Hill, in Custer County; in the San Cristobal quadrangle, in Hinsdale and Mineral counties; at Leadville, in Lake County; at the National Bell mine and in the Red Mountain district, in Ouray County; at Summitville, Jasper, Embargo and other places in Rio Grande County; and near Bonanza, Beidell, and on Tracy Creek, in Saguache County.

Freight Rates to the Cripple Creek district may soon be reduced, if the arguments made by prominent shippers of the camp are considered favorably by the railroad rates committee. Many of the district mines have been forced to cease operations, and others have had their outputs curtailed through increased cost of operation. Several of the large producers fear that they will be forced to close down entirely if something is not done soon to remedy the situation. It is urged that a reduction in coal rates to the Cripple Creek district be put into effect as soon as possible. The seriousness of the situation is apparent when the general agent for the Colorado Springs and Cripple Creek lines requests the railroad freight rates be reduced, on the ground that such reduction is of vital importance to the existence of the Cripple Creek district. Before making a decision in the matter, the railroad rates committee will review data regarding the production of ore and the cost of production before the war and under present conditions.

PHOENIX, ARIZ.—Oct. 15

A Reconnoissance Geological Map of Arizona is to be prepared by the State University, involving compilation of all existing records on the subject and the collection of field data where sufficient data are not available or existent. Thereafter, bulletins are to be issued covering the geology and mineral resources of each county. The work is to be in charge of Olaf P. Jenkins, recently appointed geologist of the Arizona Bureau of Mines and connected with the University of Arizona.

"The Association of the Arizona Mining Men" is a new organization perfected in Phoenix which has 50 charter members, but expects to have at least 300 members within a month. It has no connection with the Arizona chapter of the American Mining Congress, and does not include representatives of any of the great producing mines of the state as its membership is composed principally of men connected with the properties under development or in the shipping stage. Officers are: President, C. P. Reninger, Tucson; vice presidents, C. S. VanDyke, Miami, and Ed. Bush, Tucson; secretary, W. H. Lawhon, Phoenix; treasurer, W. S. Humbert, Phoenix. Matters under consideration at the first meeting included a discussion of the plan of closing down development mines and even commandeering their equipment. Resolutions on this subject were to the effect that encouragement, not suppression, should be asked for the mines under development within Arizona. Modification was asked of the Treasury Department of the income-tax regulations covering mine profits. Strong support was pledged to a workmen's compensation bill which is to be voted upon at the election in November.

CALUMET, MICH.—Oct. 16

Copper County Mine Managers do not believe that the after-the-war problem of the copper producing corporations will be so much the finding of a market for their product as limiting the market and are taking into consideration the fact that with the end of the war the call for copper for manufacturing munitions will cease entirely, probably forever, excepting in limited amounts, but they point to the great era of reconstruction that will, they believe, bring to the industry the greatest prosperity that it has ever known. One of the problems to be met will be that of price. With Government restrictions removed and the output limited because of high material cost, shortage of labor that is certain to exist for some time or through the reconstruction period, it is believed metal will go "sky-high" unless the producers get together on a price limit. No great reduction in cost of manufacturing the metal is looked for and higher prices for copper than those ruling at present will be welcomed, of course, but the mining corporations do not favor the sky-rocketing of prices that they believe is almost certain to come unless a limit is set. It is anticipated here that the heads of the larger companies will get together on price limiting shortly after war matters have been adjusted and that the price of the metal will be the big subject of conversation and probably of corporate legislation. Of course there is no certain indication that the Government restriction of price is to be lightened. Many of the companies are now preparing for the after-the-war period when they can increase their output practically to capacity but they do not look for any great influx of labor from the old world, anticipating that most of the European governments will limit emigration in order to keep labor at home.

CLEVELAND, OHIO—Oct. 15

Ore Movement in the Vicinity of Duluth is being seriously interfered with by the forest fires, according to "Iron Age" Traffic was delayed on the ore-carrying railroads, and boats were compelled to wait for cargoes. Acting on the suggestion of the operating heads of railroads in the Lake Superior mining district, a committee representing the mining companies is working out a plan to cut off ore shipments from some of the mines about Nov. 1. The purpose of this move is to relieve the railroad situation during the early winter months. In case of small underground mines, it takes some time to accumulate enough ore for a boat cargo. When the weather becomes cold, some of the ore is likely to freeze in the cars before a cargo is accumulated, and thus cause delay in handling. Ore to replace that from mines from which shipments are suspended will in some instances be procured from other properties. In case the ore is of a grade that the consumer must have, and if it cannot be replaced from other mines, a plan is being considered to accumulate a stock pile at the mine and load this on cars with a steam shovel as soon as sufficient ore has been mined for a cargo.

VICTORIA, B. C.—Oct. 16.

Bog Iron From British Columbia will be in use soon for fluxing purposes at the furnaces of Irondale, Wash., arrangements having been made with the owners of the iron property by the Pacific Coast Steel Co. The same company is using magnetite ores from Texada Island, B. C., and the product of its plant is to be utilized in connection with the building of ships in the Puget Sound district. The contract for the bog iron calls for the delivery of 5000 tons as soon as possible, and a spur line is being run from the Pacific Great Eastern Ry. to the property, which is situated near Mons, B. C., in order to provide satisfactory transportation facilities.

The Mining News

ALASKA

ALASKA SHIPMENTS of domestic copper ore and matte to the United States during September were 7371 gross tons, having a copper content of 4,216,816 lb. and valued at $1,106,512.

ARIZONA

Cochise County

COPPER QUEEN (Bisbee)—Construction on new concentrating mill near Warren stopped for the period of the war, owing to inability to secure needed material and machinery.

DENN-ARIZONA (Bisbee)—Sinking to new level at 1800 feet.

PHELPS DODGE CORPORATION (Bisbee)—Has endorsed and authorizes the announcement of a practical mining course to be given to employees of the Copper Queen branch. Men successfully completing this course will be given preference in the selection of future shift bosses.

Coconino County

NAVAJO COPPER (Flagstaff)—Work, abandoned due to high freight cost, to be resumed soon. Order has been given for 100-ton leaching plant. E. J. DeSable of New York is principal owner and T. A. McCullough of Denver will be manager.

Gila County

OLD DOMINION (Globe)—Output of copper during September was 2,292,000 pounds.

INSPIRATION CONSOLIDATED (Miami)—September production was 7,800,000 lb. of copper. Plant operated 28⅓ days.

Greenlee County

ARIZONA COPPER (Clifton)—Copper produced in September was 4,350,000 pounds.

SHANNON (Clifton)—Credited with best labor record in Arizona, with only [illegible] changes in [illegible] [illegible] in [illegible] of [illegible] [illegible] of the employees are [illegible].

[illegible] ([illegible])—[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]. Two cars of [illegible] ready to ship.

Mohave County

[illegible] ([illegible])—Will install new 100-ton mill.

[illegible] ([illegible])—[illegible] by [illegible] [illegible] the [illegible]. [illegible] ore than [illegible] with [illegible] [illegible] through the [illegible] from the [illegible]. A [illegible]-ton [illegible] plant in operation.

HACKBERRY (Hackberry)—Camp and mill buildings and other improvements nearing completion.

RICO EXPLORATION (Kingman)—Shaft down 190 ft. Crosscutting will begin on 200 level.

Pinal County

RAY CONSOLIDATED (Ray)—General office building being enlarged to accommodate large hall, mine safety division and executive offices on second floor. Near Hayden mill, the company is securing better water supply by sinking ten more wells in Gila river bottom, to be pumped by new compressor plant.

Santa Cruz County

WORLD'S FAIR (Patagonia)—To install 100-ton tube mill.

Yavapai County

KAY (Agua Fria)—Shaft down 500 ft. Drift 70 ft. to the south. Cut copper vein carrying gold and silver.

COPPER CHIEF (Jerome) — Hayden Development Co. announces stoppage of operations during the war, as soon as the mill has cleaned up the ore on hand, on account of high costs. Plans being made for a new process—acid and cyanide mill.

GADSDEN (Jerome)—West crosscut on 1200 level is 350 ft. from shaft in schist and porphyry, but no ore has been cut.

JEROME-SUPERIOR (Jerome)—Shaft below 600 level. At 750 ft., crosscutting will be started westward toward an andesite dyke. Property is one of the most northerly of the district and lies north of the Hopewell tunnel portal.

UNITED VERDE EXTENSION (Jerome)—Less than 400 ft. of work remains to be done to connect main heading of service tunnel with east heading from Texas shaft.

VERDE SQUAW (Jerome)—Shaft sunk more than 100 ft. At 250 ft., crosscut will be started to cut Boulder ledge.

LITTLE EGYPT (Mayer)—machinery being unloaded at mine. Al Blumenauer is manager.

BIG BUG (Prescott)—Ready to install hoist.

SENATOR (Prescott)—Several leases shipping high-grade ore to Humboldt.

TILLIE STARBUCK (Prescott)—Tunnel has cut first of two gold-silver veins and second will be reached within a few days. Property is three miles south of Senator and is in charge of A. J. Pickrell former managing director of the United Verde Extension.

Yuma County

BLACK GIANT (Cunningham Pass)—Shaft sunk 195 ft. with station cut on the 75 level and one at the 115.

CUPRITE INVESTMENT (Cunningham Pass)—Active development to begin as soon as machinery can be secured.

VICTOR AND BELLE CROWN (Cunningham Pass)—Driving tunnel 200 ft. below old workings which will intersect the known veins at a depth of 600 ft. Geo. M. White is in charge.

HARQUA HALA (Salome)—Gold producer now owned by Yuma Warrior Co. is preparing to explore for copper ore at greater depth.

BLACK GIANT (Wenden)—Shipping copper ore to El Paso from vein developed to 195 ft. S. B. Serf of Jerome is in charge.

CRITIC (Wenden)—Shipping two carloads a week of gold-copper ore from 450 level. Under lease to Joseph Nolachek.

CALIFORNIA

Amador County

OLD EUREKA (Sutter Creek)—Shaft sunk 250 ft. in last two months. Total depth 2650 ft. New ground will not be developed till shaft is completed to 3150-ft. point. Waste from mine used for surface filling in preparation of ground for storage of timbers and other supplies. T. Walter Beam is manager.

Del Norte County

CHROME SHIPMENTS to be increased by use of four new motor trucks received at Crescent City. The large production in the county is mostly hauled by trucks to Crescent City and Requa for water shipment to Eureka and delivered to the Northwestern Pacific Ry. for shipment to the East.

Eldorado County

CHROME SHIPMENTS of one carload a week from four leases in the Greenwood and Georgetown districts. Ore hauled by motor trucks to Placerville for rail shipment over Southern Pacific.

Humboldt County

CHROME SHIPMENTS from Eureka over Northwestern Pacific Ry. during the week of Oct. 5 amounted to only three cars from Del Norte County. One car of Horse Mountain ore is ready for shipment from Essex. Manganese shipments are from Fort Baker mines via Carlotta. Fort Seward shipments are tied up by bridges being out of commission. Bad weather and shortage of labor will reduce shipments and production during the winter.

Lake County

QUICKSILVER SHIPMENTS through Calistoga light during September. Sulphur Bank shipped 57 flasks; Big Chief, 7 flasks.

Mendocino County

MANGANESE DEPOSIT on Cow Mountain being developed by Carl Angle and associates. Five tons of ore from initial development. Ore to be hauled by motor truck to Ukiah for rail shipment.

Plumas County

DISCOVERY OF PLATINUM reported at placer mine on Grizzly Creek by P. R. Kelsey.

San Diego County

AMERICAN LITHIA CHEMICAL (Pala)—Shipping three carloads of lithia ore a week. Shipments by motor trucks to Temecula, Riverside County.

San Luis Obispo County

LUCKY JAKE CHROME (Santa Margarita)—To install another concentrator to meet increased production.

Shasta County

SCOTTISH CHIEF (Keswick)—To install Gibson mill at a cost of $11,000, ready for commission in November.

Siskiyou County

TWENTY HYDRAULIC MINES in Klamath and Salmon districts are getting ready to renew operation, owing to recent rains which have provided sufficient water.

COLORADO

Boulder County

ROOK (Boulder)—Acquired by L. E. Ewing and associates who will sink shaft an additional 100 feet.

CARIBOU (Caribou)—Yates & Yates have opened vein of payable ore on the 1040 level.

HURON GOLD ORES (Eldora)—Recent development opened payable ore in lower tunnel. Mill in operation. C. I. DuPont is president and G. M. Woodring is superintendent.

MELVINA (Jamestown)—Cleaning out 390 level preparatory to drifting to prospect Little Melvina vein, northeast of present workings.

WANO MINING MILLING (Jamestown)—Mill treating 25 tons of fluorspar daily. Three additional concentrating tables will be installed soon to increase capacity. Company's gold mine shut down because labor cannot be secured to carry on development work. D. S. Gerow is general manager, and James Warren is superintendent.

CRUCIBLE STEEL (Lakewood)—Under development by Thomas Mitchell and T. W. Tinsley. Shaft has been sunk 80 ft. and drifting is in progress.

GOLD COIN (Ward)—To be taken over by new company known as the Ward Gold Coin Mining Co., of which J. F. Weber is manager. Will develop the Gold Coin and Cardiff veins.

UTICA MINING (Ward)—Developing with encouraging results. C. H. Fry is superintendent.

Clear Creek County

GOLD ANCHOR (Alice)—Taken over by the K. & K. Co., of which Guy Harper is manager. A new hoisting engine is being installed, and considerable milling ore has been opened. Milling plant has been overhauled and placed in good running order; table concentration has been discontinued. and flotation equipment has been installed. Smelting ore will be sorted out and shipped to the Argo plant, at Idaho Springs.

KANSAS EXPLORATION (Idaho Springs)—Special meeting of the stockholders to be held at Idaho Springs on Oct. 30 to consider the propriety of dissolving the corporation.

PRINCE ALBERT (Lawson)—Being developed by the Matrix Leasing Co. Payable ore has been opened. and a five-ton test lot has been shipped to the sampler.

TERRIBLE (Silver Plume)—Silver-lead property being reopened and developed by the Denbigh Silver Lead Mines Co. On the 11 level, 273 ft. below the collar of the shaft, at a point 715 ft. east of the shaft, a three-compartment raise has been started on the Terrible vein to connect with the seventh and intervening levels. Between this raise and the shaft the vein has been opened for 250 ft. in payable ore. This level has been equipped with an electrically driven exhaust fan and a line of five-inch ventilating pipe running to the raise. On the 14 level, at a point 715 ft. east of the shaft, a raise which is being driven to connect with the 11 level has been put up 90 ft. At 77 ft. [illegible] a blind drift is being driven west to connect with the 13 level, to insure good ventilation. A similar connection will be made with the 12 level. When the new raises are finished, they will complete a new working shaft through to the seventh level, where a double-drum electrically driven hoist will be installed. The new shaft will have three compartments, two skipways and one ladder way. At present all ore produced is being broken in development. After the completion of the new shaft, the company plans to increase the production of the mine to 300 tons per day. At the portal of the seventh level, which is the main opening of the mine, office quarters, store room, and steam-heated change room have been constructed. New ore bins have been built, and grizzlies and ore-sorting tables have been installed. Compressed air is supplied to the mine by two compressors, one driven by water power and the other by electric power.

Gilpin County

FIFTY GOLD MINES (Black Hawk)—Entire property sold recently to Morse Brothers Machinery and Supply Co., of Denver, for $22,500. This property, which was at one time estimated to be worth millions of dollars, includes 50 patented gold-mining claims and an 80-stamp mill at Black Hawk. Among the mines included in the sale are the famous Gregory and Bob Tail properties, which are the first lode claims located in Colorado in 1879. The gross production of these properties in gold, silver, copper and lead is estimated at several millions of dollars. The amount paid for the properties is said to be only a fraction of what the equipment is worth, although the plant has been idle for several years and the machinery has deteriorated. The sale is subject to the approval of William B. Harrison, referee in bankruptcy, at Denver.

San Juan County

SUNNYSIDE (Eureka)—Construction work being pushed on new bunkhouse and boarding house at the mine, so that it may be completed before snow falls. Charles McMillan is superintendent of construction.

GOLD KING EXTENSION (Gladstone)—Mill being overhauled and placed in good condition preparatory to early resumption of operations. W. Z. Kinney is manager.

CONGRESS (Red Mountain)—Leased by King brothers, who will continue development work, which recently opened vein of high-grade copper ore. Property formerly operated by Al Kramer, who shipped 36 cars of payable ore before the expiration of his lease.

SUMMIT (Red Mountain)—Considerable development work to be done by this company during the ensuing year. Raise from the Koehler tunnel to the Carbon Lake workings, a distance of 310 ft., is nearly completed. D. A. Ferguson is superintendent.

SHIPMENTS FROM SILVERTON during September were: Sunnyside, 50 cars; Iowa-Tiger, 13; Pride of the West, 11; Mears-Wilfley, 8; Genesee, 8; Mayflower Leasing Co., 5; Congress, 4; Joe & John, 3; American Queen, 3; Hamlet, Highland Mary, Dives Leasing Co., and King Leasing Co., 2 cars each; S. D. & G. lease, Pactolas, Herman Fanchinio, Anderson & Holmquist, Arthur Johnson, Henrietta Copper Co., and F. Knowles, one car each; miscellaneous lots, 30 cars; total 150 cars.

San Miguel County

SHIPMENTS FROM TELLURIDE during September were: Tomboy, 38 cars; Smuggler-Union and Black Bear, 39; Cimarron, 2; Lewis, 2; total, 81 cars of concentrate.

Teller County

JERRY JOHNSON (Cripple Creek)—New ore body opened on 950 level and its extent is being determined by winze and raise. Trial shipment indicates that ore is of good milling grade. F. C. Denham is lessee and manager.

BIG TOAD (Victor)—Mill now running at full capacity of 100 tons per day, on low grade ore from the Dante mine.

CRESSON (Victor)—Crosscut from Roosevelt tunnel now directly under the Cresson shaft. Raise will be driven to connect with the bottom of the shaft.

DEADWOOD (Victor)—Rich ore opened in old Williams shaft at 55 ft. below the surface. Being worked by the Deadwood Leasing Co. under lease from United Gold Mines Co. New [illegible] are under con[illegible] [illegible] shipments of ore to be made soon.

MODOC (Victor)—Plans erection of a new ore house, to be equipped with conveyors and washers. The 10-drill compressor at the Modoc incline shaft will be removed and installed at No. 3 shaft, and with the 8-drill compressor now in commission will supply air for 18 machine drills. Retimbering of Last Dollar shaft completed to fifth level. Recent development south of shaft has opened three new veins. Plans to drive crosscut from 1500 level of No. 3 shaft to prospect Combination property.

REX (Victor)—New concentrating plant to be erected on property. Grading completed and masons are laying foundations

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Copper production in September was 10,341,468 lb. Producers were: Ahmeek, 1,866,665 lb.; Allouez, 510,000; C. & H., 4,964,872; Centennial, 157,671; Isle Royale, 1,185,643; La Salle, 124,000; Osceola, 1,153,217; Superior, 120,000 and White Pine, 260,000 pounds.

FEDERAL SYNDICATE (Calumet)—Closed down. Thirteenth mine to shut down in 18 months.

SOUTH KEARSARGE (Calumet)—Closed down south shaft No. 2. Men cannot be secured for both shafts.

QUINCY (Hancock)—Building additions to stamp mill plant at Mason to be used for installation of regrinding and flotation process.

MOHAWK (Mohawk)—Using saw-tooth system of mining successfully.

LAKE MILLING, SMELTING AND REFINING (Point Mills) — Employing women as head feeders and they are successfully doing the work.

MONTANA

Beaverhead County

C. F. MERCER (Polaris)—New cyanide plant for treatment of silver ores nearly completed.

Cascade County

ANACONDA (Great Falls) — Second furnace of ferromanganese plant has been blown in.

CASCADE (Neihart)—Construction of new 500-ton mill progressing. Ores, lead-silver sulphide with barite.

Deerlodge County

ANACONDA (Anaconda)—New stack at Washoe smeltery nearing completion.

Jefferson County

MOUNT WASHINGTON (Wickes)—Old silver producer has been opened up and is making shipments.

Park County

GIST (Contact) — Installing 100-ton concentrating plant on chrome property at Big Timber.

Silver Bow County

SCARCITY OF SKILLED MINERS is still felt in the Butte district, and indications are that the production of copper will be below normal this month and possibly next. Many miners left to seek work elsewhere at the start of the I. W. W. trouble, and though some have returned, it is feared that the majority will remain at places where the I. W. W.'s are not permitted by the Federal authorities to have as much sway as they did here in the matter of intimidating the men.

ANACONDA (Butte)—Production of copper during September was 21,800,000 lb. Company has completed its option for the purchase of the Walker Copper Co. of California. Stock was bought from the Plumas Mining Company.

BUTTE AND SUPERIOR (Butte)—During September mined 32,000 tons of ore, producing 9,500,000 lb. of zinc and 180,000 oz. of silver. Mill recovery was 93 per cent.

NORTH BUTTE (Butte)—Development proceeding at Sarsfield shaft, which has been dewatered

NEVADA

Clark County

LAS VEGAS & TONOPAH R. R. (Las Vegas)—Proposed discontinuance of service between Las Vegas and Goldfield denied by state railroad commission.

Humboldt County

ROCHESTER MINES (Rochester)—Gloryhole opened in quartz croppings on [illegible] Bruce [illegible] and large tonnage milling-grade ore can be [illegible]. Lack of water [illegible] has delayed starting of milling plant and [illegible] has been laid off temporarily as all storage room is filled with broken ore.

Lander County

NEVADA-AUSTIN (Austin)—Frank Margrave appointed receiver following filing of suit to foreclose mortgage on property held by W. C. Pitt. Company has mine at Newpass, and recently completed construction of mill there.

Lincoln County

CHRISTMAS CONSOLIDATED (Goodsprings)—Vanadium ore found on four claims, and shipment made to New York recently. Thorough examination will be made to determine possible production. Property in Yellow Pine district.

Lyon County

UVADA GOLD DREDGING (Dayton)—Operating at Santiago Pool, on Carson River, below Dayton, and making recovery of quicksilver and amalgam. Centrifugal pump used to elevate pulp to riffles. For several years during period of large production from Comstock Lode, seven mills using pan amalgamation process, operated along Carson River above this point.

WESTERN NEVADA (Mason)—Operated by Nevada-Douglas Co. New vein opened at extreme east end of 400 level. Ore is primary copper sulphide in character. Leasing inaugurated, and some carbonate and oxide ore is being mined on surface.

Mineral County

CANDELARIA MINES (Candelaria)—Stated that company has lease on old dumps and stope fillings of Mount Diablo and Argentum mines on a flat royalty basis, with agreement to erect plant to treat the ore. Has also acquired Lucky Hill, Badger and H. G. groups. Lucky Hill has extension of Mount Diablo vein, and rich silver ore is being opened. Ore being shipped to smeltery. Candelaria ores carry silver in form of cerargyrite, and cyanide process will be used in treatment.

MINE OPERATORS OF MINA AND LUNING DISTRICTS will hold a meeting at Reno during October to discuss the advisability of building a copper-smelting plant for those districts.

JUMBO COPPER (Mina)—Large tonnage good-grade copper ore being opened in development work. Property east of Mina.

OLYMPIC MINES (Omco)—Cyanide plant treating 100 tons of gold ore daily. Property 25 miles east of Mina. Fred Siebert is manager.

TUNGSTEN DIKE (Sodaville)—Large tonnage of scheelite ore opened in development work, and 40-ton concentrating plant is now being installed. Property formerly owned by Atkins-Kroll Co.; now owned by Messrs. Noonan, Bean and Beck.

WAGNER (Sodaville)—Opened to a depth of 250 ft. and considerable tungsten ore developed. Property adjoining Tungsten Dike mine. Mill may be built.

Nye County

WHITE CAPS (Manhattan)—No work being done on second and third levels. Shaft being sunk through hard rock, and has reached a depth of 85 ft. below fifth level. Mill is operating steadily.

JEFFERSON CANYON GOLD AND SILVER (Round Mountain)—Operating Kanrohat mine, in Jefferson Canyon. Cyanide process will be added to milling plant.

TONOPAH DISTRICT ore production for the week ended Oct. 5 was 8723 tons, of an estimated gross milling value of $148,291. Producers were: Tonopah Belmont, 2173 tons; Tonopah Mining, 3100; Tonopah Extension, 2044; West End, 983; Jim Butler, 102; Rescue, 119 and Montana, 202 tons

JIM BUTLER (Tonopah)—Crosscutting from winze on lowest level to Fraction vein [illegible] a good producer on levels above [illegible] by a fault.

TONOPAH DIVIDE (Tonopah)—Power line completed, and mine plant in operation. [illegible] of ore to begin at once and shipments of [illegible] Consolidated mill. Ore will be trucked to [illegible] station on railroad. Shaft will be sunk another lift of 100 ft. from 500 level.

[illegible]

End vein above 400 level. Ohio vein now furnishing major portion of ore milled. Milling plant making good recovery.

Storey County

UNION CONSOLIDATED (Virginia City)—Progress being made in shaft repairs; also development.

White Pine County

OPHIR GROUP (Aurora) — Tungsten claims have been taken over by interests represented by O. E. Roodhouse, who is in charge of operations. A 150-ton plant is being erected.

OKLAHOMA

Joplin District

COMMONWEALTH (Picher)—To redevelop, and will sink shafts deeper.

OKO MINING (Picher)—To build 250-ton mill, and will purchase jigs, crushers, compressors, and conveyors. A. Meyerhoff is superintendent.

UTAH

Beaver County

MAJESTIC MINES (Milford)—Water in shaft at 386 ft. point at Old Hickory property. Prospecting will be done at this level until pumping equipment can be installed. Ore carries copper with some silver and gold.

Juab County

TINTIC SHIPMENTS for week ended Oct. 11 totaled 164 cars as compared with 145 cars the week preceding.

APEX STANDARD (Eureka) — New hoist and compressor installed. Old shaft, down 165 ft., being repaired for further sinking.

CHIEF CONSOLIDATED (Eureka) — New shaft down over 250 ft. and good progress being made.

EUREKA-LILLY (Eureka)—Drifting west on 1200 level. Property adjoins the Tintic Standard.

IRON KING (Eureka)—New working shaft down 1050 ft. At 1200 level, crosscutting will be started for Tintic Standard vein.

NORTH BECK (Eureka) — Contract awarded to drive two drifts on 1200 level. Shaft recently sunk to the 1200 level.

ZUMA (Eureka)—Sinking from 500 level. Winze down 200 ft. P. J. Fennell is manager.

TINTIC MILLING (Silver City)—Mining ore under lease from Dragon Consolidated and from old Star ground, now a part of the Empire Mines Co. George H. Dern is manager.

Piute County

GREAT WESTERN (Marysvale)—Winze being sunk from tunnel level has cut copper ore. Property in Billion Canyon. J. H. Stocks, superintendent.

Salt Lake County

CONGESTION OF ORE from Alta, at Wasatch, has been relieved to some extent. The Denver & Rio Grande R. R. has a force of men making improvements on the track. The narrow gage road from the mines to Wasatch is in good condition and shipments are expected to be maintained at normal rate soon. Present season favorable for shipping from Alta and the Cottonwoods.

ALTA CONSOLIDATED (Alta.)—Winze being sunk on Braine fissure in ore.

COLUMBUS-REXALL (Alta.)—Silver-copper ore being taken from new raise near main winze. M. R. Evans is manager.

SELLS (Alta)—New aërial tramway from the ore lines to the railroad nearly complete.

Summit County

PARK CITY SHIPMENTS for the week ended Oct. 11 amounted to 3,220,780 lbs. of crude ore and concentrates.

AMERICAN FLAG (Park City)—Work to be resumed. To sink main shaft 200 ft., present depth 1130 ft. Water level just below 1100.

JUDGE MINING AND SMELTING (Park City)—Crosscut from Anchor tunnel to Daly West shaft has been completed, and prospecting and developing in this section will be undertaken soon by both the Judge and the Daly West.

NEW QUINCY (Park City)—Preparations being made to resume work, which will be done through the Daly West.

ONTARIO SILVER (Park City)—New incline shaft being sunk below 1700 level, and is prospecting some untouched territory. Most of the ore being shipped is coming from the 1600 and 1700 levels.

PARK-UTAH (Park City)—Drifting south from main operating tunnel. Paul Hunt is superintendent.

SILVER KING CONSOLIDATED (Park City)—Overhauling and additions to mill in Thaynes Canyon are completed, except for the placing of two large smokestacks. Capacity has been increased from 125 to 150 tons per day.

THREE KINGS (Park City)—New crosscut being driven to the southeast on 500 level has cut several porphyry dikes. Work being done to reach lower ore bearing limestone beds of the Park City formation. W. R. Elliot is manager.

WISCONSIN

Zinc-Lead District

CONNECTING LINK (Cuba City)—New producer has shipped 1200 tons of blende, galena and pyrite since Aug. 1 and has paid two dividends of 5% on $90,000. Situated five miles northeast of Cuba City on the Henry Dall land. Company has also proved up by churn drill and shaft, the ore range on the Coulthard lease, and contemplates the erection of another mill for this tract. R. A. Fox, Cuba City, is superintendent.

HARVEY LEASE (Cuba City)—Charles Wolfe has struck the "Dall" range by churn drill on the Joe Harvey land, north of the Connecting Link and states that a concentrating mill will be provided.

PAQUETTE (Shullsburg) — Material assembled for erection of 25-ton mill. W. A. Porter, Winona, Minn., is the principal owner. Lawrence Markley is superintendent.

CANADA

Ontario

BONSALL (Gowganda)—Drifting on 100 level.

CASTLE— (Gowganda)—Shaft which is being sunk under option by the Trethewey of Cobalt, is nearing the 300 level.

WALSH CLAIMS (Gowganda) — The Crown Reserve, of Cobalt, has relinquished its option on this property.

COBALT SHIPMENTS during September totaled 2,319,515 lb. of ore. Shipping properties were as follows: Dominion Reduction, 356,400 lb.; Coniagas, 308,151; McKinley-Darragh, 280,288; Buffalo, 264,060; Nipissing, 239,750; Kerr Lake, 173,666; Mining Corporation, 129,573; Right of Way, 77,628; Alladin, 76,000; Edwards & Wright, 65,974; La Rose, 65,930; Beaver Consolidated, 65,318; O'Brien, 64,010; Peterson Lake 60,000; National 59,215; Pittsburg Lorraine, 33,552 pounds.

OPHIR — (Cobalt) — Contact cut by winze and crosscutting being done to pick up vein encountered 140 ft. above.

DOMINION KIRKLAND (Kirkland Lake) Mineralized quartz vein opened up.

KIRKLAND - PORPHYRY (Kirkland Lake)—Extension has been given to injunction secured by the minority interests of the Orr Gold mines to prevent the sale of property to company

PATRICIA (Boston Creek) — Underground work is being speeded up. Four machines are in operation and lateral work is being done at 100 and 200 levels.

HATTIE (Coulson Township)—Ore zone has widened and is yielding rich samples of free gold and tellurides.

CASTLE OIL (Mosa)—Contracts let for drilling of 13 new wells in addition to one which is being sunk by the company. Two other wells are being drilled in the Shetland field, Lambton County.

INDIA

Burma

BURMA MINES (Namtu)—Erecting mill for concentrating lead, silver and zinc ores, according to "Commerce Reports." Mill being built under supervision of American engineers, and American machinery is used throughout. Mine is situated about six miles from Namtu, with which it is connected by a narrow-gage railway. Ore is brought out of the mine through a tunnel two miles long, and electric locomotives will be used to haul the mine cars to large storage bins at the portal. From these bins the ore will be hauled by rail to the mill bins at Namtu. Mill will have a capacity of at least 700 tons per day, and is laid out so that its daily capacity can be extended to 3000 tons. The Burma Mines Ltd., controlled by the Burma Corporation is the largest mining corporation operating in Burma. The resident manager and his assistant are Americans, and 33 other American engineers, superintendents, and mechanics are employed.

The Market Report

SILVER AND STERLING EXCHANGE

t.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Oct.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
7	4.7550	101⅛	49½	21	4.7550	101⅛	49½
8	4.7550	101⅛	49½	22	4.7550	101⅛	49½
9	4.7550	101⅛	49½	23	4.7550	101⅛	49½

New York quotations are as reported by Handy Harman and are in cents per troy ounce of bar ver, 999 fine. London quotations are in pence per y ounce of sterling silver, 925 fine.

AILY PRICES OF METALS IN NEW YORK

t.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
17	*26	†	8.05	7.75	8.30@8.50
18	*26	†	8.05	7.75	8½@8⅝
19	*26	†	8.05	7.75	8½@8⅝
21	*26	†	8.05	7.75	8⅜@8⅝
22	*26	†	8.05	7.75	8⅜@8⅝
23	*26	†	8.05	7.75	8⅜@8½

*Price fixed by agreement between American pper producers and the U. S. Government, accord- g to official statement for publication on Friday, ptember 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the rice for which has been fixed by agreement between merican copper producers and the U. S. Govern- ent, wherein there is no free market) are our ppraisal of the average of the major markets based enerally on sales as made and reported by producers nd agencies, and represent to the best of our judg- ent the prevailing values of the metals for the eliveries constituting the major markets, reduced to asis of New York, cash, except where St. Louis is e normal basing point.

The quotations for electrolytic copper are for cakes gots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c elow the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime estern brands. We quote New York price at 35c. r 100 lb. above St. Louis.

LONDON

Oct.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
17	122	122	137	334	334	29½	28½	54
18	122	122	137	334	334	29½	28½	54
19	...	...	...	...	...	...	...	...
21	122	122	137	334	334	29½	28½	54
22	122	122	137	334	334	29½	28½	54
23	122	122	137	334	334	29½	28½	54

The above table gives the closing quotations on ondon Metal Exchange. All prices are in pounds erling per ton of 2240 lb. For convenience in mparison of London prices, in pounds sterling per 40 lb., with American prices in cents per pound e following approximate ratios are given, reckoning change at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; 110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; 280 = 59.3937c.; £300 = 63.6362c. Variations, £1 0.2121205c.

Metal Markets

NEW YORK—Oct. 23, 1918

Copper—Refiners are falling further be- nd in their production and also in their ipments of what they have produced, ving to shortage of labor. The effects the influenza have been even more seri- s than was feared.

Late news from the front are to the fect that the Servians have regained the pper mines at Bor, which the Austrians ve been exploiting vigorously.

The influenza, which has now spread all over the United States is creating trouble in all industrial affairs. In the metal industry it is diminishing production.

The meeting between the copper producers and the War Industries Board, scheduled for this week, was called off and the matter of the price for copper after Nov. 1 is being arranged by correspondence. It is planned to continue the price of 26c. until Jan. 1, 1919. Most of the producers have already assented to this and it is expected that all of them will do so.

Copper Sheets—The base price of copper sheets remains at 35½c. per lb. Copper wire is quoted at 29½ to 30c. per lb. f.o.b. mill, carload lots.

Lead—The situation continues to work easier, owing to the effective curtailment of non-essential uses. Also, Governmental demands are not so stringent for some purposes, such as the construction of new sulphuric acid chambers, which are completed or are nearing completion.

The works of the Compañia Fundidora y Afinadora de Monterrey were taken over by the Compañia Minerales y Metales (American Metal Co.) on Sept. 15. This plant produces 2000 tons of lead per month and is the only one in Mexico that comprises a refinery.

Tin—The business in so far as this country is concerned is entirely in the hands of the U. S. Steel Products Co. It is believed that the announcement of the fixed price will be made soon.

The War Trade Board in a new ruling (W. T. B. R. 278) have introduced instructions on the importation of tin in order to give effect to the regulation of the distribution of tin and tin ores, concentrates and derivatives under the Tin Executive recently established in London. All outstanding licenses for the importation of pig tin, tin ore and tin concentrates, and for any chemical extracted therefrom, have been revoked as to ocean shipment from abroad after October 20, 1918. Hereafter no licenses will be issued for the importation of these commodities except to cover shipments consigned to the U. S. Steel Products Company.

To conform with the action taken by the Inter-allied Tin Control, all outstanding licenses for the importation of pig tin, tin, ore and tin concentrates have been revoked, effective Oct. 20. In the future licenses will be issued only to cover shipments consigned to the U. S. Steel Products Co.

Zinc—Following the consummation of large business last week, there was a sharp advance in the price, in which speculative buying, probably for covering shorts, apparently played a considerable part. The market responded sharply to this, owing to the improvement in the technical position, although the accumulation of unsold stocks in the aggregate was about as large at the end of the third quarter as it was at the end of the second. However, the real difficulty in obtaining supplies for prompt shipment led to the natural conjecture that there had been some change in the distribution of the stocks in a way that was favorable to the market.

Following the first advance there was a slight reaction, during which some large business was done, including some buying by galvanizers, and toward the close an easier tone was exhibited, but the appearance of an inquiry for a large block for export was considered likely to have some effect within a day or two.

Throughout the week, spelter for prompt shipment commanded a premium, while contracts for delivery during the first quarter of 1919 were freely offered at 8c.

At the request of the War Industries Board, the zinc smelters conferred with a committee of the Missouri and Oklahoma producers in New York last week in order to arrange a sliding scale for zinc ore. The representatives of the smelters and the miners came to an agreement, whereby each smelter is to take its required quota of ore, making payment therefor according to the stipulated schedule which is based on the price for spelter as quoted by the "Engineering and Mining Journal." A large proportion of the smelters have already assented to this agreement, but the matter has not yet been completed.

Zinc Sheets—Unchanged at $15 per 100 lb. less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—There was further weakness, but very little business was done. We quote spot at 13@13½c. One important interest expresses the opinion that stocks are now smaller than ever known in the history of the trade. Without going quite so far as that, certainly they have been greatly reduced. Consequently, the weakness in this market is the more surprising.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—This metal is quoted at $1.50 @ $2 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Unchanged at $125@130. San Francisco telegraphed "No quotation; market unsettled." The meeting between the quicksilver producers and the War Industries Board, to be held in Washington, has been postponed to Nov. 20.

Silver and Platinum

Silver—Silver is steady at the fixed price in London, 49½. Supplies are going forward in about the usual proportions to England and India. Some small amounts have been purchased account the French Mint. Exports to London for week ending Oct. 19 were 1,033,000 ozs. Exports of bar silver from San Francisco, for Sept. were 8,178,000 ounces.

Diplomats in Peking of the various Allied nations, with the exception of the Japanese representatives, have approved an application recently made by China for an embargo on the export of silver. The Chinese officials are said to be formulating the conditions, which will be forwarded to the foreign banks at Shanghai for their consideration.

Mexican dollars at New York: Oct. 17, 77½; Oct. 18, 77½; Oct. 19, 77½; Oct. 21, 77½; Oct. 22, 77½; Oct. 23, 77½.

Platinum—Unchanged.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 19.—Blende, per ton, high, $78.70; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $51@50; calamine, basis 40% zinc, $40@35. Average selling prices: blende $51.31; calamine, $39.29; all zinc ores, $50.51.

Lead, high, $102.35; basis 80% lead, $100; average selling price, all grades of lead, $97.38 per ton.

Shipments the week: Blende 9756, calamine 704, lead 1265 tons. Value, all ores the week, $651,520.

Recently there has been recorded an advance of $1 per ton, but this week advances of 50c. and $1 per ton caused ore to change from one to another buyer. Prime Western grade was generally held at $50 base, but a desire for some with particularly low-lead content caused the slight advances, and they got the ore. Lead has been gradualy lowering for several weeks.

Platteville, Wis., Oct. 19—Blende, basis 60% zinc, highest price reported $74.45; base price for premium grade, $75; base price for high-lead blende, $52. Lead ore, basis 80% lead, $97.50 per ton. Shipments reported for the week were 2335 tons blende, 40 tons galena, and 474 tons sulphur ore. For the year to date the totals are 103,555 tons blende, 6369 tons galena and 37,344 tons sulphur ore. During the week 1798 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—The market is oversupplied and the only ore that is readily saleable is that assaying upward of 50% chrome oxide, and less than 2% of silica.

Manganese Ore—Unchanged.

Molybdenum Ore—Very little interest is exhibited.

Pyrites—Prices of domestic pyrites are determined by negotiation between buyer and seller; the price range is between 30@35c. per unit.

Tungsten Ore—Prices are unchanged from last week, as also are the general conditions.

Iron Trade Review

PITTSBURGH—Oct. 22

At the Duquesne Steel Works, employing about 5100 men, an average of about 750 men per day have been off duty the last few days, chiefly by reason of Spanish influenza. At the Homestead works about 800 of the 8000 men employed at the steel works proper have been away. The two plants show 15% and 10% respectively of absence, but these are exceptionally high. At many plants the epidemic has had little effect. Steel production on the whole is curtailed but little, and is running approximately as high as in September, when such an excellent record was made.

Distribution of steel under the regulations is not working as well as formerly, and some producers are rather seriously concerned over the outlook. It is predicted that trouble will result from the new ruling that priority can be "reflected" but once, so that a given priority applies to a sub-contractor but not to a sub-sub-contractor, who must be served with a separate priority order, secured afresh. There may be so many of these as to delay matters, while mills have difficulty in making up rolling schedules with so many small orders. The War Industries Board regards the ruling as imperative, in order to conserve steel. The continued denial of steel to consumers whose grade of priority is below that which the mills can reach with the amount of steel they have to distribute is being felt much more seriously than formerly. Efforts being made to save steel in the higher ranges of priority may relieve the situation, but new military requirements of importance are continually cropping out. It seems that the more successful the Allied arms are, the more steel is needed.

The regulations as to consumption of tin plate in packing non-perishable food products have been promulgated, and are not particularly drastic. Regulations are expected permitting the use of limited quantities of tin plate for packing various other goods, and the outlook is that more tin plate will be permitted to be made and used in the next three months than was expected a month ago would be the case. Operations are not to exceed 70%, but may reach that proportion. Steel for the production of butt weld pipe has been cut to the various pipe mills, cutting down their output of butt weld by about 30% in November and December. A part of the steel thus saved wil be used for an increased output of oil country goods, which have a general B-2 priority, lately extended to goods handled through jobbers. Sheet production is at about 55% of capacity, some mills operating much below this and some considerably above. Circumstances prevent an evening up of the front in this matter, and the alternative is being adopted of redistributing some sheet orders so that all mills will be able to work down to about the same degree of priority in taking care of orders.

Pig Iron—In the country as a whole the production of foundry grades of pig iron is being restricted further, in favor of the manufacture of basic iron. Hopes are entertained nevertheless that foundry iron can be furnished for the manufacture of the large quantities of semi-steel shells desired. Representations are being made that methods of manufacture will be explained such as to induce foundrymen to undertake the work. Hitherto they have doubted their ability to carry out orders offered. There is practically no activity in the market, and there are few fresh allocations. We quote the market at Government limits as follows: Bessemer, [illegible]; basic, $33; No. 2 foundry, $34; malleable, $34.50; forge, $33, f.o.b. furnace, freight from valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less.

Steel—There is practically nothing being done in the open market, all available unfinished steel being allocated. We quote: Billets, [illegible]; sheet bars and small billets, [illegible]; slabs, [illegible]; rods, [illegible].

Ferroalloys—The market in both ferromanganese and spiegeleisen is very quiet, [illegible]. We quote 70% ferromanganese at [illegible] delivered, [illegible] for extra units, and 16% spiegeleisen at [illegible] furnace.

Coke—Production of coke in the Connellsville and Lower Connellsville region has continued to decline slightly, but shipments of raw coal to byproduct plants have increased rather sharply. The byproduct plants are all fairly well supplied with coal, but only with the greatest difficulty in some cases, and there is practically no stocking. The quality of beehive coke is improving slightly, on the whole, but there is still much improvement desired.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	......	32.361	44.324	......
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	(a)	244.038	343.905
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	......	6.650	......	30.500	......
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	43.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8. 73	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	......	7.813	......	54.000	......
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.5	34.40
October	37.25		33.95		33.95	......
November	37.25		33.95		33.95	......
December	37.25		33.95		33.95	......
Year	$43.57		$39.62		$40.83	......

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Oct. 22
Alaska Gold M.	3¾
Alaska Juneau	2⅛
Am.Sm.&Ref.,com.	88½
Am. Sm. & Ref., pf.	108
Am. Sm. Sec., pf., A.	89¾
Am. Zinc	15¾
Am. Zinc, pf.	51
Anaconda	71⅞
Batopilas Min.	1⅜
Bethlehem Steel	71¾
Butte & Superior	24¾
Butte Cop. & Zinc.	10
Cerro de Pasco	36⅞
Chile Cop.	21¼
Chino	41⅞
Colo. Fuel & Iron	44½
Crucible Steel	56¾
Crucible Steel, pf.	89
Dome Mines	12
Federal M. & S.	11¼
Federal M. & S., pf.	39¾
Great Nor., ore ctf.	33¼
Greene Cananea	56½
Gulf States Steel	72¾
Homestake	85
Inspiration Con.	55½
International Nickel	32⅝
Kennecott	38¼
Lackawanna Steel	76
Mexican Petrol	155
Miami Copper	28⅞
Nat'l Lead, com.	61¼
National Lead, pf.	104
Nev. Consol	20½
Ontario Min.	7¼
Ray Con	24⅜
Republic I.&S.,com.	86
Republic I. & S., pf.	100¼
Sloss-Sheffield	55
Tennessee C. & C.	17¼
U. S. Steel, com.	110⅞
U. S. Steel, pf.	112⅝
Utah Copper	90¼
Va. Iron C. & C.	70

BOSTON CURB*	Oct. 22
Alaska Mines Corp.	‡.12
Boston Ely	.94
Boston & Mont.	.45
Butte & Lon'n Dev.	.12
Calaveras	.50
Chief Con.	3⅛
Contact	‡.15
Corbin	.15
Cortez	.13
Crown Reserve	.18
Crystal Cop.	.45
Eagle & Blue Bell	2¼
First Nat. Cop.	1¾
Houghton Copper	.45
Intermountain	.05
Iron Cap	18¾
Mexican Metals	.33
Mines of America	.90
Mojave Tungsten	.07
Nat. Zinc & Lead	.11
Nevada-Douglas	.40
New Baltic	.60
New Cornelia	18½
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.06
Yukon Gold	.85

SAN FRAN.*	Oct. 22
Alta	.03
Andes	.04
Best & Belcher	.01
Caledonia	.01
Challenge Con.	.03
Confidence	.08
Con. Virginia	.07
Gould & Curry	‡.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.05
Mexican	.12
Occidental	‡.40
Ophir	.08
Overman	.01
Savage	‡.02
Sierra Nevada	.04
Union Con.	.10
Utah Con.	.01
Belmont	2.35
Jim Butler	.48
MacNamara	.20
Midway	.08
Mont.-Tonopah	.07
North Star	.07
Rescue Eula	.08
West End Con.	.98
Atlanta	.03
Booth	.02
Comb. Frac.	‡.02
Florence	.10
Jumbo Extension	.09
Kewanas	.02
Nevada Hills	.02
Nevada Packard	.22
Round Mountain	.15
Silver Pick	.02
White Caps	.11
Big Jim	‡.75
United Eastern	4.00

COLO. SPRINGS*	Oct. 22
Cresson Con.	4.93¾
Doctor Jack Pot	.03¼
Elkton Con.	.05
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.69
Granite	.18
Isabella	.06
Mary McKinney	.05
Portland	.95
United Gold M.	.12
Vindicator	.39½

BOSTON EXCH.*	Oct.
Adventure	‡.60
Ahmeek	82
Algomah	‡.15
Allouez	‡49
Ariz. Com., ctfs.	15
Arnold	‡.20
Bingham Mines	10
Bonanza	‡.16
Butte-Balaklava	‡.25
Calumet & Ariz.	70
Calumet & Hecla	459
Centennial	‡11
Copper Range	49
Daly West	2
Davis-Daly	5
East Butte	10
Franklin	‡4
Granby	‡79
Hancock	‡6
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	26
Keweenaw	‡.70
Lake	‡5
La Salle	‡3
Mason Valley	‡3
Mass	4
Mayflower	3
Michigan	3
Mohawk	57
New Arcadian	‡1
New Idria	‡13
North Butte	14
North Lake	‡.40
Ojibway	‡.75
Old Dominion	42
Osceola	56
Quincy	72
St. Mary's M. L.	49
Santa Fe	‡.60
Seneca	12
Shannon	3
Shattuck-Ariz	‡14
So. Lake	‡1
So. Utah	‡.12
Superior	‡4
Superior & Bost.	3
Trinity	3
Tuolumne	.95
U. S. Smelting	48
U. S. Smelt'g, pf.	‡43
Utah Apex	2
Utah Con.	10
Utah Metal	2
Victoria	‡2
Winona	‡1
Wolverine	21
Wyandot	‡.50

N. Y. CURB†	Oct. 2
Big Ledge	
Butte & N. Y.	‡.75
Butte Detroit	.05
Caledonia	.48
Calumet & Jerome	
Can. Cop. Corpn.	2
Carlisle	‡2
Cashboy	.03
Con. Ariz. Sm.	1
Con. Coppermines	5
Emma Con.	‡.03
Goldfield Con.	.21
Goldfield Merger	‡.01
Greenmonster	‡
Hecla Min.	5
Howe Sound	‡4
Jerome Verde	
Louisiana	‡
Magma	‡32
Majestic	.19
Marsh	‡.03
McKinley-Dar-Sa.	.40
Milford	‡.75
Mother Lode	.39
Nixon Nevada	.37
Ohio Cop.	
Rawley	‡2
Ray Hercules	4
Richmond	‡.56
Rochester Mines	.33
St. Joseph Lead	‡14
Standard S. L.	
Stewart	.14
Success	.11
Tonopah	‡2
Tonopah Ex.	1
Tribullion	‡
Troy Arizona	.10
United Verde Ext.	38
United Zinc	‡1
Utica Mines	‡.08

TORONTO*	Oct. 2
Adanac	.08
Bailey	.05
Beaver Con.	.27
Chambers Ferland	.09
Coniagas	3.00
Hargraves	.03
Kerr Lake	6.00
La Rose	.37
Min. Corp. of Can.	2.00
Nipissing	8.25
Peterson Lake	.08
Temiskaming	.28
Wettlaufer-Lor.	.03
Davidson	‡.25
Dome Exten.	.20
Dome Lake	.10
Hollinger	4.75
McIntyre	1.50
Newray	.09
Porcu. Crown	.15
Teck-Hughes	.27
Vipond	‡.14
West Dome	.09

* Bid prices †Closing prices. ‡ Last quotations.

Engineering and Mining Journal

November 2, 1918

Volume 106 Number 18

BUNKER HILL PLANT FROM THE EAST

Lead Refining at the Bunker Hill Plant*

BY C. T. RICE

Refinery practice at the Bunker Hill plant is comprehensive, and both design and equipment merit more than passing notice. The paper presents descriptions of special apparatus, such as the Miller casting machine. Baghouse construction and operation, and the Cottrell system are described.

THE refined lead at the Bunker Hill & Sullivan plant goes by steel launders to one of the four 50-ton merchant kettles. From this it is sent by centrifugal pump to one of the two Miller casting machines, where it is molded into 100-lb. pigs that assay 99.989% lead, 0.002% antimony, 0.0005% copper, a trace of zinc, and 0.15 oz. silver per ton—arsenic and bismuth nil—being practically all of corroding grade. The casting machine is the invention of John F. Miller, of Salt Lake City, and has been in use at Trail for several years. Recently two machines were installed at the Port Pirie smeltery, Australia, but with these exceptions the Bunker Hill machine is the only one constructed since the invention was originally brought out, in British Columbia. As the machine casts under pressure, the 100-lb. pigs produced at the Bunker Hill plant vary only a few ounces in weight. With one of these machines, four men can cast and load into a railroad car 20 tons of pig lead in an hour. Other lead smelters have failed to show due appreciation for an admirable labor-saving device.

The Miller casting machine, Figs. 1 to 3, consists of a wheel rotating upon a horizontal axis that carries a series of water-jacketed molds under a fixed water-jacketed cover-plate, in which a diaphragm is placed. Through a slot in this diaphragm the stream of metal enters the mold. As there is a pipe, through which molten lead is constantly circulating, the pig is formed under pressure. The excess lead is returned from the diaphragm through a pipe to the kettle. The molten metal is thus prevented from solidifying when it comes in contact with the water-jacketed cover of the molds. The cooling of the mold by the jacket water causes the outside of the pig to solidify quickly, so that, as the mold moves ahead with the rotation of the shaft, the slot on the diaphragm becomes sealed and the excess lead returns to the kettle by a pipe, as shown in Fig. 2. Another empty mold then comes up in front of the slot, and another pig is immediately formed.

By the time the pigs have traveled far enough to drop out of the mold, the metal has not only solidified completely, but has also contracted sufficiently for the pig to fall out by its own weight on the truck placed under the machine to catch it. Guard rails, as shown in Fig. 3, hold the pigs in place. The uniformity with which the pigs are cast, when the machine has once become warm, is shown in Fig. 4. During the first half hour a little trouble will probably be experienced with the pump and the casting machine because of cold metal (the lead must be about 720° F. for good castings), and an occasional pig that is not full size will be formed. But as soon as the pipes have become thoroughly warmed, this trouble ceases.

The skim from the zincking kettles is taken to the silver refinery, where it is charged into graphite crucibles, and the zinc is distilled in Faber du Faur furnaces (Figs. 5 and 6), leaving the gold and silver behind in the lead. The zinc as it distills is caught in a condenser and tapped into molds from time to time, as shown in Fig. 6. The retort metal is poured into bars and sent to

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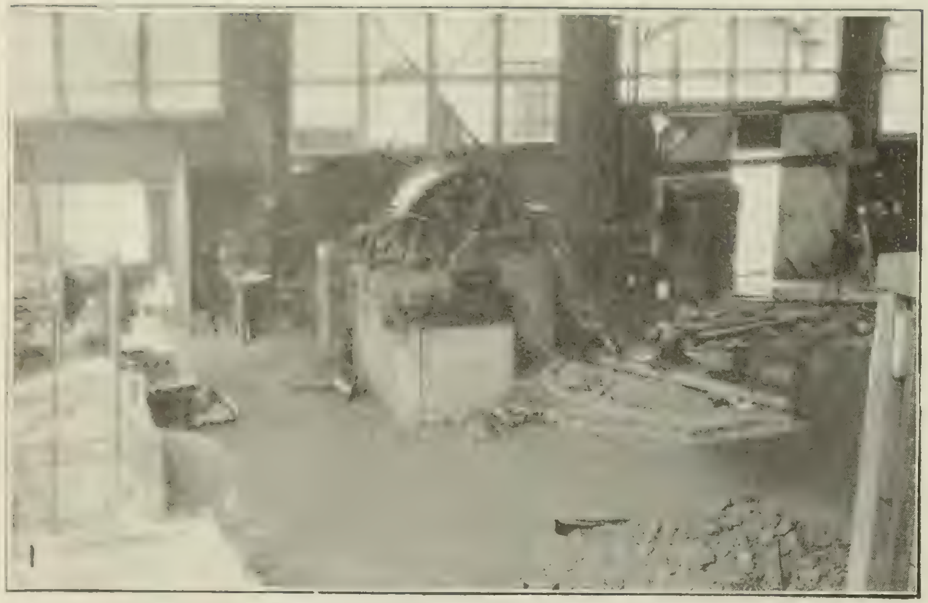
*The fifth and last of a series of articles on the design and operation of the Bunker Hill & Sullivan smeltery and refinery which began in the July 20 issue.



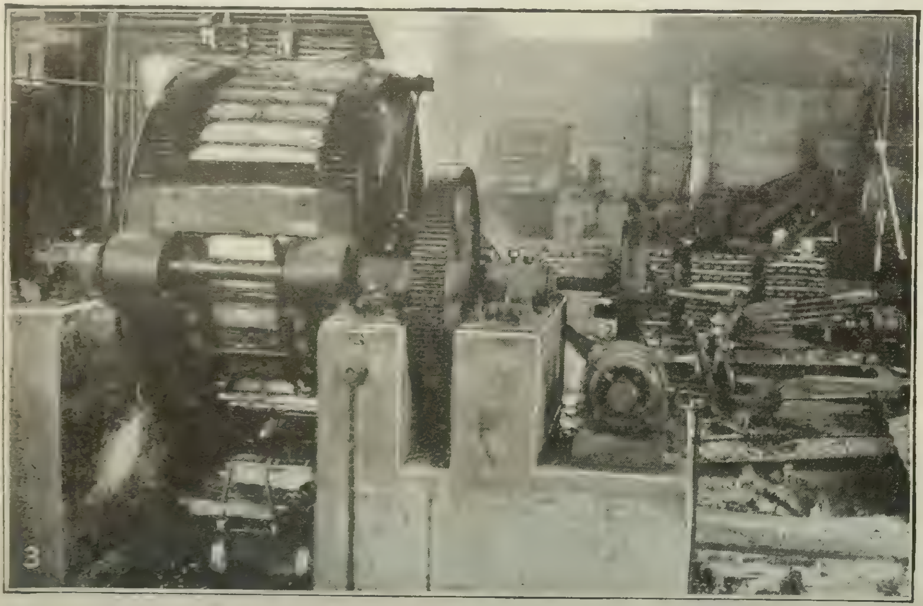
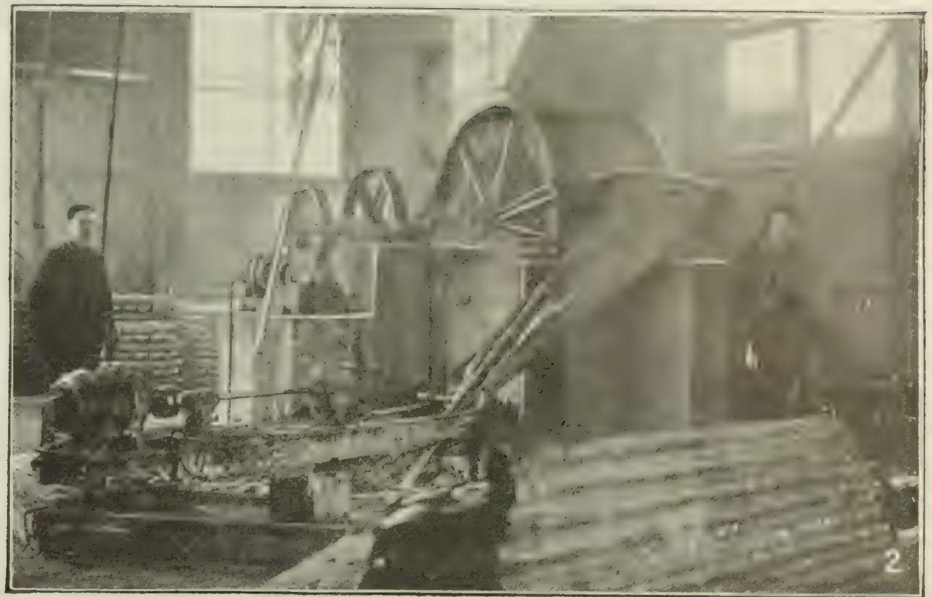


FIG. 1. MILLER CASTING MACHINE, LEAD PUMP, AND MERCHANT KETTLE
FIG. 3. DELIVERING THE MOLDED LEAD PIGS TO CAR UNDERNEATH



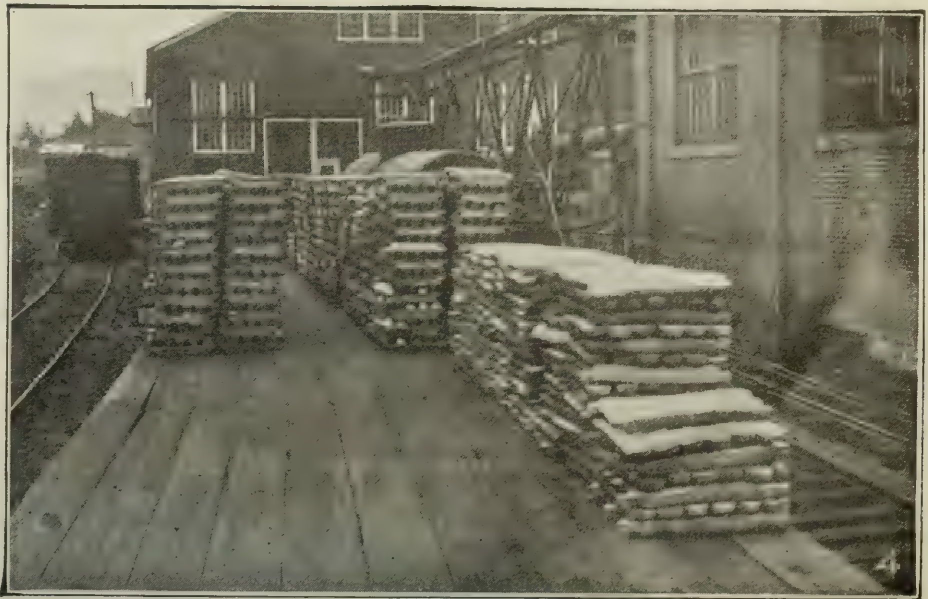
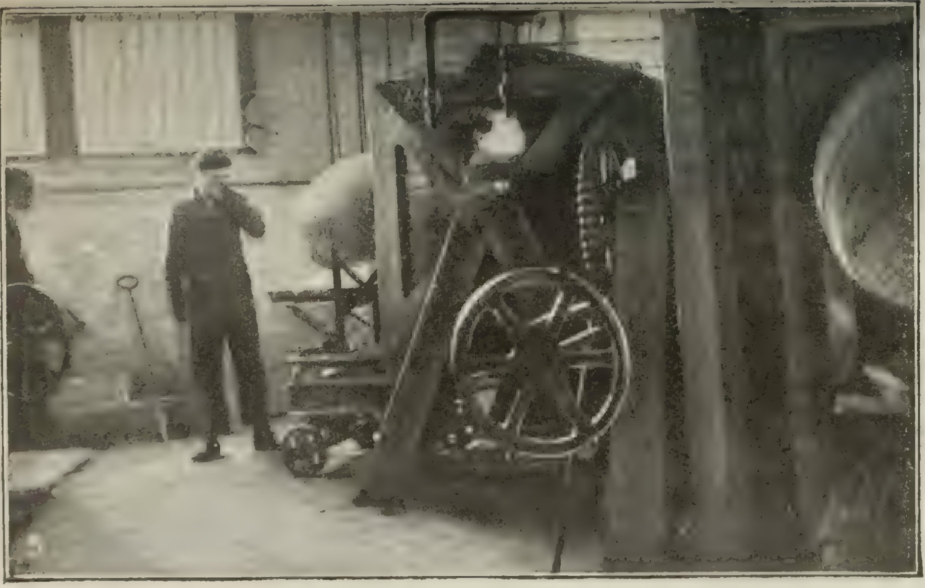
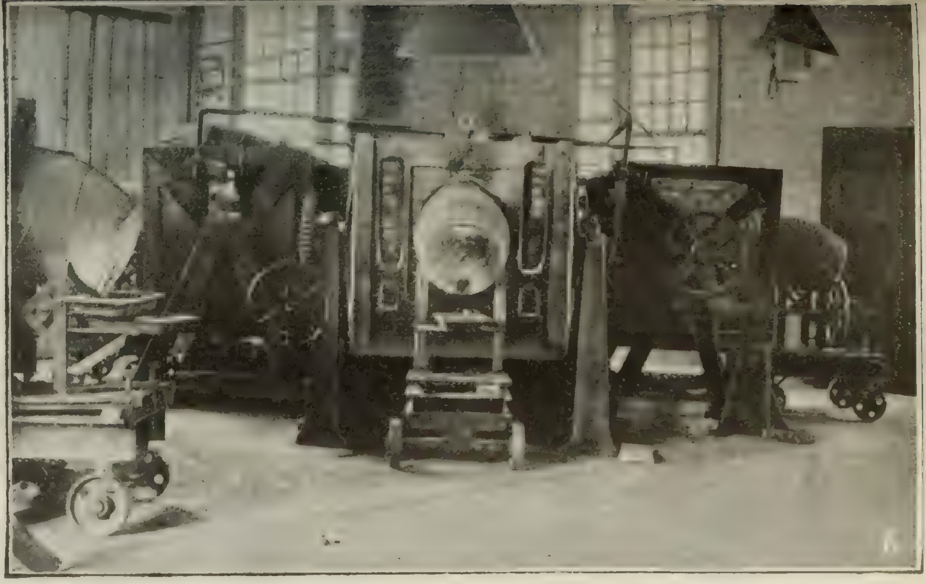
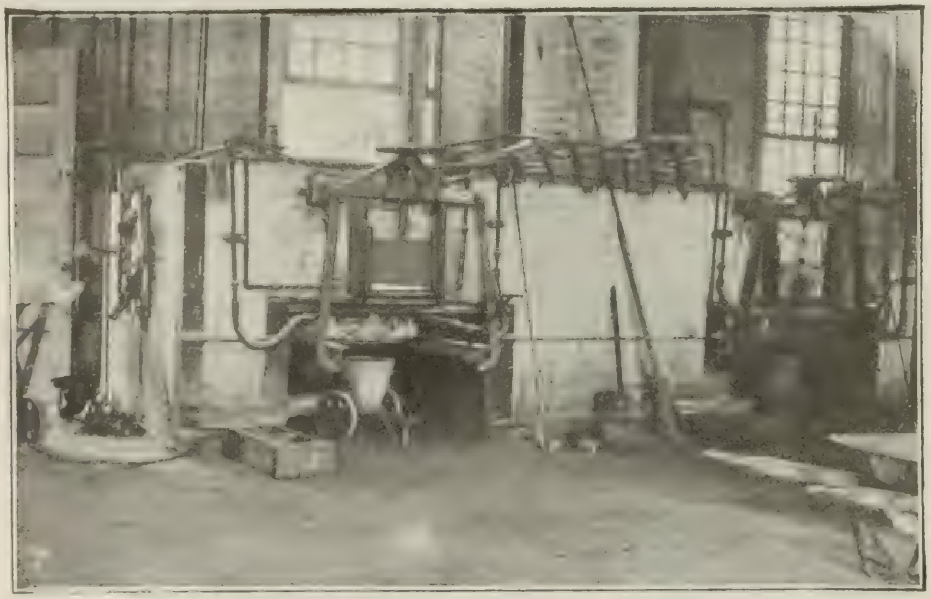


FIG. 2. RETURNING EXCESS LEAD FROM CASTING MACHINE
FIG. 4. LEAD PIGS READY FOR LOADING







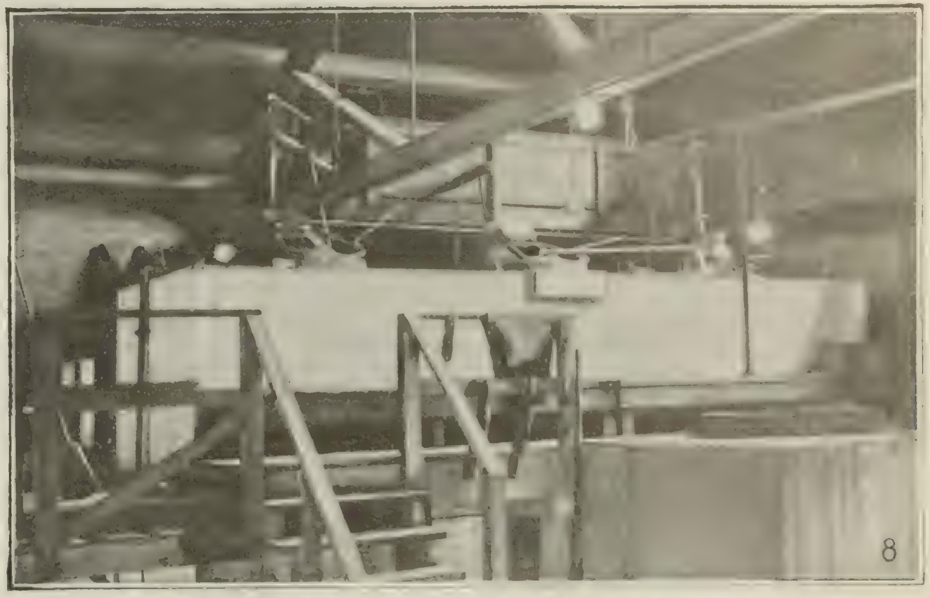
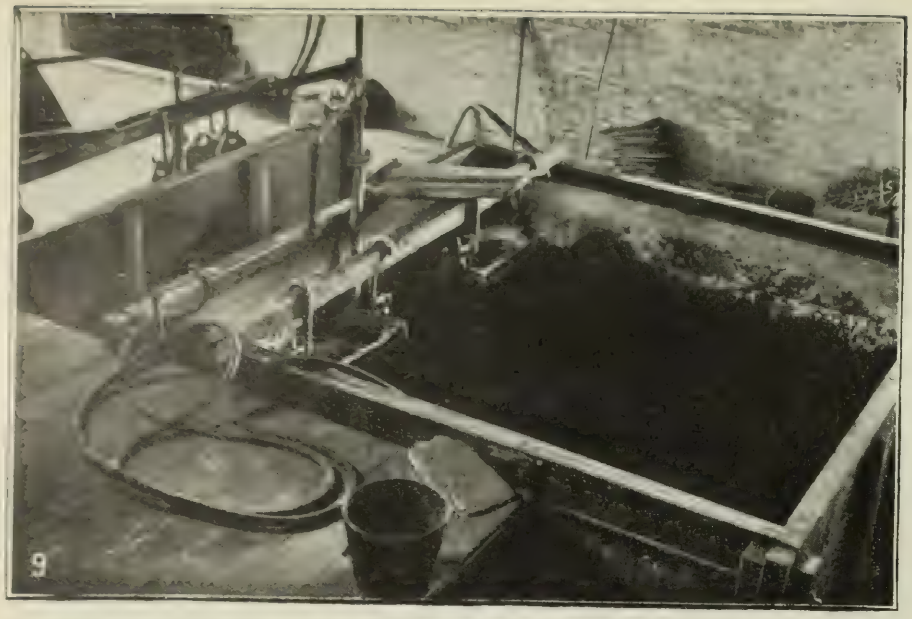


FIG. 5. TAPPING ZINC FROM FABER DU FAUR CONDENSER
FIG. 7. CUPEL FURNACE IN THE SILVER REFINERY

FIG. 6. FABER DU FAUR FURNACES IN THE REFINERY
FIG. 8. PARTING KETTLES IN THE SILVER REFINERY



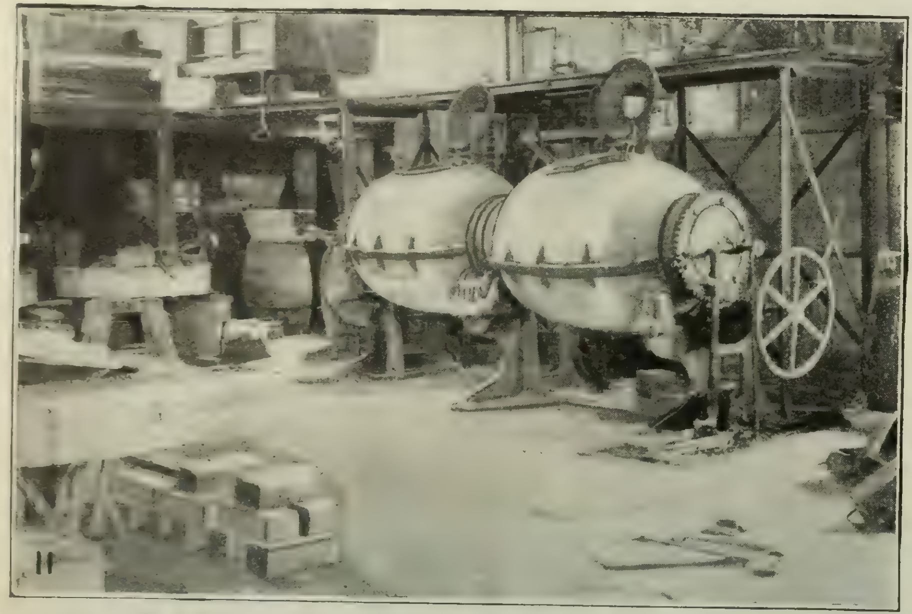
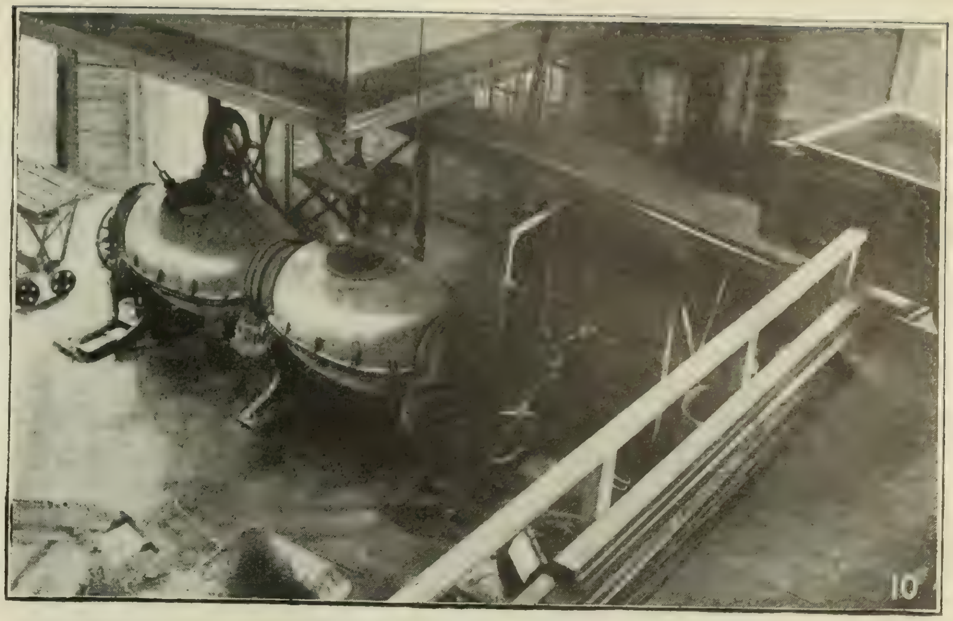
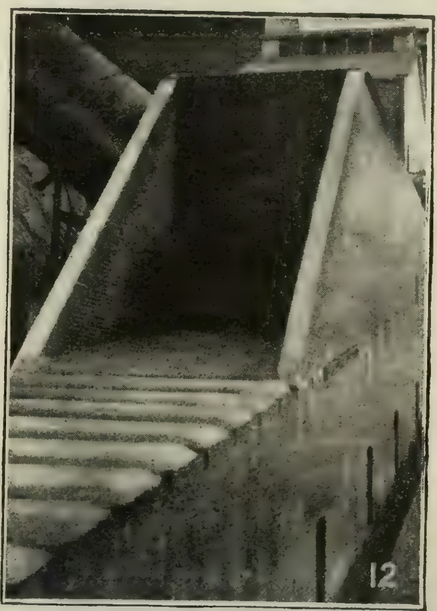


FIG. 9. LEAD-LINED PRECIPITATE VATS IN SILVER REFINERY
FIG. 11. DOUBLE MONARCH MELTING FURNACE IN SILVER REFINERY





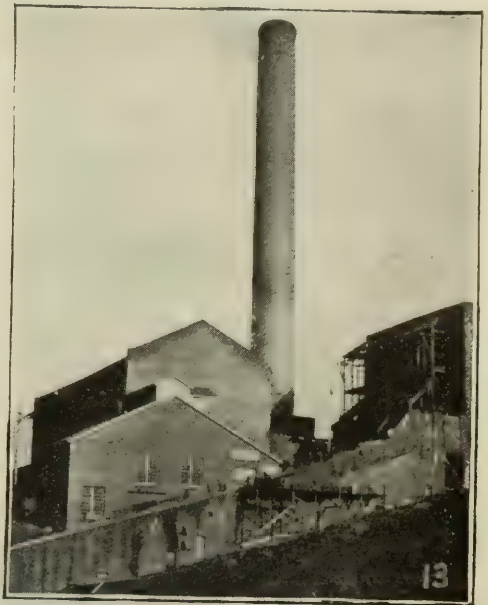


FIG. 10. SILVER SLUDGE FILTER CAR
FIG. 12. MAIN FLUE UNDER ROASTER FLUE
FIG. 13. STACK, BAGHOUSE AND COTTRELL TREATER

he cupel furnace (Fig. 7) where the lead is oxidized, nd the litharge tapped off as necessary, and returned to he softening furnaces for re-treatment.

After the lead has been removed, the doré metal is oured into flat bars. These bars are parted, by the ulphuric acid method, in iron kettles, shown in Fig. 8, 5° Bé. acid being used. The silver sulphate obtained is iphoned off and sent to the lead-lined precipitation tanks (Fig. 9). The gold sludge, after being collected and washed, is dried, charged into a graphite crucible, melted in an oil-fired furnace, and then poured into cast-ron molds. The lead-lined tanks contain copper bars, and the silver is obtained by boiling the sulphate solution and precipitating the silver on the copper as a sludge, which falls to the bottom of the tank. The copper-sulphate solution which results is piped to the sulphate plant, where the liquid is evaporated and the copper sulphate obtained by double crystallization in almost pure orm. The mother liquor is then boiled to strength, and eturned to the acid storage tank for re-use in the silver efinery.

The cement silver obtained by precipitation from the ulphate solution, after being washed, is filtered in a anvas bag in the car (Fig. 10), and then is charged nto a double Monarch melting furnace (Fig. 11), where t is melted and poured into silver bars.

DETAILS OF FLUE CONSTRUCTION

The gases from the blast furnaces are taken by downomers to a brick flue which goes to the baghouse fans and the stack. To facilitate cleaning, this first brick lue is made with a hopper bottom. As the concrete reaining wall above the blast-furnace building is made to orm one of the walls of the flue by lining it with four nches of brickwork, the hopper bottom slopes only oward the front, where gates are placed at frequent inervals. The main flue itself is rectangular in section nd built with a flat bottom, as it is cleaned through manholes in the sides, with dry walls of brick that may be opened easily.

The feature of the brick flues at the Bunker Hill & Sullivan smeltery is that they are roofed over with transverse jack arches carried on I-beams. These jack arches are formed of special hollow radial tiling, capped with a ayer of a cement grout from ¾ to 1 in. thick. The plant had been running nine months at the time the notes for his article were obtained, and the roof had stood dmirably.

Gases from the balloon flue which serves the roaster building join the main flue that comes up from the blast-furnace flue and are led, in a brick flue placed on top of the main flue, to the Cottrell plant. Both flues are roofed over with hollow-tile transverse jack arches. At present the gases from the various refining furnaces are taken by a steel-pipe flue to the main brick duct eading up from the blast-furnace flue. But this will soon be changed so that the gases from the various refining furnaces and kettles are led by special duct to he flue that takes the roaster gases to the Cottrell reaters.

One of the features of this smeltery is the placing of he baghouse and the Cottrell plant near one another at he base of the stack (Fig. 13) so that both can be operated by two men, one in the power house and the other attending the bags. The gases from the blast furnaces go to the baghouse, as they vary too much in amount and composition to be handled efficiently by the Cottrell treaters. The Cottrell system requires constant temperature, velocity, and composition of the gases treated, in order that efficient recovery of fume and dust may be made.

The baghouse, which is 130 ft. long by 56 ft. wide and contains 1200 bags 18 in. in diameter and 30 ft. long, is divided into three main sections of 400 bags each. Under the nipple floor each of these main sections is divided into four smaller compartments to facilitate cleaning, an independent damper permitting each section to be shut off from the main flue while it is being cleaned. The gases are taken from the main flue and sent to the baghouse by one of two Buffalo Forge No. 19 special conoidal fans. Each fan is driven by its own 100-hp. motor and has a capacity of 160,000 cu.ft. per minute. The fans are placed in the same power house as the rectifiers of the Cottrell plant.

The bags are shaken mechanically by a system of levers from a line shaft driven by a 10-hp. motor and are hung in rows of 25. There are 16 rows of bags in each of the three sections into which the upper part of the baghouse is divided, and each of these sections is served by two shaker shafts which operate eight rows of 25 bags each. The bags are suspended by rods from I-beam carriers that run lengthwise over the rows, and the individual bags fasten into the bottom rings of these rods. The bags in each row are wired together at the carrier rings; and at the far end this wire fastens into a rod that passes through a stuffing box in the back wall of the baghouse. This stuffing box consists simply of a 2-in. pipe babbitted down so as to fit the rod snugly. On the outside of the wall, each of these shaker rods is fastened to a strong spring, so that the bags are shaken in tension. At the other end a similar stuffing box is used to carry the rod that connects with the eccentric rod on the shaft, and each shaker shaft is equipped with a clutch.

The cleaner sections below the thimble floor are 14½ ft. high, with a flat brick-paved floor. The dust caught is sintered and removed in cars. It is taken later by railroad car to one of the secondary bins to be returned to the blast furnaces. As this sintered material assays as high as 76% lead and is porous, it aids greatly in loosening the charge in the blast furnaces. About 125 tons of fine flue dust a month is caught at the baghouse. The gases are kept at a temperature of about 180° F. as they enter, and practically no trouble is experienced with burning of the bags. There is little arsenic in the ore; and whenever the temperature of the blast-furnace gases rises above 200° F., cold air is added at the intake flue.

COTTRELL TREATER TUBES

The treater house of the Cottrell plant is novel in construction, being made of bricks, kept low, and designed with down-draft flow of the gases. The stack draft pulls the gases up through a flue that runs longitudinally over the top of the treater house, and the gases are then sucked down through dampers into each of the four sections. In each unit are 64 treater pipes 12 in. in diameter, arranged in rows of eight each. These pipes are connected by plates in groups of four; and the shaking of the pipes is effected by hammers carried on a shaft running through the center of the section, and near the bottom. The dust which accumulates upon the pipes is removed where the hammers strike. In the center of each treater pipe is suspended a No. 10 jack chain with a 20-lb. weight at its bottom. The chains pass through a grid at the bottom, so as to keep them properly centered in the different precipitation pipes, to prevent their developing a swing after they have been shaken to remove dust, and to obviate oscillations due to other causes. The chains hang from bus bars that run longitudinally over the different rows of pipes in the upper header of the section, which connects through a damper with the main flue at the top of the treater building. These bus bars are carefully insulated from the building. The dust precipitated from the gases accumulates on the chains as well as on the inside of the pipes. A device that jars the chains is used to remove the dust. This is placed in the upper header of the section and arranged so that it can be operated from the outside of the building.

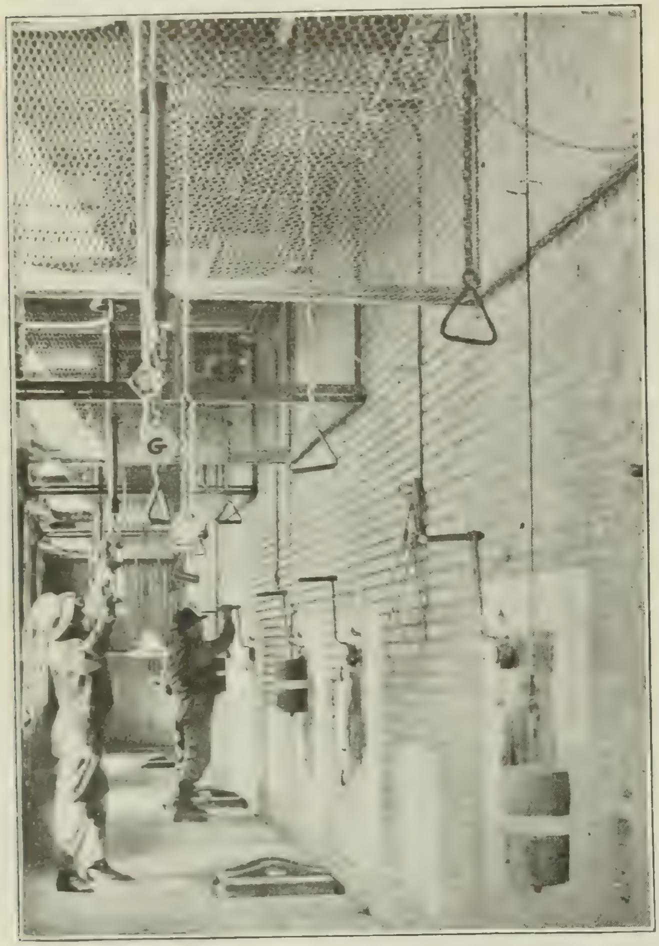


FIG. 14. OPERATING FLOOR—COTTRELL TREATER

TEMPERATURE UNIFORMITY INSURED

In a treater in which discharge is by down-takes from the top of the section, the gases, as they issue from the different pipes, curl around and rise to the top under the pull of the stack draft. Consequently the air in the dust chamber below the pipes is clear and free from sulphur smoke, and the operation of the different pipes can be readily inspected. As the gases come in and go out at the top of each section (for the two down-takes lead off from the side immediately under the top header), the temperature is kept more uniform throughout the section than if the gases were drawn off directly at the bottom. The brick construction of the building also helps considerably in keeping an even temperature throughout the treater—an important aid to efficient operation. It was, however, not with this idea that brick was used, but because it was difficult at the time to get the steel needed for the construction of the treater building. By leading the gases off from the top of each section a better mechanical settling of the flue dust is obtained than if they were taken off at the bottom, for, in such a treater as this, nearly one-half of the fume recovered is due to mechanical settlement.

The dust-collecting chamber at the bottom of the treater is made of ample dimensions and has gates on one side for the removal of precipitated dust. Access to the treater sections is also provided through light steel explosion doors on the sides of the different sections. About 2½ tons of dust, assaying 60% lead, is caught in the treater each day.

Particular attention has been given, in designing this treater, to the arrangement of incoming line switche shaking devices, and other mechanisms, so that ever thing can be operated from one platform level, (Fig. 14 The incoming lines are carried on poles outside the trea er house, and each section is fed directly from one these poles to its switch, which is placed on the extren outside of the operating platform. Consequently, throwing the proper switch, each section can be

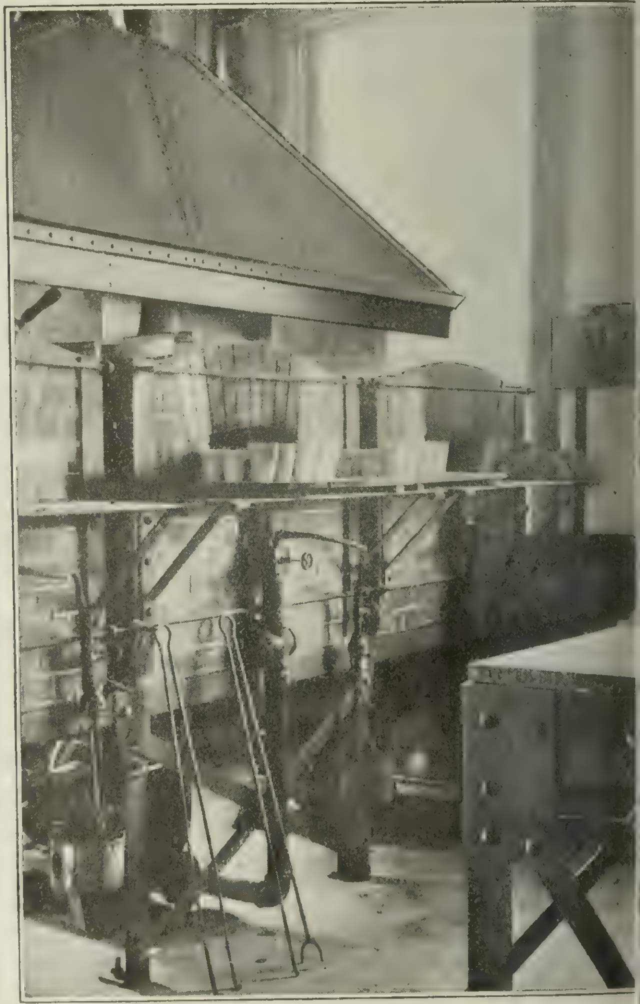


FIG. 15. MUFFLE FURNACES IN ASSAY OFFICE

out of electrical connection with the rest of the treater, and can be inspected from top to bottom without danger of coming in contact with high-tension current. Everything about the plant is grounded so as to prevent a short-circuiting in the event of faulty insulation; and three special "grounds" have been buried deep in moist soil to insure ample protection.

The power plant for the Cottrell treater is placed in the same building as the fans which feed the blast-furnace gases to the baghouse, making it possible for one man to attend to both installations. Three rectifier units are provided in the power house; but the foundations for two more are already constructed, so that additional equipment can be easily installed should it become desirable to increase the treater capacity. The mechanical rectifiers are of the Western Precipitation Co.'s K1 type. The 25-hp. 440-volt, 60-cycle induction motor of each rectifier unit drives a 15-kw. alternator at 1800 r.p.m., the current going to a transformer at 220 volts. At the transformer the pressure is boosted to a maximum of 100,000 volts (the voltage actually used depends upon treater conditions, being generally about 60,000), and then goes to the rectifier of the unit. Only the positive waves go to the bus wires.

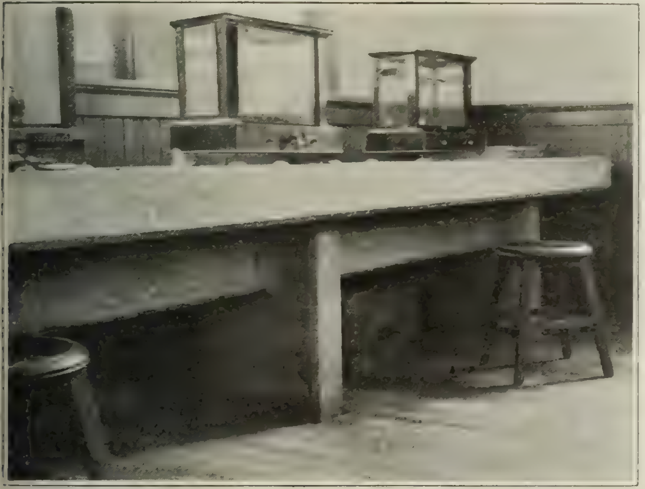


FIG. 16. CONCRETE ASSAY BALANCE TABLE

Five bus wires are carried at the top of the room, one for each rectifier unit; of which three are connected up to the three rectifiers at present installed. Two overhead switches are suspended below the bus wires, each switch consisting of a central knife surrounded with five poles. Each outside pole connects with a bus wire, and the central pole of each switch connects with the lead that goes to the feed wires of two treater sections. Thus, by moving the knife switch, any one of the rectifiers can be connected with either pair of treater sections, and a greater flexibility of operation is obtainable than in earlier Cottrell installations. At present only two rectifiers are in operation at a time, the third being an emergency machine.

Stack Design and Accessory Equipment

From the Cottrell treaters and the baghouse the gases go to a stack, 200 ft. high, with an inside diameter of 16 ft. at the bottom, and 15 ft. at the top, built by the Alphonse Custodis Chimney Construction Co., of New York. The bottom 30 ft. is lined with a radial-tile core wall, the remainder being unlined. The top of the stack is 315 ft. higher than the feeder floor of the blast furnaces and 239 ft. higher than the flues of the roaster building.

A commodious and well-arranged assay office is provided. The equipment includes oil-fired furnaces (Fig. 15) having special insulating construction to keep the muffles even in temperature, chemical balances with chain vernier riders, electric hot plates, the latest grinding equipment, and the best of gold and silver balances, carried on a concrete table (Fig. 16), on foundations independent of the building. A modern change house is equipped with showers and individual racks for the clothes of the men who see fit to change at the plant.

A fine office building provides ample accommodation for the engineering and office force of the smeltery; and nearby on the flat to the east of the town site, where excellent houses are provided for the employees. The town site has graded streets which are surfaced with rock and mill tailings; and a septic tank system of sewage disposal is provided. At present most of the employees live at Kellogg, 1½ miles away. Many, if not most of them, own their own homes.

Iron Manufacture in South Africa

The iron-smelting works which are being erected near Pretoria are nearing completion, and smelting operations will probably begin soon, states the *South African Journal of Industries*. The enterprise owes its inception to the commendable public spirit of the mayor and corporation of the capital, as they last year commissioned Professor Stanley, of the School of Mines and Technology, and Dr. Wagner, the well-known South African geologist, to report upon the feasibility of establishing smelting works in the locality, to treat local ores. The report of these experts being favorable, C. F. Delfos, who had previously obtained a concession from the municipality, formed a local company, the Pretoria Iron Mines, Ltd.; and manufacture of pig iron in Pretoria may be looked for in the near future. Great activity prevails at the new plant. The Railway Administration is constructing a branch line about 1¾ miles long from the Pretoria North line to the works. The earthworks are almost complete, and the rails will be laid to synchronize as nearly as possible with the beginning of operations. The equipment comprises a 50-foot blast furnace, lined with firebricks from the Olifantsfontein works, capable of producing between 10 and 15 tons of pig iron per diem; a substantial block of brick buildings, including engine house, storage bins for lime, coke, and graded ores; business offices, and a well-equipped laboratory. Quarrying has been in progress for some time, and a stack of ore of several thousand tons is already awaiting treatment.

It may be of interest to state that the company purposes drawing its supplies of coke from Dundee (Natal); and limestone, for the present, will be obtained from the Zwaartkop farm, south of Pretoria. The material to be smelted will consist of a mixture of siliceous Time Ball Hill and clay-band ore occurring in the lower portion of the Pretoria series. The progress of the company will be watched with considerable interest, especially in the capital, and the enterprise is pregnant with important industrial possibilities.

American Zinc Products Co.'s Rolling Mill

BY J. H. DIETZ*

THE American Zinc Products Co. has completed a modern zinc-rolling mill at Greencastle, Ind., having a daily capacity of from 1000 to 1500 tons of zinc plates and sheets. The company is an Ohio corporation, capitalized at $1,000 000, D. W. Kerr, of Warren, Ohio, being president, and F. W. Stillwagon, of Warren, Ohio, vice president. The plant is situated on the Pennsylvania R.R., having shipping connections also with the main line of the Big Four and Monon railroads.

The equipment consists of furnace and mill building, power plant, storeroom, warehouse, blacksmith and machine shops, tin shop, carpenter shop and offices. The main building contains the refining furnace into which the spelter is charged. This furnace has a capacity of 100 tons of molten zinc and is heated by a coal furnace. The metal is melted by direct contact of the combustion flame on the surface. The furnace is provided with charging doors and provisions for skimming dross and tapping settled lead. The metal is dipped from this furnace and molded into flat slabs on a motor-driven revolving mold table.

ROLLING-MILL PLANT OF THE AMERICAN ZINC PRODUCTS CO. AT GREENCASTLE, INDIANA

The molded slabs are loaded on steel cars and stored in a reheating furnace, which is maintained at the constant temperature required for rolling. The slabs are removed from the discharge end of this furnace and go direct to the 24-in. roughing mills. The sheets from these mills are sheared to the exact weight required for the finished sheets to be rolled, and are stacked in packs on steel cars, which then go to the pack annealing furnaces. These furnaces are also maintained at the constant temperature required for finish rolling. All furnaces are equipped with recording pyrometers for the guidance of firemen.

The mill contains finishing mills, 24 x 72 in. in size, with automatic, motor-operated lifting tables. The packs from the pack-annealing furnace come to these mills on transfer cars and are rolled into finished sheets of any size and gage required. The finished sheets are trimmed in packs on rotary slitting shears; and, after sorting and inspection in the shipping department, are packed in standard steel drums ready for shipment. The shipping room contains several Kron automatic dial scales, and is served by two switch tracks in the building. Provision has been made for the subsequent addition of more finishing mills, the power plant and finishing roll engine installed being of sufficient capacity to handle the additional mills.

The finishing mills and the roughing mills are pulled by independent direct-geared Corliss engines, the roughers having sufficient capacity for the manufacture of heavy zinc plates up to 1 in. thick, in addition to supplying the roughed sheets for the finishing mills.

The entire main building and house track are served by a 10-ton electric crane, which is also used for returning scrap cars from all shears to the slab furnace. The blacksmith and machine shops are completely equipped for all repair work. The tin shop is used for the manufacture of the steel drums used in shipping. The carpenter shop is kept busy in making boxes for the shipment of the heavier gage sheets and plates.

The power plant equipment consists of ten 150-hp. high-pressure horizontal tubular boilers and two 150-kw. turbine generators. Either generator is capable of pulling the electric load. All the machinery except the rolls is driven by direct-connected motors. The mill is provided with an indirect blower system for heating, cooling, and ventilation. The ventilating system includes a large Sirocco fan and the usual steam coils heated by exhaust steam. Provision is made for recirculation in the winter and a by-pass for cold air from the outside in the summer.

The buildings are principally of brick and steel construction, with ample provision for lighting and ventilation. The interior of the main building is painted white. The floors are of 3-in. yellow pine, waterproofed and covered with hardwood matched flooring. The mill is equipped with circulating cold-water system and with sanitary drinking fountains, and has every convenience for the comfort of the employees. The plant has been in continuous operation 24 hours per day since the middle of May, and is operating close to capacity. Practically all the operators are being trained from workmen secured locally.

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*[illegible], American Zinc Products Co., Greencastle, Indiana.

Tungsten in Manganese Ore

By William R. Jones*

Prof. Walter S. Palmer's interesting article entitled "The Occurrence of Tungsten in Manganese Ore," which appeared in the *Journal* of Apr. 27, 1918, page 780, has caused me to decide to submit the following notes, as they may give Professor Palmer a suggestion which may enable him to trace the source of the tungsten in the manganese ore analyzed by him.

In moist tropical countries such as lower Burma, Siam, and the Malay States, it is common to find wolframite so weathered that only deposits of the oxides and hydroxides of manganese and of iron, or of tungstic acid, remain. In some cases what it left after the weathering of the wolframite is almost a pure manganese mineral; in others it is limonite, and in still others no manganese or iron mineral is left, but only the greenish-yellow mineral tungstite, almost as pure as that obtained in the laboratory. Other products of the weathering of wolframite are also known.

Whether the wolframite is replaced by manganese minerals, by iron minerals, or by tungstite appears to depend on the following:

1. *The original composition of the wolframite.* The wolframite as found in the countries named is almost invariably composed of the hübnerite[1] and ferberite molecules mixed in varying proportions, and I do not know of any case where a variety of wolframite from these places has been found not to contain both manganese and iron.

2. *The composition of the water acting on the wolframite.* The water generally has an acid reaction due to decaying vegetation and the decomposition of unstable sulphides and arsenides. Occasionally it has an alkaline reaction from the alteration of feldspar. The presence of manganese or iron in solution in the water before it attacks the wolframite appears also to be of importance in determining how the wolframite will weather. The residue most commonly left by the weathering of wolframite in these countries is limonite, but lumps of manganite are also fairly common. The tungstite generally occurs as a bloom on the wolframite, and in cleavage planes and minute fractures.

So unstable is wolframite in these countries that at the foot of hills in which there are veins of that mineral which are being worked, it is the exception to find any wolframite in the alluvial deposits, although they are common in the detrital deposits. Careful prospecting in such places has shown that, although tin ore may be present in the alluvial deposits, and obviously derived from the lodes carrying wolframite and tin ore, the wolframite has been removed chemically owing to its good cleavage exposing new surfaces, and to its instability. This is strikingly shown in an alluvial deposit where tin ore is being recovered carrying less than 1% of wolframite in the concentrates, although occasionally rounded pebbles of quartz are found carrying wolframite protected from decomposition by a covering of silica.

In conclusion, there is given below the analysis of a manganese deposit taken by me from a wolframite lode occurring in decomposed phyllite. The manganese deposit occurred as a patch in the lode and gave place on both sides to slightly altered wolframite assaying over 70% WO_3. The analysis, made by H. R. Pepper, was as follows: MnO, 90.38; WO_3, 4.2; Al_2O_3, 4; and SiO_2, 1.80 per cent.

Wallaroo & Moonta Co.'s Report

The report of the Wallaroo & Moonta Mining and Smelting Co., Ltd., of South Australia, for the six months ended June 30, 1918, shows that the Wallaroo mines produced 29,586 tons of 8.69% copper ore, and the Moonta mines 4396 tons, carrying 13.91%, in addition to 404 tons of precipitate averaging 68.81%. Copper produced at the smelting works from ore and precipitate was 3804 tons, in addition to 864 tons recovered from Mount Cuthbert blister. The acid plant produced 3441 tons of sulphuric acid during the period. The cementation treatment of slime was continued for two shifts per day at the Moonta property, where tailing heaps are leached in rotation during night shifts and week-ends.

Owing to the difficulties encountered in an attempt to secure from Australian manufacturers the necessary electric motors, to drive the new installation of conveying machinery, the work was undertaken at the mine workshops. Fourteen high-efficiency motors, designed for a normal load varying from 5 to 25 hp., with all the necessary control apparatus, have been completed. A 40-kw. generator has also been constructed; and all the different machines have successfully passed the necessary tests.

The statement of assets over liabilities shows a balance of £390,860, in connection with which no provision has been made with respect to future liability under the Wartime Profits Tax. This liability is indefinite, and the 1915-1916 profits were taxed to the extent of £37,936 10s. 8d., an amount which was considered excessive and in connection with which an objection was lodged.

Iron Ore in Brazil

An outlet for the iron-ore region around Itabira, Brazil, will be afforded by the Victoria & Minas Ry., when complete, according to the Bureau of Foreign and Domestic Commerce at Washington. This road runs inland from the port of Victoria across the State of Espírito Santo and to Cachoeira Escura, in the State of Minas Geraes. The line is being built and operated under Federal concessions by an English concern, which also owns iron-ore deposits at Itabira. The gage of the road is one meter, and 366 miles were open and 115.5 miles under construction in December, 1913.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

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*General manager, High Speed Steel Alloys Mining Co., Ltd., Tavoy, Burma.

[1] [Dana gives wolframite as $(FeMn)WO_4$; hübnerite as $MnWO_4$; and ferberite as $FeWO_4$. But it is not therefore to be assumed that wolframite is a mixture of hübnerite and ferberite —Editor.]

The Porphyry Coppers, Part I—Resources And Achievements

BY L. H. GOODWIN*

The relatively rapid rise of a group of mines generally designated as "porphyry coppers" to a position of dominating importance in the copper industry of this country may be accepted as the forerunner of parallel development where similar deposits are found, as it is probable that the future world supply of the metal will come largely from such low-grade producers. A résumé of the commercial results achieved by this group of mines, considered from the investor's point of view, should be of present interest because of the unprecedented demand for copper.

SIX large porphyry mines have been brought up to capacity in this country. Half of these are steam-shovel operations, and the remainder underground mines. The Utah Copper mine, at Bingham Canyon, Utah, the pioneer of development among the "porphyries," was originally planned to be worked by underground methods, and considerable development, beginning in 1903, was done preparatory to the introduction of the caving system; but, as a result of further prospecting, it was decided that the orebody could be more economically handled by steam-shovel operation. Stripping of overburden was begun in 1906, and, after that, no underground work was done except incidentally as a means of keeping the concentrators at capacity until they could be supplied by the shovels alone. Milling was begun at the large plant at Garfield in September, 1906. The Nevada Consolidated mine, at Ely, Nev., was developed soon after the Utah property, and milling was begun in 1908. Ore is still being mined mostly by steam shovels, but underground work has always furnished a small proportion of the total production. The Chino deposit at Santa Rita, N. M., was the last of the steam-shovel porphyries to be developed, and milling began late in 1911.

TABLE I. ORE ACCOUNTS AND INDICATED LIFE OF OPERATIONS

	Utah Copper		Nevada Consolidated		Chino		Miami		Ray Consolidated		Inspiration	
	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Recoverable ore developed before mill started	120,000,000	1.77	30,073,000	1.99	54,970,646	2.34	18,232,000	2.58	75,096,000	2.17	74,950,000	1.70
Further ore developed to Dec. 31, 1917	318,972,700	1.26	65,793,377	1.40	54,718,717	1.03	4,999,542	1.38	31,499,122	1.57	....	....
Total recoverable ore developed to Dec. 31, 1917	438,972,700	1.40	95,866,377	1.60	109,689,363	1.68	23,231,542	2.34	106,595,122	1.99	74,950,000	1.70
Ore mined to Dec. 31, 1917	67,220,700	1.43	25,841,055	1.63	15,198,427	1.90	8,471,542	2.19	16,782,600	1.68	9,268,622	1.48
Recoverable developed ore remaining	371,752,000	1.39	70,025,322	1.58	94,490,936	1.65	14,760,000	2.40	89,812,522	2.05	65,681,378	1.73
Developed ore unrecoverable by present mining or milling equipment:												
In detached orebodies	....	....	864,199	2.41	....	....	....	...	....	....	....	....
Carbonate ore used as flux	....	....	174,648	2.50	....	....	....	....	....	....	....	....
Mixed carbonate and sulphide ore	....	....	....	....	1,064,907	1.81	....	....	....	....	....	....
Low-grade sulphide ore	....	....	....	....	....	....	28,000,000	1.06	....	....	....	..
Mixed oxide-sulphide ore	....	....	....	....	....	...	6,000,000	2.00	....	....	4,732,700	1.31
Oxide ore	....	. .	....	....	....	....	....	....	....	....	17,460,300	1.31
Total developed ore of all classes remaining	371,752,000	1.39	71,064,169	1.67	95,555,843	1.66	48,760,000	1 55	89,812,522	2.05	87,874,378	1.63
Ore milled during 1917, tons	12,542,000	. .	4,064,095	....	3,608,100	....	1,640,206	....	3,560,900	....	5,316,350(*a*)	....
	Years		Years		Years		Years		Years		Years	
Life of mine as indicated by applying the 1917 rate of mining to												
Recoverable developed ore remaining	30		17		26		9		25		12	
Total developed ore of all classes remaining	30		18		27		30		25		16	

(*a*) Ore milled during 1916

Work on the two older underground porphyry mines, both in Arizona—the Miami, near Globe, and Ray Consolidated, about 20 miles south at Ray—was begun in 1907, and the mills of both companies began operations in April, 1911. A somewhat longer period was required to bring these mines to the producing stage, because of slower underground development. The Inspiration mine, which is adjacent to the Miami, was the last to be developed; its mill was started in July, 1915.

A factor of the greatest importance to investors is the extent to which these mines permit a reliable estimate of the tonnage and grade of ore reserves which may be thoroughly prospected by drilling, thus eliminating one of the greatest hazards of mining practice. This feature has led many to refer to this type of mine as a "manufacturing proposition," which is an apt analogy, because such mines are engaged in producing a commodity under stable conditions of supply of raw material and demand for their product. The fact that a mine is a wasting asset, whereas the manufacturing business is one in which every successful transaction is of benefit in establishing prestige and good-will, which brings new business, makes it necessary for the investor to differentiate between the two industries. The term "manufacturing proposition" appears to have a valid significance when used to distinguish between two mines which have their reserves blocked out, one, say, for two years and the other for a generation in advance.

In order to present the data of ore reserves as concisely as possible, Table I has been prepared to show the tonnage in reserve at various stages of each mine's history, as presented in the annual reports, from which the indicated life of each property is estimated. In all cases the total reserves are given, and the distinction between fully or partly developed ore is not indicated. It will be seen that all the mines have sufficient reserves to last several years, and that the more fortunate are assured a long life. It is probable, moreover, that not one of them has fully exhausted the possibilities of further development.

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*Mining engineer, with [illegible] & Ball, 42 Broadway, New York.

A satisfactory review of the financial condition of these mines is possible because the directorates of all of them have been frank with their stockholders, and have submitted excellent reports. This matter cannot be judged solely by a consideration of the money that was originally invested in the mines, as compared with that which has been taken from them in the form of dividends. A considerable proportion of earnings has been invested in plant extensions, which will not only increase the annual earning capacity of the mine, but also, theoretically at least, increase its total recoverable value as a result of quicker redemption. Broadly speaking, the gross earnings of a mining company are usually subject to only two charges—operating and overhead expenses. The item of fixed charges does not, as a rule, amount to an appreciable expense in the accounts of successful mining companies. After the deduction of these charges, the net income is distributable in three channels, namely, as dividends to the stockholders, as expenditures on new plant and equipment to extend the operations of the company, and, lastly, as new construction to replace depreciated plant, or as depreciation reserves for such purposes.

TABLE II. SUMMARY OF EARNINGS ON THE PAID-IN CAPITAL AND THEIR DISPOSAL TO DEC. 31, 1917

	Utah Copper	Nevada Cons.	Chino	Miami	Ray Cons.	Inspiration
Actual paid-in capital:						
Number of shares outstanding	1,624,490	1,999,457	869,980	747,114	1,577,179	1,181,967
Par value of shares	$10	$5	$5	$5	$10	$20
Total par value outstanding	$16,244,900	$9,997,285	$4,349,900	$3,735,570	$15,771,790	$23,639,340
Surplus from sale of securities	8,290,620	7,071,850	2,995,253	1,995,412(*e*)	1,506,646	....
Totals	$24,535,520	$17,069,135	$7,345,153	$5,730,982	$17,278,436	$23,639,340
Milling operations began	June, 1907	October, 1908	November, 1911	April, 1911	April, 1911	July, 1915
Amount of earnings available for distribution:						
Total net profit before depreciation (*a*)	$129,652,482	$56,448,305	$38,646,186	$22,476,073	$34,388,803	$33,810,284
Previous surplus	588,261	2,084,409	165,974	38,920	....	....
Miscellaneous credits or debits to surplus	252,902(*b*)	568,813(*c*)	179,000(*d*)	....	....	....
Totals	$130,493,645	$59,101,527	$38,991,160	$22,514,993	$34,388,803	$33,810,284
Disposal of that amount:						
Dividends	75,770,883	35,771,603	22,488,132	16,226,633	15,555,252	18,299,279
Reserves for depreciation, depletion, etc	3,676,332	9,455,096	1,350,981	1,657,834(*f*)	1,942,883	1,500,000
Written off prepaid stripping expense	2,500,000	....	288,121	....	....	....
Earned surplus	48,546,430	13,874,828	14,863,926	4,630,526	16,890,668	14,011,005
Totals	$130,493,645	$59,101,527	$38,991,160	$22,514,993	$34,388,803	$33,810,284
Ratios in per cent. of the following items to the actual paid-in capital:						
Dividends	308.8	209.6	306.2	283.2	90.0	77.4
Depreciation	15.0	55.4	18.4	28.9	11.2	6.3
Earned surplus	197.8	81.3	202.4	80.8	97.8	59.3
Total available for distribution	521.6	346.3	527.0	392.9	199.0	143.0

(*a*) From year in which the mill started to Dec. 31, 1917. (*b*) Credit by railroad earnings. (*c*) Credit by railroad surplus less debit by shortage in inventory. (*d*) Credits accrued from investments. (*e*) As of Dec. 31, 1916. (*f*) Does not include charges of $3,655,101 made in 1917 for mine depletion in 1916 and 1917.

TABLE III. CONDENSED FINANCIAL STATEMENTS AS OF DEC. 31, 1917

	Utah Copper	Nevada Consolidated	Chino	Miami	Ray Consolidated	Inspiration
Total cost of property, development and equipment less depreciation or depletion	$28,935,700	$10,986,337	$10,027,587	$22,065,508 (*a*)	$22,691,558	$23,167,399
Investments	5,604,002	....	442,040	1,929,354	310,329	....
Deferred charges to operations	8,300,040	5,454,520	2,910,197	....	....	....
Current assets less current liabilities	30,242,207	14,503,106	8,829,255	3,123,907	11,167,218	14,482,946
Total assets	$73,081,949	$30,943,963	$22,209,079	$27,118,769	$34,169,105	$37,650,345
Total paid-in capital	$24,535,520	$17,069,135	$7,345,153	$22,407,774 (*a*)	$17,278,436	$23,639,340
Earned surplus	48,546,429	13,874,828	14,863,926	4,710,994	16,890,669	14,011,005
Total liabilities	$73,081,949	$30,943,963	$22,209,079	$27,118,768	$34,169,105	$37,650,345

(*a*) Contains excess in valuation of mine in accordance with Government regulations, and is not comparable with the other mines' figure for this item.

To summarize the factors involved in a presentation of the financial status of these mines, Tables II and III have been compiled. Table II indicates the total amount of capital which was originally invested in the enterprises, the net earnings and other credits making up the totals available for distribution, and then the division of the amounts in dividends, depreciation, and earned surplus. The figures include data with reference to all operations for each mine from the year in which the mill was started to Dec. 31, 1917, and are based upon figures given in the reports of the various companies in what is generally called the combined balance sheet, that is, for the combined operation, including railroad and smelter, if they are operated by the company, as well as for the mine and concentrating plant. The figures of this table will not be found to agree exactly in all cases with those of the respective reports, but this is due to bookkeeping changes in accounts. They are, however, essentially correct.

As regards the actual amount of money invested, it is the custom with most companies in the field under review to carry, as a liability, a surplus account, which represents the profits realized from the sale of capital stock at a figure above its par value, and from the conversion of bonds into stock at a figure above par. The sum of the liabilities carried as capital stock, bonds, and surplus should give the amount actually invested in the property by the stockholders. It would appear to be a simpler method, and just as satisfactory, to carry the item of surplus for sale of securities as one account with the capital stock—a system which will perhaps be adopted when the practice of issuing securities without a par value has become more general.

In the matter of total dividends paid, it would seem fair to include the interest on bonds in this amount, especially as the bond issues are usually convertible, but as generally reported this is not segregated from interest on cash advances, and its exact amount is consequently not shown. It is a comparatively small matter, however, and would make little difference in the result indicated.

The manner in which the amounts of paid-in capital and the earnings after dividends have been employed is shown in the condensed financial statements summarized in Table III. The total amounts spent for the mining and milling property—its development and equipment to the end of 1917—are shown in a lump sum. In the reports of Utah, Nevada Consolidated, and Ray, this item includes the cost of a railroad; and in the record of operations of Nevada Consolidated, the cost of a smeltery.

Remarkable Exhibition of Earning Power

The financial success attending the exploitation of these mines must be considered satisfactory. Both Utah and Chino have already returned to their owners dividends aggregating over 300% of the actual paid-in capital. Chino required only about six years to achieve this result, earning about 50% per year. Inspiration's performance is also noteworthy, thanks in large measure, of course, to its fortuitous beginning at a time of high metal prices. Although it had operated only two and one-half years, the net result during that short period was to return to the stockholders in dividends over 77% of their investment, and, in addition, to accumulate an earned surplus, which, it may be noted, is accurately represented by the excess of quick assets over quick liabilities, amounting to another 60% of that investment. The results of the other underground properties are not so remarkable, but none can be considered poor.

The financial report on Utah Copper denotes that a sum considerably larger than the actual paid-in capital is represented by the total cost of the properties. Nearly one-third of the entire property and plant investment is represented by the cost of the railroad; which illustrates the importance of a subsidiary enterprise which is external to the actual mine operations. Utah's investments are large, and appear to be conservatively carried, consisting, as they do, mostly of 1,000,500 shares of the capital stock of the Nevada Consolidated company, which has always sold at a much higher figure in the open market. It should be noted that the Nevada Consolidated mine has helped the Utah to make its good showing, because nearly all of the $23,480,489 reported as dividends received on investments came from this source.

Nevada Consolidated's results might be expected to be better than Utah's, because the grade of its ore is considerably higher, but even after allowance has been made for the dividends paid by the former to the latter, its exhibit is not as good. This may be partly explained by the following facts: The cost of the Nevada's railroad was relatively higher than Utah's in proportion to the size of the operation, and the amortization of a smelting plant has been a drawback. Nevada's depreciation policy has been more conservative; and the property was considerably slower than Utah in reaching full production. Nevada's conservatism in the matter of depreciation charges has presumably been prompted by the comparatively short indicated life of its mine. The fact that such charges include amortization of its orebody makes the total for depreciation of reserves out of proportion to totals for the other mines.

Chino has been able to outstrip its big rival, Utah, in the matter of quick return of capital, because of its higher grade of ore. Referring to the percentage ratios of dividends and earned surplus to paid-in capital in Table II, it will be noted that in its six years' operation it has accomplished practically the same result that Utah has required ten years to achieve, owing mostly to the magic difference between 1.90% and 1.43% copper. Chino's advantage in this matter is really not fully shown by these figures, for the reason that Utah has been aided by dividends from Nevada Consolidated, as noted in the preceding paragraph.

The attainments of the underground mines cannot be expected to be as spectacular as those of the open-pit properties, owing to larger initial outlay per unit of capacity and to shorter periods of operation. Miami's comparatively high-grade ore has enabled it to make an excellent showing.

Methods of Electric Welding

There are two kinds of electric welding, known respectively as carbon electric welding and metal electrode welding, states the *Railway Mechanical Engineer*. In the former, an arc is drawn between a carbon electrode and the piece to be welded. The metal to be added is fed into the arc. In the metal electrode process a metal electrode is used, the arc being drawn between the electrode and the piece being welded. The heat of the arc melts simultaneously the metal of the piece and the metal of the electrode. As the metal of the electrode melts, it is drawn across the arc, and a complete and homogeneous union is formed with the molten metal of the piece. With the exception of work with certain electrodes (manganese steel and slag-covered electrodes) the electrode is always made the cathode or negative, i.e., the current flows from the piece being welded to the metal electrode. The voltage required for metal electrode welding is about 20, direct current.

Mining Equipment as Realty Fixtures

By A. L. H. Street*

According to a recent decision of the Colorado Supreme Court, mining, milling and concentrating machinery, implements and tools, belting, attachments, and similar apparatus, placed on mining property by a lessee of the land, for the special purpose of developing the mines, extracting ores and treating the same, are trade fixtures, and may be removed by him at any time during the term of the lease or within a reasonable time after its expiration. Such equipment does not become a part of the real estate, nor the property of the lessor, in the absence of agreement to the contrary, and hence is subject to attachment to satisfy claims of third persons against the lessee. (Foote *vs.* Campbell, *170 Pacific Reporter, 954.*)

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Dust Abatement in Mines*

BY W. O. BORCHERDT

The composition of dust in mines and the effect of inhalation on the health of employees are discussed, and attention is drawn to the necessity for safety work to protect the lives and well-being of miners. The author of the paper characterizes as ridiculous the contention that dust, of whatever character, is not injurious. Attention is drawn to the stringent laws in force in Australia and South Africa which were framed to combat the dust menace. A considerable amount of valuable data was obtained by the author by means of a questionnaire; and the information, classified, is here presented in tabular form.

DUST in mine air is dangerous and objectionable more or less in proportion to its silica content; and the well-known diseases phthisis and silicosis commonly result from the continued inhalation of dust high in silica. It is not generally recognized that all dust is injurious, and that it should be the business of mine operators to suppress dust of any character, and to employ the same perseverence and intelligence which are, or should be, applied to the more obvious dangers due to faulty sanitation or unsafe practices. It is sometimes assumed that because high silica dusts are the most injurious, other dusts, unless present in quantities offensive to the senses, may be ignored. Figures have been advanced showing that the incidence of tuberculosis among coal miners is no greater than among surface workers in the same locality, and it has even been stated that the inhalation of coal dust is supposed to confer a partial immunity to tuberculosis.

Those who are operating mines in which the rock dust is not siliceous, or in which it is siliceous to only a slight degree, have, of course, a less serious problem to face than those whose work is carried on in the highly siliceous rocks; but the dust problem exists none the less, and it behooves operators to recognize and solve it promptly and voluntarily, in order to make unnecessary eventual interference and regulation by the state.

NATURE AND EXTENT OF DUST EVIL

So far as I am aware, there has not been in this country any legislation directed at the dust evil which is as drastic as that of South Africa; but that conditions have existed, in certain parts at least, which paralleled those in the African gold mines is shown by the admirable work in the Joplin district.

Respirators do not, in general, present any hope of a solution, because they are objectionable to the miners, are partly effective only when properly cared for, hamper respiration, and will, therefore, be worn by only exceptional men or under conditions where unusually strict discipline can be maintained. To make such a provision effective it would be necessary for nearly all underground men to wear them. Moreover, ordinary respirators do not remove from the air dust particles less than five microns in diameter, and much of the dust which has been shown to be harmful is less than three microns in diameter.

Water sprays directed into the dust as delivered from the drill hole, and dust-collecting bags intended to catch the dust and prevent its distribution through the mine atmosphere, have been constructed in many forms. It is my conclusion that none of these methods is effective on a practical scale. Elsewhere the opinion has been expressed that the best hope for a practical solution of the problem lay in the use of drills employing hollow steel, through which water is injected into the hole. This would appear to be the ideal method, because, as frequently pointed out, this type of drill not only allays dust, but gives a higher drilling speed. In some mines the conditions resulting from the operation of such drills have been entirely satisfactory, from both a hygienic and mining point of view. In others, however, especially in those in which conditions demand overhand stoping and a large amount of raising in dry ground, the water-feed drills have not been a success, partly because of mechanical imperfections, and largely owing to the attitude of the miners, who generally insist that they would rather breathe dust than get wet.

As the general features of this problem and the most practical methods for its solution have been covered in other papers and in the official reports of the South African and Australian Dust Commissions, it occurred to me that the best hope of contributing something of real value lay in the direction of determining the actual practical operating results with the various types of water-feed drills in different mines under diverse conditions. For the purpose of securing this information I sent a questionnaire to 47 representative mines in the United States and Canada, to which 26 have made reply.

In the accompanying table the information has been arranged in a convenient form; and, although it was necessary to use symbols and a key, it will be found easy to understand. A summary of this table shows 11 instances of the use of respirators, only five of which were considered successful: four cases refer to raising, and one case refers to overhand stoping.

One operator suggests that improvements in respirators could be made by following the design of military gas masks; and, although it seems probable that a respirator could be developed along these lines which would be highly effective in stopping dust of even a few microns' diameter, the difficulty of getting men to use such respirators would be greater than is the case with the existing types, which, though less effective, are also lighter and not so objectionable.

A man cannot chew or smoke while wearing a respirator; and I think no one familiar with the actual problem of protecting men from themselves and others will fail to agree with the statement that even men of more than average intelligence will not voluntarily and consistently use safety guards or precautions if these interfere with their comfort, convenience and fixed habits. This is unfortunate, but it is a fact, nevertheless. In practice it is not sufficient to point out the existence of a danger and the means by which it may be guarded against, but the men must be continuously and intensively educated in order to secure their coöperation in self-protection; and no amount of education will insure the adoption of a safety device which results in discomfort or inconvenience to the wearer. A sidelight on this problem is obtainable from the sand-blast art, where, originally, various types of masks and respirators were used, but in which present practice provides that the operator work on the outside of the chamber in which the sand blast is being used.

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*Excerpted from a paper presented at the seventh annual congress of the National Safety Council.

CONSTRUCTION OF RESPIRATORS

I have experimented in the construction of respirators containing a filtering element or cartridge which would be inexpensive, readily inserted and removed, and would have a filtering surface of such dimensions as to render violent exertion possible without distress. I believe that considerable progress is possible along these lines, and that, by the addition of an arrangement for humidification, it might be possible to stop even the finest dust. At best, however, I believe that the field of respirators is limited.

The use of dust-collecting bags is reported in three instances, which were unsuccessful, because all appliances so far produced have been a nuisance. The failure of water sprays is shown by the fact that, though reported in 29 instances, only one successful result is claimed—in connection with drifting, where the dripping of the water on the operator is naturally not as extensive as in overhand stoping and raising. Water-feed hand drills—unmounted machines of the Jackhamer type—are extensively used. In drifting, four instances are given, three of which were successful; the other case was unsuccessful, because, as stated, the men prefer inhaling dust to getting wet, and because of mechanical imperfections in the machine. In underhand stoping, three instances are given, all successful, although objection was recorded in one instance on the ground that the safety precaution involved too much inconvenience. For sinking, nine instances are given, eight of which were successful. In the one unsuccessful instance the objections were that the steel sticks, that the machine cannot be rotated by hand, and that no dust is produced by dry sinking, anyhow. Evidently, because my questionnaire was not well worded, I failed to elicit any information either for this type of drill, or for others used in block holing. This I regret, because, in many mines, blockholing undoubtedly contributes materially to the dust in circulation, as it is carried all over the stopes and often into the chutes, during shift; and, indirectly, because boulders are frequently blasted during the shift, with the consequent spreading of dust.

EXPERIENCE WITH DRILLS

The water-feed stoping drill is a machine of comparatively recent development. Mechanically it leaves more to be desired than any of the other modern hammer drills. It has great inherent possibilities; and to many operators it has seemed that designers and manufacturers have not fully recognized the extent of these possibilities, and have not given the question of the development of this type of machine the attention which it deserves.

In drifting, five instances are shown, of which four were successful. In overhand stoping, which would appear to be an ideal field for this machine, five instances are recorded, three unsuccessful, resulting in the comment that the men prefer dust to getting wet. Workers will not employ a safety device which causes discomfort or inconvenience, and no one should expect them to do so.

In raising, in 11 instances of the use of this type of machine three were successful. One of the successful cases is qualified by the familiar objection that the men prefer dust to getting wet, and that the machine has not been perfected mechanically; another comment was that the men will use the wet stoper if the wages paid are high enough, even if they do get wet. Of the eight unsuccessful instances, six were based on the grounds that the men prefer the dust to the water; another agrees to this and mentions the disadvantage of high maintenance cost; and still another supplements the same objection by referring to the frequency of the steel sticking, making rotation by hand impossible.

Two operators report the use of dry drills with auger steel for drifting or undercutting in soft ground. This type of equipment is recommended for these conditions by three operators, as being substantially dustless; and it is possible that this combination has not received the attention that it deserves, although it can be employed only under favorable conditions.

That the water-feed mounted drill is now the standard machine in most mines is clearly indicated in the table. In drifting, 22 instances, all successful, are shown, although in the case of one of these the machine is used in wet ground, and dust allaying is not considered one of its functions. In overhand stoping, of 11 instances nine were successful and two unsuccessful, the latter being due to mechanical imperfections and the fact that the men prefer dust to water. In underhand stoping, eight applications, all successful, are shown. In raising, nine instances are given, of which seven were successful, although one is qualified as partly successful, and one refers to use of the machine only if the ground is dry, but says that "the men prefer the dust to getting wet." In the two instances of failure this same familiar reason is given. In sinking, 12 instances, all successful, are quoted, one operator saying that the machines are used occasionally, but are not usually necessary; and another, that the water feature is not employed to allay dust.

USE OF THE WATER-FEED MOUNTED DRILL

To the man interested in safety alone, an examination of the accompanying tabulation would lead to one conclusion—that the water-feed mounted drill should be employed universally for drifting, overhand and underhand stoping, raising and sinking. Fortunately in some mines—instances of which are shown in the table—the dictates of mining economics appear to agree with those of safety. The water-feed mounted drill has been adopted for all purposes, and it is reported throughout as a successful machine. To what extent this conclusion represents the results of actual comparison I am, of course, not informed, but my own experience leads me to believe that in overhand stoping and raising, particularly in the latter, a properly designed water-feed self-rotating stoper would insure faster and cheaper progress than could be obtained with any mounted drill. In many overhand stopes the same would be true; and, even in drifting, the water-feed hand-rotated stoper is a much more formidable competitor, as compared with the mounted water-feed drill, than is generally supposed. There is reason to hope that, with the development of the former, much more effective work may be done in drifting than is now possible. It is these considerations which suggest that the manufacturers of rock drills should devote more attention to the development of this machine.

ANALYSIS OF QUESTIONNAIRE ON DUST-ALLAYING METHODS

Kind of Mine	Location	Rock Dust Problem	Experience With Various Dust-Allaying Appliances in— Drifting	Overhand Stoping	Underhand Stoping	Raising	Sinking	Blockholing	Suggestions for Improvement
Zinc and lead	Va.	Moderate	R-Ub SM-Ub WFMD-S WFSD-Sf	R-Ub SM-Uab WFSD-Ua	R-Ub	R-Ub SM-Uab WFSD-Ua	R-Ub	R-Ub	WFSD-g h
Copper	Ariz.	Moderate, worse in siliceous rock	SM-Uab WFMD-S	SM-Uab WFMD-S WFSD-Sld	WFMD-S	SM-Uab WFMD-Sk WFSD-Sad			m
Zinc	Mont.	None o	SS-Uab V WFMD-S	SS-Uab		SS-Uab WFMD-Sea WFSD-Sac	WFMD-Sp WFHD-Sp		g q
	N. J.	None							
Iron	N. J.	r							
Zinc and manganese		Moderate, drifting and raising only	SM-Uab WFMD-S WFSD-Ud DCB-Ub	WFMD-Ud		SM-Uab WFSD-Uaf DCB-Ub			
Iron	Mich.	None o s	DDAS-S WFMD-S WFHD-S	WFMD-S	WFMD-S WFHD-S	R-S WFMD-Ua	WFMD-S WFHD-S		DDAS in soft ground
Copper	Mich.	None	WFMD-S WFSD-S	WFMD-S WFSD-S	WFMD-S	WFMD-S WFSD-S	WFMD-S		
Nickel and copper	Ont. Can.	Slight	SM-Uab WFMD-S	SM-Uab WFMD-S		SM-Uab WFMD-S	WFMD-S		
Gold	Cal.	None	SM-Uab WFMD-S	SM-Uab WFMD-S	WFMD-S	SM-Uab WFMD-S WFSD-Uat	WFMD-S WFHD-Utu		
Zinc, lead iron	Colo.	In stoping	WFMD-S	WFMD-Ua WFSD-Ua	WFMD-S WFHD-S	WFSD-Ua	WFMD-S WFHD-S		DDAS in soft ground
Manganese iron	Minn.	None r							
Gold silver	Colo.	In some parts of mine	SM-Uab WFMD-S			WFSD-Ua			Rv
Copper	Ariz.	Yes	R-Ub SM-Uab SS-Ub WFMD-S WFHD-Uad	SM-Uab SS-Ub WFMD-S WFMD-w	WFMD-w	SM-Uab SS-Ub WFSD-Ua WFMD-w	WFMD-S		x
Copper, Zinc, Silver, Gold	Mont.	In stoping	SM-Ua WFMD-S WFSD-Sa WFHD-S				WFHD-S		
Silver	Ont. Can.	None	SM-Uabd DCB-U						
Zinc	Wis.	None r							
Iron	Mich.	Only in rock raises	WFMD-Sn r			R-S	WFMD-Sn r		
Zinc	N. M.	Drifting and blockholing	WFMD-S	R-S V-S					
Copper	Nev.	None r	WFMD-S	Undercut'g DDAS-S			WFMD-S WFHD-S		DDAS in soft ground
Au-Ag-Pb-Zn-Cu	Utah	Yes, in stoping	SM-Uabd WFMD-S	WFMD-Sb	WFHD-Sb	WFSD-Ua	WFHD-Sb		
Lead Silver	Utah	Moderate	WFMD-S			Re-S	WFMD-S WFHD-S		Ra
Zinc	Tenn.	None	SM-Uab WFMD-S WFSD-S	WFMD-S WFSD-Ua	WFMD-S	WFMD-Ua WFSD-Ua	WFHD-S		x Vj
Copper	Tenn.	Only in raising	SM-Uab WFMD-S			Re-S			
Zinc and lead	Okla.	In drifting	SM-S WFMD-S						
Copper	Mich.	None	WFMD-S	WFMD-S	WFMD-S	WFMD-S	WFMD-S		y
Zinc and lead	Mo.	None	SM-bd WFMD-S	WFMD-S	WFMD-S	WFMD-S	WFMD-S		z

KEY

R	Respirators.
DCB	Dust-collecting bags.
SM	Spray, mounted on drill.
SS	Spray, separate mounted.
V	Ventilation.
WFHD	Water-feed hand drill.
WFMD	Water-feed mounted drill.
WFSD	Water-feed stoping drill.
DDAS	Dry drill with auger steel.
S	Successful.
U	Unsuccessful.
a	Men prefer dust to getting wet.
b	Too much trouble to use.
c	Men will use if wages high enough.
d	Not perfected mechanically.
e	If in dry ground.
f	Maintenance high.
g	Perfection of self-rotating stoper.
h	Ventilation by suction from working face.
j	Better ventilation.

KEY

k	Partially—hard to use in style of raise driven.
l	Difficult to place holes accurately.
m	Perfection of water-feed stoper.
n	Not used in order to allay dust.
o	Except in raises in gangue rock.
p	Occasionally—not usually necessary.
q	Reduce indiscriminate outflow of water on men in overhand stoping and raising.
r	Have not attempted to allay dust in mine, as ground is damp enough so that dust problem is not serious.
s	Use spray to wet down dirt piles on account of gas.
t	Steel sticks, cannot rotate by hand.
u	No dust in sinking dry.
v	Respirator construction might be improved by study of military gas masks.
w	Intend to use.
x	To use water-feed drills for all work.
y	No phthisis problem. Men are as healthy as any other class of labor.
z	Most dust at present comes from squibbing holes and popping boulders Discontinue shooting of any kind on shift and use water-type drills

Some of the drills now available are convenient, light, and extremely powerful, but their maintenance cost is high, and they contain details of design borrowed from machines intended for other purposes, which, under new conditions, cause difficulty and delay. In overhand stoping and raising, about the only advantage discernible, from the point of view of the operator, in the use of the mounted water-feed drill, as against the stoper, is that the mounted machine is self-rotating, and it is not necessary for the operator to stand so close to the drill barrel; therefore, he does not get so wet as with the other machine. The operator of the hand-rotated water-feed stoper, owing to the necessity for hand rotation, has to stand close up, where he receives all the drip and spatter. With an automatically rotated stoper, this proximity to the machine would not be necessary.

IMPROVEMENTS IN DRILLS

So far as mechanical troubles which result from water and drill sludge running down the steel and into the working parts of the machine are concerned, there is no apparent reason why the same improvements in construction would not eliminate these difficulties also. That this is the thought of other operators is evidenced by the response to the request for suggestions for improvements. Three of these refer to the development of a perfected self-rotating water-feed stoper, and one refers to means for the reduction in the indiscriminate use of water in the machines engaged in overhand stoping and raising. A certain amount of water is required to allay the dust effectively. In many cases the design of the machine is such that much more water is discharged through the steel than is necessary, or water is released at other points, with the result that the operator is constantly sprayed, and the machine is condemned.

SUCTION VENTILATION IMPRACTICABLE

Ventilation by suction from the working faces would prevent the distribution of any quantity of dust through the mine atmosphere; but would be more expensive and difficult to apply. The problem of the ventilation of metal mines, comparatively speaking, is in its infancy; and many projects which might now be condemned as impracticable or too expensive will later become customary, as advanced practice or legislation suggests their adoption.

MACHINE MUST BE AS NEARLY AS POSSIBLE "FOOL PROOF"

At present, conditions, rather than theories, must be faced. Mines must be made safe, regardless of whether the motive for doing so is lofty, or simply that of making a virtue of necessity. Few metal mines would show an atmosphere conforming, for example, to the South African regulations; and, as it is idle to talk longer of disciplining labor or of making the men do this or do that, it is obvious that the only solution possible is the use of drilling apparatus which will be inherently non-dust producing, and at the same time not be objected to by the men. In order to combine with these qualifications a drilling rate which will make it possible for the mine to operate, the machine must operate successfully, must be light, simple, durable, powerful, and, at the same time, as nearly as may be, "fool proof."

Remember the Comfort Fund of the 27th Engineers.

Manufacture of Mine Disinfectant*

Locally manufactured hypochlorite is now used at the Falcon mine, in Rhodesia, for treating wounds, washing out buckets, and for like purposes.

In the process of manufacture a continuous current is passed through a salt solution; and among the several chemical reactions that take place as the result of the electrolysis of the salt and water is the production of sodium hypochlorite, $NaOCl$.

The electrolytic cell consists of a wooden watertight box, the internal dimensions of which are 12 x 12 x 4⅛ in. wide, the last dimension being determined by the size of the carbon plate obtainable. The cell contains 12 carbon plates—six anodes and six cathodes.

The plates should be as close together as possible, as this assists the formation of sodium hypochlorite, and tends to prevent loss of chlorine gas. The plates are separated by thin wooden strips fixed down the sides of the box.

The six anodes should be raised 1 in. off the bottom of the box; and, by making them a tight fit against the sides, the solution, as it flows through the box, is forced to travel up and down between the plates, thus insuring good circulation, which aids production.

Owing to the corrosive action of the solution, and also to prevent impurities from getting in, thin carbon rods should be embedded in the carbon plates, and taken up 4 or 5 in. clear of the top of the cell, the copper conductor being soldered to a tight-fitting metal cap, attached to the top of the carbon rod. The cell can be made water-tight by painting over with hot bitumen.

The carbon plates are a somewhat expensive item, the 12 costing £8 ($38). These plates are of the best quality "Morganite" carbon. At first the carbon plates from old Leclanche porous pots were tried, but these were found to disintegrate rapidly, and by the end of a week or ten days the anodes or + plates were almost destroyed. The cathodes are not attacked, and therefore a cheaper quality carbon can be used for them.

After passing through the cell, the solution is clarified in a sand filter and passes thence to earthenware jars, ready for use. Continuous current is essential for the process. The source of supply at the Falcon mine is a small motor-generator, converting from 550 volts 3-phase alternating current to 3—6 volts continuous current. In cases where a motor-generator is not available, the small current required could generally be obtained from the "exciter" attached to all alternating-current generators. An "exciter" usually generates a current at a pressure varying from 60 to 100 volts. By inserting a "bank" of a few carbon-filament lamps as a resistance, a current of 5 to 10 amperes can be obtained at the required 3 to 5 volts.

The above notes are not published with the intention of recommending the general use of sodium hypochlorite. In many cases, however, war conditions have brought about a serious shortage of suitable disinfectants, and in instances where large consumers have suitable electric current and apparatus available, the information concerning the production and use of hypochlorite may be of assistance.

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*Abstract from report of the 1918 Rhodesia Munitions and Resources Committee.

The Ferro-Alloys*

BY J. W. RICHARDS†

The ferro-alloys have become of great importance in manufacturing and in construction. With the exception of ferromanganese and spiegel, little attention up to within a few years ago had been given to the manufacture of ferro-alloys in the United States, but it is now an important industry. The paper that follows is of value to engineers, for it gives a condensed description of the method of manufacture, properties and many of the more important uses of the alloys of iron.

A LARGE industry has grown up within the last fifty years, most of it within the last twenty-five years, which furnishes to steel makers alloys of iron with some of the rarer metals, in order to introduce these rare metals into steel. Such alloys are known as ferro-alloys, because they all contain iron (ferrum); some of them, however, contain more of the rare metal than iron. They were originally made in crucibles, cupolas or blast furnaces, but are now made principally in electric furnaces, and their manufacture is one of the principal electric-furnace industries.

They are of great importance to the steel industry. The steel maker uses them for one of two purposes: (1) As reagents to take oxygen out of melted steel and thus insure sound solid casting (ferromanganese, ferrosilicon, ferro-aluminum); or (2) to put into the steel a small or large percentage of the rare metal (ferromanganese, ferrochromium, ferrotungsten, ferromolybdenum, ferrovanadium, ferrotitanium, ferro-uranium, ferroboron).

These two uses may be discussed briefly. Melted steel, just before taking from the furnace, always contains some oxygen dissolved in it (like the gas in charged soda water). If this is not removed, the casting made is more or less unsound from cavities or blowholes. The addition of a small amount of a metal with a high affinity for oxygen removes this element and makes the casting sound. Manganese (1% or less) is the cheapest and and most generally used reagent for accomplishing this; silicon ($\frac{1}{2}$% or less) is more powerful but also more expensive, and is often used to supplement the action of manganese; aluminum (0.1% or less) is still more powerful and still more expensive, and is used in small quantities as a final addition to complete the action of the manganese and silicon. All steel makers use one, two, or all three of these reagents; manganese and silicon in the form of ferro-alloys, aluminum more often as the pure metal, but ferro-aluminum is sometimes used.

The second use is to make special steels, that is, steels containing such quantities of the rare metal as give to them properties different from plain carbon steels deoxidized by manganese, silicon or aluminum. Thus we may make manganese steel by putting in 12 to 14% of manganese, making a very tough, hard steel such as is used in mining and grinding machinery, burglar-proof vaults, etc.; chromium (2 to 4%) makes a very hard tool steel; tungsten (15 to 25%) makes high-speed tool steel, which cuts iron while red hot; molybdenum (6 to 1%) has powers similar to tungsten, and is also used in steel for lining large guns. Vanadium ($\frac{1}{10}$ to $\frac{1}{2}$%) makes a strong steel which resists shock extremely well, as when used for automobile axles; titanium, uranium and boron impart valuable properties not so easily described. Every one of these materials is used for producing some specific result which is not produced by any other; sometimes combinations of two, three, or four are used in one steel, producing a particular combination of special properties for some special purpose. Some of these materials cost $5 per pound, and the special steels produced cost up to $2.50 per pound, but their particularly valuable properties justify the expense. The value of these special steels to the industries, and particularly for military purposes, is very great, so great that the supply of ferro-alloys for their manufacture is an important factor in winning the war.

FERROMANGANESE

This is the oldest of the ferro-alloys. Its manufacture was begun about fifty years ago. First made in crucibles, it has for a long time been made in blast furnaces, but is now being produced in many places in electric furnaces. It is made with 30 to 85% manganese, 3 to 5% carbon, a little silicon and the rest iron. The rich grades, 75 to 85%, are preferred by the steel maker, but they require rich manganese ores for their manufacture. The United States has very little rich manganese ore, but has quantities of low-grade ores. One of the present burdens of the steel maker is to use low-grade ferromanganese, in order that we may not have to use ships for importing the high-grade ores from Brazil.

The usual manufacture in blast furnaces is wasteful of both fuel and manganese; the furnace must be run hot and slowly, with hot blast, in order to reduce the manganese oxide ore as completely as possible and not waste manganese in the slag. Yet, in spite of all efforts, from 15 to 25% of the manganese going into the furnace escapes reduction and is lost in the slag. This waste of fuel and manganese has led to the use of the electric furnace, in which fuel is required only as a chemical reagent and not to produce heat, thus saving about two-thirds the fuel requirements of the blast furnace, while the higher temperature available causes the extraction of manganese to reach 90%, i.e., slag losses to be down to 10% or less. Against these economies must be set the considerable expense for electric power and the smaller scale on which the furnaces run. At the present high prices of coke and manganese ore, and in view of the scarcity of manganese and the high price of ferromanganese, the electric ferromanganese industry is able to exist and make large profits. Whether it can do so when normal conditions return, after the war, is questionable; it is to be hoped that it will be able to do so, because of the economy which it undoubtedly possesses in regard to fuel and manganese.

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*A paper read at the Fourth National Exposition of Chemical Industries, New York, Sept. 27, 1918.

†Professor of metallurgy, Lehigh University, South Bethlehem, Pennsylvania.

Steel producers use ferromanganese particularly for making the low carbon or soft steels, because they can thus introduce the required manganese for deoxidation without putting in considerable carbon. For higher carbon steels spiegeleisen (15 to 20% manganese), a cheap blast-furnace alloy, can be used, and is being used at present wherever practicable, in order to save ferromanganese. The best practice with either spiegeleisen or ferromanganese is to melt them in a small electric furnace, and tap from it the required weight to be added to the heat of steel. The melted alloy mixes quicker with and reacts more actively upon the melted steel, while less of it is necessary because less is oxidized by the furnace gases. The saving in manganese by the use of the electrically melted ferro is alone sufficient to justify the expense of melting it in an electric furnace, while better and more homogeneous steel is produced.

FERROSILICON

This alloy may run 15 to 90% silicon, but the most commonly used is the 50% grade. It is made from ordinary silica (quartz or sand), reduced by carbon in the presence of iron ore or scrap iron. The blast furnace is able to make only the lowest (15%) grade, because silica is exceptionally difficult to reduce, and under conditions which would reduce 99% of the iron ore in a furnace, or 75% of the manganese ore, only 15 to 20% of the silica present can be reduced, and only a low-grade silicon alloy produced. The higher grades must all be produced in the electric furnace.

The raw materials are ordinary silica, the most abundant metallic oxide on the earth's surface; iron ore or scrap iron (iron or steel turnings or punchings), and coke. Electric furnaces up to 10,000 hp. have been operated on ferrosilicon (50% grade). At the high temperature required, a not inconsiderable proportion of the reduced silicon vaporizes, and burns outside the furnace to a white silica smoke. This can be largely prevented by skillful furnace supervision. In normal times, the 50% alloy sells at $45 to $50 per ton, which is a low price for an alloy so difficult to produce.

Steel producers use ferrosilicon principally for the great activity with which the silicon removes dissolved oxygen from the steel. It is about four times as active as manganese in thus reducing blowholes and producing sound castings. It is usual, however, to use manganese first, to do the bulk of the deoxidation, and silicon afterwards to finish up the reaction more completely. It is particularly useful in making sound steel castings which are cast into their ultimate form and do not have to be worked into shape, because a slight excess of silicon may make the steel hard to forge or roll, whereas an excess of manganese does not have so bad an effect on the working qualities. A particular kind of steel called silicon steel carries 1 to 2% of silicon and yet forges well; this would be classed as a special steel.

The ferrosilicon industry has attained large proportions in countries where electric power is cheap, particularly therefore in Switzerland, the French Alps, Norway, Canada, and parts of the United States. Under present conditions it is even profitably run where electric power is relatively dear, as at Anniston, Ala., and Baltimore, Md. It is a large, interesting, and rapidly growing industry.

FERRO-ALUMINUM

This alloy, with 10 to 20% of aluminum, was made in the electric furnace and used in considerable quantity in steel about 1885-88, but was displaced by pure aluminum as the latter became cheaper. Aluminum is about seven times as powerful as silicon and twenty-eight times as strong as manganese in acting upon the oxygen dissolved in steel; therefore only minute quantities are necessary, say 1 oz. up to a maximum of 1 lb. of aluminum per ton of steel. Its use gives the finishing touch to the deoxidation of the steel.

About 1885 the Cowles brothers, operating the first large electrical furnaces run in America, at Lockport, N. Y., made and sold considerable quantities of ferro-aluminum, selling the aluminum in it at the rate of about $2 per pound, while the pure metal was then costing $5. When, a few years later, pure aluminum sold for 50c. per pound, the steel makers turned to using the pure metal instead of ferro-aluminum, and at the present time aluminum is so used in practically every steel works in the world.

There seems to me a distinct opportunity for makers of ferro-alloys to revive the manufacture and sale of ferro-aluminum. Such great advances have been made in the construction and operation of large electric furnaces since 1890, and so much experience has been had in reducing the difficult oxides to ferro-alloys, that the production of 50% ferro-aluminum at say $100 per ton may be a distinct electric-furnace possibility. That would furnish the contained aluminum at about 10c. per pound, as against 30c. for the commercial aluminum now used. The alloy should be broken to small pieces before using, and thrown in the runner or on the bottom of the ladle, in order that the melted steel may quickly dissolve it as it runs into the ladle.

Such ferro-aluminum would require bauxite with iron ore or scrap iron, for its manufacture, but there are large deposits of low-grade bauxite rich in iron, in Southern France, which could be reduced directly to the alloy without any additions, and thus furnish very cheap raw material for the operation.

In conclusion, ferro-aluminum is not now being made, but its electric-furnace production is a real possibility.

FERROCHROMIUM

Ferrochromium is used for making what is familiarly but erroneously called "chrome steel." It makes steel exceedingly hard. Very hard cutting tools, and armor plates to resist projectiles, are made of it. Only 2 to 4% of chromium may be used.

Several grades are made in the electric furnace, depending on the percentage of chromium (25 to 75), and the content of carbon (2 to 8%). This alloy takes up carbon so actively in the furnace that it has to be treated subsequently to remove the carbon down to what can be endured by the steel into which it is introduced.

The raw material for its manufacture is chromite, an oxide ore of both chromium and iron. If this is mixed with carbon and smelted in the electric furnace it reduces directly to ferrochromium alloy (often misnamed "ferrochrome"), and highly saturated with carbon (6 to 10%). Steel makers want lower carbon than this, so the alloy is re-melted with more chromite in another furnace, and the excess of carbon oxidized out. The low-carbon alloy sells for two to three times the price of the high-carbon crude material.

The cutting off of importations of high-grade chromite ore from Asia Minor has led to considerable prospecting in the United States. Fair material has been found in many places, and at present our country is nearly independent of foreign sources of the ore.

FERROTUNGSTEN

Tungsten (also called wolfram) imparts curious and valuable properties to steel. A small amount (2 to 5%) has been used for half a century or more, to make the steel self-hardening; that is, a tool of this steel need only be allowed to cool in the air, and it becomes hard without the ordinary quenching or chilling operation. Larger proportions (10 to 25%) make a steel which stays hard even when red hot. A tool of this material can be run so fast on a lathe, for instance, that it gets red hot from the friction and work, yet keeps hard and keeps on cutting. It is called high-speed tool steel, and its use alone has more than doubled the output capacity of the machine shops of the world.

The ore used is either wolframite or scheelite—found in considerable quantities in Colorado and some other Western states, and imports of this ore have not been necessary during the war. In this respect we are much more favorably situated than the European nations. A plentiful supply of tungsten ore may indeed be regarded as a large factor in the production of cannon and firearms and all kinds of machinery, and therefore a considerable factor in winning the war.

FERROMOLYBDENUM

Molybdenum has only recently come into large use in steel. Its action being somewhat similar to that of tungsten, scarcity of the latter metal, particularly in Europe, has led to the manufacture of ferromolybdenum on a comparatively large scale.

The ores are widely distributed but not very plentiful. Molybdenum sulphide, molybdenite, looks almost exactly like shiny graphite, but it is a shade lighter in color and nearly twice as heavy. It occurs usually as flakes in granite rock and might easily be mistaken for graphite. Lead molybdate, wulfenite, is a compound of lead and molybdenum oxides, a prettily crystallized yellow-to-red mineral, in thin square plates. It occurs abundantly in a few lead mines in the West. It is usually first treated to extract its lead, and the residue then worked for molybdenum. The sulphide used to be roasted to molybdenum oxides, and this reduced by carbon in the presence of iron ore or scrap iron in an electric furnace. It is now smelted directly in the electric furnace with carbon and a large excess of lime along with iron ore or scrap iron. Ferro with 50 to 60% of molybdenum is tapped from the furnace like other ferro-alloys, but with molybdenum up to 80% the alloy has such a high melting point that it cannot be tapped out without freezing; it is necessary to make a furnace full of this alloy and then let the furnace cool down and take it apart, taking out a large mass of solidified alloy; the furnace is then rebuilt.

The large use of molybdenum in steel has been so recent that not much has been made public about it. Rumor says that the large German guns which bombarded Liége (the "Black Berthas") were lined with molybdenum steel (6 to 7%) to increase their resistance to erosion. It seems certain that Germany drew considerable supplies of molybdenite from Norway to compensate for shortage of tungsten for high-speed tool steel. Parts of guns, gun carriages, motors, automobiles, have also been made of molybdenum steel of most excellent quality. Canada has been especially active in the manufacture of ferromolybdenum steel, most of which is exported to Europe. This alloy is therefore another valuable war material that has established itself in manufacturing.

FERROVANADIUM

Without vanadium the modern automobile or auto-truck would be a much weaker machine. When steel is desired to withstand the heaviest shocks and vibration, nothing is quite so effective as adding vanadium. This is another comparatively rare metal, found principally in the radium ores of Colorado and as a black sulphide on the highlands of Peru. The canary yellow Colorado ore is treated for radium, and the residue for vanadium and uranium. The U. S. Government (Bureau of Mines) operated this process for the radium supply. The black ore of Peru is rich and unusual; it is a sulphide with some asphaltic matter, and it is roasted to the condition of iron-vanadium oxide before reduction. The oxides are best reduced by metallic aluminum. This is the well-known thermit (Goldschmidt) method of reduction. Electric-furnace reduction by carbon is not advantageous because of the large amount of carbon taken up by the alloy; powdered silicon is therefore put into the charge as the reducing agent, together with iron, lime and fluorspar, and then a 30 to 40% vanadium alloy is obtained with seldom over 1% of carbon, a very desirable composition. (R. M. Keeney).

Only small amounts of vanadium are necessary to improve steel; 0.1 to 0.4% are the usual quantities. This is fortunate because the vanadium costs $5 per pound and over. Metallurgists suspect that part of the improvement of the steel may be due to the vanadium combining with an removing nitrogen dissolved in the melted steel. This is probably true, yet some advantage undoubtedly must be ascribed to the final vanadium content in the steel; both avenues of improvement function. Steels thus treated are unusually resistant to shock and alternate stresses, making them very useful for axles, cranks, piston-rods, and such severe service.

FERROTITANIUM

Titanium is an abundant element in nature. It occurs in immense amounts as a double oxide of titanium and iron, known as ilmenite, or titanic iron ore. This ore can be reduced directly by carbon in electric furnaces to ferrotitanium. The reduction proceeds easier if some aluminum is put in as a reducing agent, but this is expensive and unnecessary. The alloy running 15 to 25% titanium is sold for use in steel as a refining agent to remove oxygen and nitrogen. Thousands of tons of steed for rails has been thus treated, the tests showing considerable improvement in the mechanical properties by the use of quite small amounts (0.10 to 0.20%) of titanium.

FERROBORON

This is another alloy whose valuable qualities have not yet been entirely determined. Boron is the metallic base of borax, which is a sodiumboron oxide. Borax is very difficult to reduce to the metallic state. Another raw material, not so abundant, is colemanite, containing lime and boron oxide. Many attempts have been made, none very successfully, to reduce this with iron oxide to ferroboron. The American Borax Co. offered a prize, for several years, for a process which would accomplish this. Boron oxide occurs rarely in nature, but it can also be manufactured from borax and colemanite. When the oxide is obtained, this can be combined with iron oxide and the resultant boron-iron compound reduced by carbon in the electric furnace to ferroboron. Small quantities of this alloy have thus been manufactured.

Experiments on steel have shown that ferroboron acts somewhat similarly to ferrovanadium. Experiments in France showed remarkably strong and tough steels were thus made, using 0.5 to 2% of boron. The results have not been properly followed up, partly on account of the difficulty in getting ferroboron. No one, as yet, has taken up its regular manufacture, and steel makers can hardly be blamed in these stirring times for not having thoroughly explored its possibilities as an addition to steel.

FERRO-URANIUM

This is the latest of the ferro-alloys to enter the lists. Uranium is a very heavy and, chemically, very active element. It is found very scarcely as a black oxide, the mineral pitchblende—the mineral in which radium was first discovered. It is found more abundantly in the Colorado radium ore, a bright-yellow oxide and silicate of vanadium, uranium and lime. After extracting the radium and vanadium, the uranium remains in the residue as a byproduct, usually as a soda uranium compound. This is treated so that uranium oxide is obtained, and this can be reduced by carbon in an electric furnace in the presence of iron ore or scrap iron, to ferro-uranium (30 to 60%). The recovery of uranium is not high (50 to 70%), the rest being lost in the slag. Mr. R. M. Keeney has recently described these processes in detail, for the first time in the August *Bulletin* of the American Institute of Mining Engineers.

The results of tests showing the influence of uranium on steel are not yet completely known. Some firms have claimed for it wonderful strengthening power and resistance to shock. The subject is still receiving expert attention from steel makers, and valuable results are confidently expected.

CONCLUSION

The ferro-alloys are exceedingly important materials to the steel maker, either in the making of ordinary steel or for producing special alloy steels. They are indispensable to the steel industry. They are important factors in producing both ordinary and fine steels, and therefore in winning the war. The country well supplied with them has a great advantage over the country in which they are scarce. They are deserving of all the expert attention which they are receiving from the War Industries Board, the steel makers, and the economists. The possession by the United States of large supplies and resources in the ferro-alloy line, may be one of the important factors in determining the quick ending of the war.

Electrical Ground Connections*

BY ORVILLE S. PETERS

Water pipes offer by far the most desirable means of making ground connections, but where it is necessary to resort to other means, such as driven pipes or plates, an appreciable degree of protection can in some places be obtained at reasonable expense. In a great many cases, however, grounds of the latter type will be found unsatisfactory. If a common ground wire is used, a good degree of protection can be had, but the expense may be considerable, and the result not equal to that obtainable from water pipes, unless the common ground wire is connected to a water pipe.

The resistance of water-pipe ground connections, where there are no high-resistance areas near by, averages about 0.25 ohm, which is sufficiently low for practical purposes in any case that is likely to arise. The resistance of driven pipe and plate grounds, however, is much higher than that of water-pipe grounds. A series of measurements on ground connections made with driven pipes, plates, coils of wire and patented devices showed results as given in the accompanying table. These ground connections were found in service in a number of cities situated in different parts of the United States between the Atlantic Coast and the Rocky Mountains.

RESISTANCE BY KINDS OF SOIL

Number of grounds tested	Soil	Average Resist.	Minimum Resist.	Maximum Resist.
24	Fills, and ground containing more or less refuse, such as ashes, cinders, and brine waste	14	3.5	41
205	Clay, shale, adobe, gumbo, loam, and slightly sandy loam with no stones or gravel	24	2.0	98
237	Clay, adobe, gumbo, and loam mixed with varying proportions of sand, gravel and stones	93	6	800
72	Gravel, sand and stones with little or no clay or loam....	554	35	2700

From these measurements, it is readily seen that, except in certain localities where natural conditions are particularly favorable toward making ground connections with driven pipes or plates, to obtain a degree of safety equal to that obtained with water pipes would entail an expense that would be almost prohibitive. It is possible, of course, to obtain an appreciable degree of protection with driven pipes in nearly all places, but the comparative advantages in connecting to water pipes are so great that the latter should be used wherever they are available. There is no possibility of damage to the pipes from currents flowing in them, nor of danger to employees of the pipe-owning company, if simple precautions are observed in regard to the use of the pipes for the purpose of grounding.

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*Excerpt from Technologic Paper 108, United States Bureau of Standards.

Dutch View of German Potash

It is pointed out in Dutch journals, says *Commerce Reports*, that the German potash industry, heretofore almost a monopoly, may have to face severe competition after the war. Potash deposits have been discovered in Catalonia; potash will probably be mined in the Netherlands (in the concession field of Winterswijk); and the United States may develop a potash industry. Under the stress of competition the German mines would doubtless combine, so that only one out of four or five mines would remain in operation, but the closed mines would still require considerable sums for the upkeep of buildings and machinery; and water must be pumped out to keep the mines dry, as it might otherwise flood the neighboring mines. The earnings of one mine would be distributed among the owners of four or five mines, and, if prices should fall, the shareholders would have to be contented with meager dividends. The German mines charge their foreign customers higher prices than the domestic consumers pay, and, owing to the enormous sums invested, high prices of potash are a vital condition for the existence of German potash industry. Hence the German interests are bound to keep the prices high and will not lower them save in case of extreme necessity.

Sliding Scale of Prices for Joplin Zinc Ore

The following documents are self-explanatory:

At the suggestion of Mr. Pope Yeatman, of the War Industries Board, a committee of the Joplin ore producers met with the Zinc Producers' Committee (which committee was appointed last year to represent the zinc smelting and mining industry of the country in its relations with the Government), for the purpose of arriving at a plan by which the long-existing differences between the Joplin ore producers and the smelters might be adjusted.

At this meeting the enclosed "Plan Governing the Purchase and the Sale of Joplin Blende Ore" was devised and received the unanimous approval of the representatives of both the mining and the smelting interests present.

In order to make this plan a success, it is necessary that practically all of the smelters using Joplin ores• should acquiesce. Already smelters representing approximately 55% of the zinc-smelting capacity of the United States have agreed to adopt the plan if acquiesced in by a sufficiently large proportion of the smelters.

It is not contemplated under the proposed plan that the relations between smelters and individual producers shall be interfered with. Orders will be placed direct by the buyers, as heretofore.

That this plan may become effective as of Nov. 1, you are requested immediately to signify your approval on the enclosed form and return it to Stephen S. Tuthill, Acting Secretary, American Zinc Institute, 27 Cedar St., New York.

It is sincerely hoped that all the zinc-smelting interests of the country will adopt this plan. It is designed to bring about closer coöperation between the zinc-ore producers and the zinc smelters and a stabilization of the zinc industry, which is a matter of national importance.

EDGAR PALMER,
Chairman Zinc Producers' Committee.

Oct. 21, 1918.

PLAN GOVERNING THE PURCHASE AND THE SALE OF JOPLIN BLENDE ORE, ADOPTED AT A CONFERENCE BETWEEN THE ZINC PRODUCERS' COMMITTEE AND THE JOPLIN ORE PRODUCERS ON OCT. 18, 1918.

1. That the smelters will specify the quantity of ore that they will obligate themselves to take in approximately equal weekly quantities during the period ending Jan. 1, 1919, and that the ore producers will furnish such tonnage, both subject to fires, strikes, accidents, or other causes beyond the control of either party, interrupting, curtailing or suspending operations at smelteries or mines, and neither party shall be liable for damages due to such interruption, curtailment, or suspension.

2. That the ratio shown in the following table shall be the basis of the settlement for 60% zinc Joplin mill concentrates, subject to the variation of $1 for each unit above or below 60% zinc contents, and subject to the customary lime and iron penalties of $1 for each unit of these ingredients in excess of 1%. Sludge material running not below 57½% zinc shall be penalized $2.50 per ton; sludge material assaying less than 57½% zinc and all flotation material shall be penalized $5 per ton. This schedule shall not apply to any ores below 50% Zn.

BASIS OF SETTLEMENT OF 60% ZINC JOPLIN MILL CONCENTRATES

Spelter Market (In Cents)	Ratio	Price 60% Joplin Ore at Mines	Spelter Market (In Cents)	Ratio	Price 60% Joplin Ore at Mines
6.0	6.8 to 1	$40.80	10 6	6.34 to 1	[illegible]
6.1	6.79 to 1	41.419	10.7	6.33 to 1	[illegible]
6.2	6.78 to 1	42.036	10.8	6.32 to 1	[illegible]
6.3	6.77 to 1	42.651	10.9	6.31 to 1	[illegible]
6.4	6.76 to 1	43.264	11.0	6 30 to 1	$69.30
6.5	6.75 to 1	43 875	11.1	6.29 to 1	[illegible]
6.6	6.74 to 1	44.484	11.2	6.28 to 1	70.336
6.7	6.73 to 1	45.091	11.3	6.27 to 1	70.851
6.8	6.72 to 1	45.696	11.4	6.26 to 1	71.364
6.9	6.71 to 1	46.299	11.5	6.25 to 1	71.875
7.0	6.70 to 1	$46.90	11.6	6.24 to 1	72.384
7.1	6.69 to 1	47.499	11.7	6.23 to 1	72.891
7.2	6.68 to 1	48.096	11.8	6 22 to 1	73 396
7.3	6.67 to 1	48.691	11.9	6.21 to 1	73.899
7.4	6.66 to 1	49.284	12.0	6.20 to 1	$74.40
7.5	6.65 to 1	49.875	12.1	6.19 to 1	74.899
7.6	6.64 to 1	50.464	12.2	6.18 to 1	75.396
7.7	6.63 to 1	51.051	12.3	6.17 to 1	75.891
7.8	6.62 to 1	51.636	12.4	6.16 to 1	76.384
7.9	6.61 to 1	52.219	12.5	6.15 to 1	76.875
8.0	6.60 to 1	$52.80	12.6	6.14 to 1	77.364
8.1	6.59 to 1	53.379	12.7	6.13 to 1	77.851
8.2	6.58 to 1	53 956	12.8	6.12 to 1	78.336
8.3	6.57 to 1	54 531	12.9	6.11 to 1	78.819
8.4	6.56 to 1	55.104	13.0	6.10 to 1	$79.30
8.5	6.55 to 1	55.675	13.1	6.09 to 1	79.779
8.6	6.54 to 1	56.244	13.2	6.08 to 1	80.256
8.7	6.53 to 1	56.811	13.3	6.07 to 1	80.731
8.8	6.52 to 1	57.376	13.4	6.06 to 1	81 204
8.9	6.51 to 1	57.939	13.5	6.05 to 1	81 675
9.0	6.50 to 1	$58.50	13.6	6.04 to 1	82.144
9.1	6.49 to 1	59.059	13.7	6.03 to 1	82.611
9.2	6.48 to 1	59.616	13.8	6.02 to 1	83.076
9.3	6.47 to 1	60.171	13.9	6.01 to 1	83 539
9.4	6.46 to 1	60.724	14.0	6.00 to 1	$84.00
9.5	6.45 to 1	61.275	14.1	5.99 to 1	84.459
9.6	6.44 to 1	61.824	14.2	5.98 to 1	84 916
9.7	6.43 to 1	62 371	14.3	5.97 to 1	85.371
9.8	6.42 to 1	62.916	14 4	5.96 to 1	85.824
9.9	6.41 to 1	63.459	14.5	5.95 to 1	86.275
10.0	6.40 to 1	$64.00	14.6	5.94 to 1	86 724
10.1	6.39 to 1	64 539	14.7	5.93 to 1	87.171
10.2	6.38 to 1	65.076	14.8	5.92 to 1	87 616
10.3	6.37 to 1	65.611	14.9	5.91 to 1	88.059
10.4	6.36 to 1	66.144	15.0	5.90 to 1	88.50
10.5	6.35 to 1	66.675			

3. The market price of spelter governing settlements will be posted by the Joplin Ore Producers' Association each Friday, and shall govern for one week. The quotation to be posted by the Joplin Ore Producers' Association shall be the average of the daily quotations for Prime Western spelter at St. Louis as given in the *Engineering and Mining Journal* for the week ending the Wednesday previous to the Friday of the week in which the quotation is posted.

4. Should this arrangement prove satisfactory, it will be continued from quarter year to quarter year, with such modifications as may be found necessary.

Smelters are now being asked to sign a certificate saying that they will be governed in the purchase of their Joplin blende by the plan governing the purchase and the sale of Joplin blende adopted at a conference between the Zinc Producers' Committee and the Joplin ore producers on Oct. 18, 1918.

Salt From Sea Water

Experiments in Norway with a view to extracting salt from ocean water by means of electricity have been successful, and two salt factories will be started for this purpose in the near future, by the name of De Norske Saltvertker, according to the *Bulletin* of the Canadian Department of Trade and Commerce. One is to be in western and the other in northern Norway, as these districts, on account of the fisheries, are the best home markets. It has been estimated that each factory will produce 50,000 tons of salt per year for a start, but the works will be so built that the production can be brought up to double the quantity, if necessary. Besides the salt, different byproducts will be made. The capital for the two factories is said to be 20,000,000 crowns ($5,360,000). Each establishment will require about 6500 horsepower for the normal production.

During the war it has been difficult to get salt from abroad, and sometimes it has been impossible to salt down the fish. The new salt works should greatly improve the situation.

Operations at the Trail Smeltery*

The Consolidated Mining and Smelting Co. of Canada, Ltd., Trail, B. C., is now producing on a commercial scale at the Trail plant five refined metals—gold, silver, copper, zinc, and lead—as well as bluestone, sulphuric acid, and hydrofluosilicic acid. During the last year the zinc plant has been completed. It has a capacity of from 60 to 70 tons of spelter a day, working on high-grade zinc ores. The ores treated, however, are, in the main, low in zinc, and the capacity of the plant is thereby reduced, the best record up to the present being 62 tons a day.

The zinc plant contains two driers; three 18 x 5-ft. ball mills; thirteen seven-deck 25-ft. Wedge roasters; a large leaching building, where the ores are leached by counter-current continuous process in Pachuca tanks and thickened in Dorr thickeners, purified in Pachuca tanks, and filtered with Kelly and Oliver filters; electrolyzing-tank rooms, where the solutions are electrolyzed in concrete electrolytic tanks; thirteen 1000-kw. motor-generator sets; the necessary transformer plant to reduce the 60,000-volt current with which the plant is supplied; and a melting plant with two reverberatory furnaces for melting the cathode zinc.

The copper plant is, primarily, a gold-copper plant for the treatment of Rossland ores. The copper tonnage is small. The copper smeltery consists of the necessary ore bins, two 35-ft. and two 25-ft. furnaces, and two 12-ft. Great Falls type converters. The refinery was originally built to refine 10 tons of copper a day. It was found necessary during the year to double this capacity.

Owing mainly to increased production of customs lead ore, the roasting capacity in the lead smeltery has been increased. This equipment now consists of three seven-hearth 25-ft. Wedge roasters, five single-hearth Godfrey roasters, 32 Huntington-Heberlein converters, and three Dwight & Lloyd sintering machines.

The lead smeltery consists of the necessary ore and roast bins, four blast furnaces, drossing kettles, and an anode casting machine. The lead refinery, which is an electrolytic Betts process plant, has a capacity of approximately 100 tons of pig lead a day. During the year a concentrator with daily capacity of 400 tons has been built. This mill is equipped with a 6 x 6-ft. ball mill, a standard 24-in. 17-cell Minerals Separation machine, concentrating tables, filters, thickeners, and complementary appliances. The mill has been working on the concentration of the low-grade zinc-lead ores from the Sullivan mine.

Since 1894, when the company took over the plant, 5,179,307 tons of all classes of ores has been treated, with a gross value of $94,315,754, and yielding 1,778,921 oz. gold, 27,500,350 oz. silver, 458,236,524 lb. lead, 75,047,410 lb. copper, and 23,056,996 lb. zinc.

During the fiscal year 10,000 tons of zinc was produced, representing a value of $3,000,000, marking an epoch in the metallurgical history of Canada. The production of lead amounted to 22,000 tons, exceeding that of last year by 2000 tons. The year's output of sulphuric acid reached 2878.7 tons of 100% product. The capacity has been doubled and a daily output of 30 tons established. Hydrofluosilicic acid was produced to the extent of 196 tons, and an installation of new retorts designed to double this capacity is being made.

Amalgamation Practice Economies*

By S. A. Pearce

The chief losses of mercury are caused by the attrition of the ore particles passing over the amalgamated plates. Beyond a certain limit, it is found that coarse pulp will strip mercury and amalgam off the plates entirely. Losses may also occur from other causes, which include:

1. Impure mill water, or insufficient lime to correct acidity in the ore.
2. Inadequacy of traps, and too long intervals between cleaning them out.
3. Too generous use of mercury at dressing. This includes carelessness in using the mercury bottle and spraying elsewhere than on the plate.
4. Too great a velocity of pulp, which may be due either to too high a ratio of water to ore crushed, or too much fall on the plates.

Another item which I think worthy of mention refers to the grinding of amalgam and black sand. Individual practice in the treatment of the "scrape and plate dressings" differs considerably.

My own experience, after trying various methods, is that a minimum of loss of mercury is involved by the old-fashioned method of cleaning up the "scrape" in a Batea pan and subsequently grinding the "black sand" in a barrel for about 20 hours, adding the necessary mercury only about two hours before finishing. When I had 100 stamps out of 300 hung up, and the quantity of scrape and black sand was correspondingly low, it was found that the size of the barrel charge had a substantial bearing on the amount of mercury floured in the operation; and, after experimenting, the following conditions to insure a minimum loss have been adopted:

Speed.—A 24-in. internal diameter barrel should run at 16 revolutions.

Load.—Barrel should be at least three-quarters full.

Consistence of charge should not be more than sloppy, with no excess of water.

As much as 100 oz. of mercury can be floured by not attending to these conditions. A liberal use of lime in the charge, to prevent acidity, is essential.

I deprecate the use of cyanide when dressing plates. An attempt was made to recover mercury in the traps by using a number of rusty iron nails therein. The iron retained both mercury and amalgam.

Liberty Loan Subscriptions placed through the special Mining Committee reached a total of $59,122,900, instead of $58,926,350, already reported in the *Journal*, the increase being due to belated reports.

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*Excerpt from the annual report (1917) of the Minister of Mines of British Columbia.

*Excerpt from the *Journal* of the Chem. Met. and Min. Soc. of South Africa.

Assayer and Chemist

Zirconium Content in Ores and Alloys

By J. D. Ferguson*

For the determination of zirconium in ores, or in ferrozirconium, take a ½-gm. sample of finely ground material and fuse well with 5 gm. of sodium carbonate in a platinum crucible. Dissolve the fusion from the crucible, neutralize with HCl, then add 20 c.c. of HCl in excess, and boil to dryness. From this point the method is the same as for zirconium in steel, as given below, after the evaporation to dryness.

Zirconium in Steel

Place 3 gm. of steel in a 250 c.c. beaker. Add 15 c.c. of hot water and 15 c.c. of concentrated HCl, followed by several additions of 1 c.c. of concentrated HNO_3 at short intervals till the sample is in solution. This takes only a few minutes. Now introduce 6 c.c. of concentrated H_2SO_4 from a burette under the cover glass of the beaker. Place on the hot plate and evaporate to dryness. Cool. Add 30 to 50 c.c. of hot water and 1 c.c. of concentrated H_2SO_4, and heat till all soluble salts are in solution. Now filter, using suction, and wash the silica well with hot water, then with hot 1 to 1 HCl solution, followed by hot water, taking care to remove all iron in the washing. Transfer the filtrate from the filter flask to a 500-c.c. beaker.

Ignite the filter containing the silica in a platinum crucible. When thoroughly ignited, cool, add sufficient concentrated H_2SO_4 to cover the silica (not less than 2 c.c.), then add HF, a little at a time, till all effervescence ceases, and then another 2 c.c. in excess. Place the crucible on a hot plate and evaporate just to white fumes of sulphuric anhydride. Cool, dilute with water, and add to the main filtrate from the silica.

Now nearly neutralize the combined filtrate with NH_4OH, leaving it only slightly acid. Then add, with vigorous stirring, 6 c.c. of ammonium bisulphite solution (made by passing SO_2 gas into concentrated NH_4OH to saturation), place on the cooler part of the hot plate and slowly heat to boiling. The ammonium bisulphite solution should completely reduce the iron, leaving it a very pale green color, except where nickel or chromium is present, when, of course, the color is deeper.

Remove from the hot plate and cool to room temperature. Now add 1 to 1 ammonia, with constant stirring, till the precipitate formed redissolves with difficulty, then 3 drops of methyl orange solution, and continue adding dilute NH_4OH, drop by drop, till the color changes from pink to yellow and a slight permanent precipitate begins to form. Immediately add 10 drops of concentrated HCl if it be the purpose to precipitate by phenylhydrazine (or 2 c.c. concentrated H_2SO_4 if the purpose is to precipitate zirconium as phosphate); see Note 1. Dilute to about 400 c.c. with hot water and heat to boiling. At this point if it be suspected that the solution is not perfectly reduced, add another c.c. of ammonium bisulphite.

When the solution boils, remove from the hot plate and add, with vigorous stirring, 1 c.c. of phenylhydrazine for every 100 c.c. of solution. This will precipitate both zirconium and aluminum as hydroxides, together with a little iron. Replace and boil for a few minutes. Remove and allow to stand for half an hour in a warm place; then filter and wash several times with hot water. Redissolve this precipitate with hot dilute HCl and H_2SO_4; reprecipitate after reducing (use only 1 c.c. of bisulphite this time), and neutralizing and proceed as before. Wash well with hot water. This should free the aluminum and zirconium hydroxides from iron. Ignite and weigh the combined oxides (or as an alternative the precipitate may be redissolved in 40 c.c. of hot 1 to 1 HCl, and the zirconium separated from the aluminum by cupferon; see note).

Fuse the combined oxides with a large excess of Na_2CO_3. Dissolve the fusion in hot water. Add a little NaOH solution, and filter. Wash well with hot water. Aluminum passes into the filtrate, and the zirconium remains on the filter as insoluble sodium zirconate. Ignite the filter containing the sodium zirconate, and fuse the residue at a low red heat for 15 min. with potassium pyrosulphate. Cool and dissolve the fusion in hot water. The zirconium may now be precipitated as hydroxide by ammonia; or, if it is suspected that iron is present, by phenylhydrazine, as before. Ignite the precipitate to ZrO_2 containing 73.90% Zr (or multiply by 0.7390 factor).

Note 1—Zirconium may also be determined as the phosphate after the reduction and neutralization, as given in the above method, by immediately adding 2 c.c. of concentrated H_2SO_4, diluting to 400 c.c. This makes the solution about 1% acid with H_2SO_4, which is the necessary condition to prevent the precipitation of aluminum. The mixture is then heated to boiling and 1 gm. of Na_2HPO_4, dissolved in a little hot water, added, with vigorous stirring. The zirconium, if present, precipitates as a whitish gelatinous substance. Boil for a few minutes, and allow to stand for a couple of hours. Hillebrand states that if the zirconium is present in small amount, 24 hours may be necessary. Filter, wash with hot 1% H_2SO_4 and hot water, without suction, till free from impurities. Dry the filter, separate the precipitate and burn separately; combine, ignite for 10 min. on the blast lamp, and weigh as zirconium phosphate containing 38.28% zirconium.

Note 2—The combined aluminum and zirconium hydroxides from the second phenylhydrazine precipitation may be dissolved in 40 c.c. of hot 1 to 1 HCl, and the solution diluted to 100 c.c. and cooled.

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A 6% solution of cupferron in water is then added, with stirring, till the zirconium is precipitated, and further additions precipitate the crystals of the reagent. Now add an excess of cupferron solution equal to 1/5 the volume of the solution being precipitated. Allow to stand for 15 min., then filter, and wash first with cold dilute HCl solution (20 c.c. concentrated HCl to 100 c.c. H_2O), then with water, followed by NH_4OH solution, and again several times with water. The precipitate is now ignited and weighed as ZrO_2, containing 73.90% zirconium.

Note 3—There is still another method of determining zirconium in steel which I shall mention briefly. Use the Stead or the Carnot method for determining aluminum steel. Zirconium precipitates with aluminum in the precipitation with phosphate. This precipitation, repeated several times, will free the zirconium and aluminum from iron. They may then be separated by methods already mentioned.

Note 4—It will be found that the results obtained from the precipitation of zirconium by phosphate and phenylhydrazine methods will agree closely. I have carried out a number of determinations for my own satisfaction, and seldom got a variation of 0.05% in result. More frequently the variation was only 0.01 or 0.02%. The phenylhydrazine method may, of course, be used to determine aluminum in iron and other ores.

Colorimetric Assay for Tungsten*

By W. R. Schoeller and A. R. Powell

The gravimetric method does not provide a satisfactory solution of the problem of the assay of low-grade tungstic material. The characteristic property of tungsten is, that the yellow modification of tungstic acid is practically insoluble in dilute mineral acids, and soluble in ammonia or caustic alkali. The assay of high-grade ores and concentrates is based on those facts. With low-grade and impure material, however, the precipitation of tungstic acid by evaporation of the acid solution is incomplete, because the change to the yellow compound does not take place below a certain concentration, and tungstic acid has a pronounced tendency to form stable soluble complexes with a number of elements—a characteristic which is exerted more strongly when the liquid is evaporated to dryness. Hence, with such material, recourse must be had to precipitation by means of reagents such as mercurous nitrate, benzidine, cinchonine and the like, which, however, precipitate other acid radicles as well. Hence, the precipitate obtained is contaminated to a greater or lesser extent, and its further treatment for purposes of purification renders the process too tedious for routine work. Nor has a satisfactory volumetric method yet been evolved to replace the gravimetric. Under the circumstances a colorimetric process, based on the reduction of tungstic acid to the blue oxide, will probably overcome the difficulties attaching to the estimation of small percentages of tungsten. The following directions indicate the lines along which the test would proceed:

A suitable quantity of ore (e.g., 3.125 gm.), ground to pass 90 or 100 mesh, is fused with sodium bisulphate in a silica crucible. The cold melt is dissolved in hot 5% tartaric acid, and the solution filtered from silica and unattacked gangue into a graduated 250 c.c. flask. The filtrate is made ammoniacal, warmed, and saturated with hydrogen sulphide; all the iron, manganese, and metals of the copper group are thus precipitated. When cold, the liquid is made up to bulk, and 200 c.c. (= 2.5 gm.) filtered off. The filtrate is slightly acidified with hydrochloric acid, and warmed so as to coagulate the precipitate, consisting of sulphides of molybdenum, arsenic, antimony, tin, or vanadium. The volume is again adjusted to 250 c.c., and an aliquot part, corresponding to 0.5 or 1 gm., filtered off. This filtrate, which contains all the tungsten, together with alumina, titanium, phosphoric acid, and lime, is now ready for the colorimetric process, after addition of a suitable reducing agent, stannous chloride or zinc, preferably the former.

[The suggestions with regard to the new colorimetric method are made by the authors without opportunity for experimental verification, and were submitted with an explanation to this effect.—Editor.]

Solution of Tin-Antimony-Lead Alloys*

By Louis E. Eckelmann

The dissolving of alloys containing tin, antimony and lead has always been accompanied by considerable uncertainty, especially with regard to the time required. The usual method of heating the finely divided metal with aqua regia, or concentrated HCl and $KClO_3$, takes a considerable amount of time; and I have found that most of the trouble experienced in bringing alloys of this type into solution is caused by the application of excess heat, and consequent expulsion of the nascent chlorine, before enough of the latter is present to act upon the dissolving metal. By the use of the following method 2 gm. of the alloy may be dissolved in less than 12 minutes:

To the finely divided alloy (1 gm.) add 60 c.c. of concentrated HCl and 2 c.c. of concentrated HNO_3. Heat to violent ebullition over a Bunsen flame. Lower the flame and continue heating, adding small portions of sodium or potassium chlorate until the alloy is dissolved. Enough chlorate must be added to permit the more or less permanent formation of the yellow supernatant foam, which is an indication of the amount of chlorine in solution. The rapidity with which this foam will disappear is an indication of the correct temperature. Too high a temperature does not allow the foam to form at all, and too low is shown by the amount of gas evolved by the dissolving metal. After solution the excess chlorine is boiled off.

Vacation Leave on Pay for Mine Employees on a daily wage has been granted by the gold-mine companies of the Transvaal since 1915. A recent amendment to this regulation has been adopted by the Chamber of Mines, by which the leave given to surface employees is increased from 10 to 12 working days, after one year's service, thus permitting three week ends in the holiday. It is claimed that in no other industry have employees paid by the day been granted privileges of this nature.

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*Abstract from a paper published in Bul. of the Inst. of Min. and Met.

*Excerpt from *Chemist-Analyst*.

Events and Economics of the War

Following close upon Berlin's reply to the last note of the President, stating that Germany was awaiting proposals for an armistice, came word on Oct. 29 that Austria-Hungary sought an immediate and separate peace. Later dispatches proclaimed that a faction in Hungary, lead by Karolyi, had declared for an independent state. While the Dual Monarchy's internal affairs were thus in such difficulties, an offensive was suddenly opened in Italy between the Brenta and the Piave rivers against the Austrian positions, with immediate results; the enemy's lines were pierced on a 37-mile front, and the Piave was crossed, many thousands of prisoners being taken.

In France, the Allies drew nearer to Valenciennes; further south, the French overcame the German resistance in the Oise-Serre salient and resumed their advance, which had been delayed; and the Americans pushed ahead on both sides of the Meuse. In Palestine, General Allenby captured Aleppo, rendering the Turkish situation desperate; the Turks are said to be seeking a separate peace.

In the United States, on Oct. 24, the Interstate Commerce Commission, in ruling on a Washington case, asserted its authority to alter the freight rates fixed by the Railroad Administration. The Military Deficiency Bill was passed by the Senate and placed in the President's hands. In accordance with the terms of the Daylight-Saving Law, clocks were set back an hour on Oct. 27.

Anthracite Miners' Wages Raised

After negotiations with the U. S. Fuel Administration lasting from the end of July until the middle of October, the anthracite miners are to be granted a wage increase. The higher scale paid in the bituminous fields, where the men ordinarily work much less regularly than they do in the anthracite region, was a source of dissatisfaction to the anthracite workers, probably because at present there is little difference in the regularity of employment in the two industries.

Following the increase of 35c. per ton added to the price of anthracite at the mines by President Wilson on Dec. 1, 1917, the anthracite workers had received an advance in wages. The wage agreement then consummated, however, proved ineffectual, and recently the representatives of the miners informed Dr. Garfield that they had exhausted their resources in holding the men at work; that the lure of higher wages elsewhere was drawing them away. Finally, after a long discussion, during which the cost of living was considered, a wage scale was agreed upon by representatives of the various Governmental agencies dealing with labor problems. The General Reviewing Board sanctioned this increase, and submitted its finding to the Fuel Administrator.

The increase to be granted amounts to 12% in the case of contract hand and machine miners. Contract miners' laborers will receive an increase of $1 or more per day; outside company men and monthly men getting $2.54 or less per day, 90c. per day; breaker boys, 60c. per day; inside engineers and pumpers, $1.10 per day; and all other mine workers, $1 per day.

Thus wages in the anthracite region are to be raised because of the higher scale prevailing in the bituminous fields. But the bituminous leaders immediately sought to bring about an advance in the bituminous scale on the basis of the new anthracite wage. However, Dr. Garfield ruled on Oct. 25 that the situation did not warrant this, although he left the way open for the introduction of further evidence.

More Potash Needed

Every effort should be made by the Government to encourage production of potash and nitrates, Bernard M. Baruch, chairman of the War Industries Board, told the Senate Finance Committee on Oct. 24. The potash situation has been calling for special attention on the part of the various Government agencies during the last few weeks. William W. Mein, assistant to the Secretary of Agriculture, urges that additional potash be secured from blast furnaces, cement mills, greensand, certain shales, the brine of certain lakes, and from kelp. An estimate by A. W. Stockett, of the U. S. Bureau of Mines, places the domestic production of potash for the next 12 months at 60,000 tons. As this is only 25% of pre-war consumption, extraordinary efforts must at once be made to increase production.

Steps Toward Reconstruction

Though the problem of economic reconstruction after the war has received far less recognition in this country than abroad, much has nevertheless been done that will prove of great assistance in the post-bellum period. Burwell S. Cutler, chief of the Bureau of Foreign and Domestic Commerce, discusses the future trade plans of the European belligerents in a report referred to in the last issue of the *Journal*. In a letter submitting this report, he outlines the work accomplished by the various Government offices at home.

This Government's greatest preparation for future trade, according to Mr. Cutler, is the building up of a merchant marine backed by ample shipyards and drydocks. The Webb-Pomerene Bill has been passed, permitting our exporters to combine for foreign-trade purposes. The Federal Reserve Board and banking system have wide leeway in foreign-trade banking matters and are meeting such needs as develop. The Federal Board for Vocational Education, and the War Department, in its attention to the welfare of crippled soldiers, are looking to the future. The work of the Department of Labor, in its efforts to create a mobile labor supply more respondent to industrial needs, will doubtless continue after the war. Steps in preparation for the future have also been taken in the Department of Agriculture, the Bureau of Mines, the Geological Survey, as well as in the Bureau of Standards and the Bureau of Foreign and Domestic Commerce.

The last-named bureau now has far better information service as to materials, markets, legislation, and economic conditions in foreign countries than ever before, states Mr. Cutler. Its foreign commercial staff has been greatly expanded, and the amount of research work done has correspondingly increased. Statistical work of similar kind has been done by the Shipping Board, the War Trade Board, and the War Industries Board, with reference to commodities for war purposes, but which will be useful in organizing an after-the-war program. The State Department has long been engaged in drafting commercial treaties, and the Tariff Commission is surveying American industries to ascertain their tariff needs. To formulate complete and binding policies as to the future would be a waste of effort at this time, but facts should be, and are being, assembled, upon which action can be based later.

Larger Coal Stocks Authorized

All classes of industries consuming bituminous coal, except Class 1, as defined by the War Industies Board, were authorized by the U. S. Fuel Administration on Oct. 16 to increase their reserve stocks of coal. Those heretofore not on Preference List No. 2 were authorized to lay in additional reserve supplies. Consumers in Class 2 may store their coal up to the limits previously imposed on Class 1. Consumers heretofore in Class 3 will receive the facilities heretofore accorded to Class 2, and consumers in Class 4 have been allotted the opportunities heretofore reserved for Class 3. Consumers not on the preference list have been allowed the stocks formerly permitted Class 4 concerns. Preference List No. 2, as it affects mining and metallurgical companies, was printed in the *Journal* of Sept. 14, page 499.

The regulations, it was announced, will stand until further notice, and it was stated that, under them, an opportunity is afforded every industrial consumer for laying in at this time some reserve supply of bituminous coal. The order affects only those consumers in states east of the Mississippi, with the exception of Alabama, Tennessee, Mississippi, Indiana, Illinois, Wisconsin, and northern Michigan.

German Potash in War Time*

To justify a bill increasing the prices of potash, the German government has submitted to the Reichstag a long report on the potash industry in war time. Sales outside of Germany in 1917, as given in this report, were 143,948 tons (2000 lb.) of K_2O, compared with 557,318 tons in 1913. Sales in Germany in 1917 were 963,075 tons, against 666,537 tons in 1913. Total sales in 1917 were therefore 116 832 tons less than in 1913. Of the total output in 1917, 95.7% was consumed in agriculture, against 90.4% in 1913.

The gradual consolidation of potash mines, begun in peace time, became all the more urgent in war time, as the number of mines in operation had increased from 191 on Aug. 1, 1914, to 209 on Jan. 1, 1918. Under this policy 99 mines have been shut down. The number of operatives decreased from 34,316 on July 1, 1914, to 31,740 on Jan. 1, 1918, the latter number including 11,361 prisoners of war and 2336 women. The general average wage in the fourth quarter of 1917 was 6.20 marks, as against 4.37 marks in 1914, 4.30 marks in 1915, and 4.83 marks in 1916. The par value of the mark is $0.238.

The condition of equipment and repairs is declared to be altogether unsatisfactory. Only mines with preliminary assignments of production quotas did any installation and equipment work during the war, and that ended when the scarcity of labor and fuel compelled the government to assign war prisoners and fuel to the principal working mines. As a rule, the mines did only such repair work as was found to be absolutely necessary.

Metal Accumulated in Russia

During the navigation period of 1917 about 80,000 tons of metal was imported into Russia through Archangel, says the *Ironmonger* of Sept. 21, 1918. When the revolution broke out, in November, 1917, the further transport of the metal into Russia was made difficult, and at the end of the year 32,000 tons of various metals had accumulated at the port. In the spring of the present year a beginning was made in sending this accumulation south, and by the end of June, 22,114 tons had been forwarded to Vologda, consisting of 10,299 tons of copper, 1565 tons of brass, 3454 tons of iron and steel alloys, 2267 tons of lead, 1991 tons of antimony, 1770 tons of aluminum, 551 tons of tin, 167 tons of steel, and 50 tons of spelter. As a result of newly arrived consignments, the stock of metals at Vologda is now said to have again increased to about 24,000 tons.

Research Laboratory Needs Data

The Engineering Foundation and the National Research Council are coöperating in compiling information about the research laboratories of the country and in promoting industrial research. They request all laboratories who have not yet done so to send to the New York office a brief statement covering the following matters:

Equipment—not a detailed list, but a summary indicating kinds and capacities in a general way and mentioning apparatus of unusual character or size; research work—general kinds, with reference, if permissible, to special problems which would indicate the scope of the work which the laboratory can undertake; staff—classes, such as chemists, physicists, engineers, assistants, together with the number of each, the name of the person in charge, and approximate time spent on research.

A committee consisting of Grant Hamilton, representing the Department of Labor; George J. Salmon, U. S. Bureau of Mines, and S. A Taylor, representing the Fuel Administration, has been formed to investigate mechanical labor-saving devices relating to mining.

**Frankfurter Zeitung*, July 10; *Commerce Reports*, Oct. 9.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Report on Gold Situation Soon

The committee appointed by the Secretary of the Interior to study the gold situation expects to submit its report before the middle of November, practically all those having replied to whom questionnaires had been sent. In compiling its report, the committee had before it yearly statements of operations of all gold properties in the United States from 1913 to this time. It also had the opinions of all operators as to the effect of a continuation of present conditions on their production. None of the deductions of the committee is to be given out in advance of the complete report. The committee consists of Hennen Jennings, J. H. Mackenzie, Charles Janin, H. D. McCaskey, and F. L. Ransome.

Revenue Bill Covers Depletion

An addition to the War Revenue Bill to read as follows has been adopted by the Senate Committee on Finance:

> In the case of mines, oil and gas wells, other natural deposits, and timber, a reasonable allowance for depletion, and depreciation of improvements, according to the peculiar conditions in each case, based upon cost, including cost of development not otherwise deducted: Provided, That in the case of such properties acquired prior to Mar. 1, 1913, the fair market value of the property (or the taxpayer's interest therein) on that date shall be taken in lieu of cost up to that date: And provided further, That in the case of mines, oil and gas wells, discovered by the taxpayer and not acquired as the result of purchase of a proven tract or lease, where the fair market value of the property is materially disproportionate to the cost, the depletion allowance shall be based upon the fair market value of the property at the date of the discovery, or within 12 months thereafter, such reasonable allowance in all the above cases to be made under rules and regulations to be prescribed by the commissioner with the approval of the secretary. In the case of leases the deductions allowed by this paragraph shall be equitably apportioned between the lessor and lessee. In the case of a foreign corporation, the deductions under this paragraph shall be allowed only as to property within the United States.

Pyrite Development Checked

Further development of domestic pyrite deposits is being discouraged by the Government. This condition has been brought about not only by the actual development of pyrite properties but by the unexpected growth in sulphur production in Louisiana and Texas. When the imports of Spanish pyrite first were curtailed, it was feared that it would be impossible to produce the necessary sulphur materials in this country to take the place of the normally heavy imports of the Spanish product. The point now has been reached, however, where there is danger of a domestic overproduction.

Negotiations are now in progress between certain pyrite producers and the War Industries Board as to the marketing of their product. On account of their high costs, many producers are not willing to sell on a parity with sulphur. Plants in the vicinity of pyrite mines are now required to use that material instead of sulphur, so long as the pyrite is offered on a parity with the sulphur price. Whether a higher price may be charged and the plants still required to use that material will be decided at the conferences now in progress. The opinion is expressed that the negotiations will result in a satisfactory agreement.

Lead-Silver Volatilization Tests

Reporting on experimental work being done in lead-silver volatilization, the acting superintendent of the Salt Lake City station of the U. S. Bureau of Mines states:

> In the lead-silver volatilization work, tests have been conducted on pure minerals in a small electrical furnace with the object of discovering the factors that interfere with and assist in the recovery of silver. Exceptionally high recoveries of oxide copper were made. In order to determine just what results could be obtained on oxide copper ores, a series of experiments has been made, on both a large and a small scale. In practically every test, better than 95% of the copper has been obtained, and as high as 85% of the silver on a 15-oz. ore. The fume has varied from 36 to 40% copper, with high silver and gold content. The fume is easy to reduce by means of powdered coke and limestone.

No loss of chlorine was encountered in the various steps, so far as could be ascertained.

Chromite Import Limit Exceeded

Immediate suspension of all shipments of chromite from overseas and revocation of all outstanding licenses therefor have been recommended by advisers to the War Industries Board and to the U. S. Shipping Board. An investigation of the chromite situation has developed that imports of that material have been much greater than the limits set by the restricting orders. This has been made possible by the loophole in the original order which permitted the use of chromite as ballast. The proposed change in the regulations would bar the importation of chromite, even as ballast.

New Engineer Chief Appointed

A new chief for the engineering division of the Ordnance Department, in the person of Brig.-Gen. G. W. Burr, has been chosen. General Burr succeeds Brig.-Gen. John H. Rice, now in France on active duty. The former is at present the representative of the Ordnance Department in England. Prior to that assignment he was in command at the Rock Island Arsenal. For many years he was in charge of ordnance matters in the Philippine Islands. Col. J. B. Dillard is acting chief of the engineering division.

Milling of Graphite Ore Improves

Decided improvement in the practice at graphite mills in Alabama is reported to the U. S. Bureau of Mines by one of its engineers, who is studying graphite conditions in that state. Though he finds widespread inefficiency on the part of the labor employed, and some inefficiency on the part of its supervision, a marked improvement has been made. No difficulty is being experienced in raising No. 1 flake to 88%, with good recovery.

A DETACHMENT OF THE 27TH ENGINEERS, PHOTOGRAPHED WHILE STILL ON THIS SIDE

Let the Comfort Fund Do Your Work

The things we would like to do for the men of the mining regiment which circumstances prevent can be done through the Comfort Fund. Hundreds of mining men have used this medium for showing their feeling toward the 27th Engineers, and it gets results.

It will be remembered that the last detachment of the regiment to go across was furnished a band through the Fund. It also carried a supply of smokes and considerable athletic equipment. Those who gave toward these things will therefore be interested to hear what Captain Balch, who commanded the unit on its trip over, has recently written from the other side. He says:

> On disembarking we had to march through the town to the railroad station. The band covered itself with glory, and the whole battalion received an ovation. The Scottish people are certainly very hospitable at times.
>
> After our Channel trip and arrival in France, we had a strenuous journey to our station, but are now comfortably located in billets in an old French town. We opened the boxes and distributed the tobacco to the men today, and they were very glad to receive it.
>
> We are well equipped in the line of athletic supplies as compared with some of the other units near here, and the men appreciate it very much. Have a game scheduled for next Sunday with another regiment.
>
> We lost four men coming over, who were sick and had to be transferred to the hospital, which was a very good record, considering the number of men. Our men are all in good health now, and we expect to get in some good hard training and hope to join the rest of the regiment soon.

Join the rest in maintaining the Comfort Fund. The mining regiment is your regiment and deserves your consideration.

HOW THE COMFORT FUND STANDS

Previously Acknowledged	$18,492.77
C. M. [illegible]	10.00
C. A. [illegible]	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
[illegible]	5.00
W. L. [illegible]	5.00
C. M. [illegible]	10.00
[illegible], monthly	5.00
[illegible]	10.00
H. A. [illegible]	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
[illegible]	5.00
[illegible]	25.00
Total	$18,727.77

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Because of the work involved in administering the Comfort Fund contributions are acknowledged only by publication in the *Journal*.

The Situation in the Brass Business

Despite the drastic curtailment of the use of brass by all non-war consumers, there still is an important shortage in making up actual war needs. Chairman Baruch of the War Industries Board says that production now is running 40% below the demand.

On Aug. 29, 1918, according to figures compiled by Everett Morss, chief of the non-ferrous tubing section of the War Industries Board, the situation stood thus:

THE DAILY REQUIREMENTS IN SHEET AND ROD BRASS

SHEET BRASS, LB.

Requirements for ordnance ammunition, etc	2,220,000
Incidental requirements	1,000,000
Total demands	3,220,000
Actual production	1,800,000
Shortage	1,420,000

ROD BRASS, LB.

Requirements for ordnance, ammunition, etc	840,000
Incidental requirements	300,000
Total demands	1,140,000
Actual production	1,000,000
Shortage	140,000

Since Aug. 29, because of the widespread effect of the influenza epidemic among employees of the brass mills, as elsewhere, the situation has grown materially worse, and, in fact, may be said to have reached a crisis.

Three measures of relief, in the opinion of the chief of the non-ferrous tubing section of the War Industries Board, appear to be immediately demanded. They are:

1. For the Government to release soldiers from the camps and assign them to the brass mills in sufficient number to make up lost production due to the shortage of labor.

2. For the War and Navy departments to eliminate to the utmost possible extent the use of brass in various accoutrements and equipment for the Army and Navy. Major General Goethals, chief of the division of purchase and supplies of the War Department and a member of the War Industries Board, has already been advised by Mr. Morss that the use of brass buttons on uniforms must be discontinued, as there is not enough of the metal available for this purpose.

3. A more vigorous pruning by the Government of its demands for other uses, and the employment of sharper restrictions to prevent the various departments from demanding more than their actual needs. Specifications must be revised.

October Mining Dividends

Dividends disbursed in October, 1918, by 29 United States mining and metallurgical companies making public reports amounted to $5,658,584, as compared with $9,778,910 paid by 48 companies in October, 1917. Holding companies paid $348,139 in October, 1917, but nothing in October, 1918. Canadian, Mexican and Central American companies paid $1,131,950, as compared with $1,287,137 in October, 1917.

MINING DIVIDENDS

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Smelters, pfd. A	U. S.-Mex.	$1.50	$148,013
Am. Smelters, pfd. B	U. S.-Mex.	1.25	44,242
Arizona Commercial, c	Ariz.	.50	132,500
Bingham Mines, c	Utah	.50	(a) 75,000
Caledonia, l.s	Ida.	.03	78,150
Cardiff, l.z	Utah	.20	100,000
Cons. Interstate-Callahan, l.z	Ida.	.75	348,742
Cresson Cons., g	Colo.	.10	122,000
Dragon Con., l.s	Utah	.01	18,750
Golden Cycle, g	Colo.	.03	45,000
Grand Central, l.s	Utah	.04	24,000
Homestake, g	S. D.	.50	125,580
Inspiration, c	Ariz.	2.00	2,363,934
Iron Blossom, l.s	Utah	.02½	25,000
Iron Cap, c	Ariz.	.25	36,203
Judge Min. and Sm., l.z.s	Utah	.12½	60,000
Nevada Packard, g.s	Nev.	.02½	29,122
New Idria, q	Calif.	.50	50,000
North Butte, c	Mont.	.25	107,500
Ontario, s	Utah	.50	75,000
Portland, g	Colo.	.02	60,000
Richmond, l.s	Ida.	.01	8,400
Rochester Mines, g	Nev.	.02	40,000
Shattuck Arizona, c	Ariz.	.50	175,000
Tonopah Min., s	Nev.	.15	150,000
United Eastern, g	Ariz.	.05	68,150
U. S. Smelting, com	U. S.-Mex.	1.25	438,894
U. S. Smelting, pfd	U. S.-Mex.	.87½	425,555
Vindicator, g	Colo.	.03	45,000
West End, g.s	Nev.	.10	178,849
Wolverine, c	Mich.	1.00	60,000

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Cons. Min. & Sm. Co., c.z	B. C.	$0.62½	$261,936
El Oro Min. and Ry., g.s	Mex.	.24	57,375
Hollinger, g	Ont.	.05	246,000
Howe Sound, c	B. C.	.05	99,208
McKinley-Darragh-Savage, s	Ont.	.03	67,431
N. Y. & Hond. Rosario	C. A.	.50	100,000
Nipissing, s	Ont.	.25	300,000

(a) Payable in Liberty Bonds.

The totals for the first ten months of the year are as follows: Mining and metallurgical companies, $135,187,192; holding companies, $1,728,438; Canadian, Central American, South American and Mexican mines, $19,618,740.

Imports of Ores and Metals

Imports of antimony, pyrites and manganese, as reported by the U. S. Department of Commerce for August, 1918, and the figures for August, 1917, as finally revised, are as follows:

	August, 1917	August, 1918
Antinony ore, contents, lb	1,457,798	18,951
Antimony matte, regulus or metal, lb	6,414,175	2,886,926
Pyrites, long tons	118,575	57,420
Imported from:		
Spain, long tons	69,674	15,364
Canada, long tons	48,901	41,469
Manganese ore, long tons	87,650	33,975
Imported from (in part):		
Cuba	4,860	972
Brazil	79,511	25,520
British India	1,500	1,650

American Smelting and Refining Co.

In its twentieth semi-annual report, covering the period ended June 30, 1918, the American Smelting and Refining Co. refers to the difficulties which have arisen because of the increase in operating costs, coupled with a stationary income on account of fixed contract charges. Many of the company's establishments were operating at a loss. The matter was discussed with the various companies with whom the A. S. and R. Co. had entered into long-term contracts, with the result that an agreement has been reached. This factor, coupled with the results arising from the improved situation in Mexico, permits the company to report earnings sufficient for the usual dividend requirements.

Net income amounted to $9,745,525.77, and permitted dividend disbursements of $3,954,949; surplus account was credited with $113,872.08. The net amount credited to property account during the period was $2,891,635.35; and the total charge to property account amounted, on June 30, 1918, to $133,905,840.87, or a reduction during the 12 months of $4,850,703.67.

Manganese in Wyoming

Few deposits of manganese ore are known in Wyoming. A deposit in the northern part of Albany County was examined by E. L. Jones, Jr., of the U. S. Geological Survey, in October, 1917. It was being exploited by the Wyoming Manganese Co., of Laramie. At the time the deposit was visited no ore had been shipped, although about 200 tons of ore containing 40% Mn was on the dumps. Later in 1917 about 30 tons of high-grade ore was shipped to a mill at Boulder, Colo., for experimental purposes. The development work consisted of 200 ft. of tunneling connecting with a shaft 25 ft. deep.

Tin Mining in Federated Malay States

The *British Board of Trade Journal* for Aug. 22 contains the following report on the tin-mining industry of the Federated Malay States:

British territory produces by far the largest share of the world's supply of tin, and the Malay States for many years have been the chief source of the metal. Last year's export from the Federated Malay States amounted to 39,833 tons, as compared with 43,870 tons in 1916, but the value of the exports rose from £7,526,566 in 1916 to £8,489,610 in 1917.

The average sterling value per ton in Singapore in 1917 was £213 2s. 7.3d. (a new record), compared with £171 11s. 2.1d. in 1916, and £153 4s. 3.1d. in 1915. In no previous year has the London market been subjected to such abnormal pulsations as in 1917, the lowest cash price quoted being £180 15s., on Jan. 1, and the highest £309 per ton, on Dec. 21—a fluctuation of £128 5s.

The output and value of the metal from the four states is compared in the following table:

TONNAGE AND VALUE OF TIN PRODUCED IN FEDERATED MALAY STATES

	1916		1917	
States	Tons.	Value.	Tons.	Value.
Perak	27,242	£4,675,379	24,643	£5,264,215
Selangor	12,241	2,099,072	10,960	2,323,541
Negri Sembilan	907	155,887	734	157,346
Pahang	3,480	596,228	3,496	744,508
Totals	43,870	£7,526,566	39,833	£8,489,610

The total of the Fourth Liberty Loan is now estimated to be $6,500,000,000. Oversubscription in every Federal Reserve district is indicated. This is a fitting commentary on the efforts of the energetic workers who have made the loan successful. More than that, it shows the unity and purpose of the citizenry of our country.

Editorials

Let There Be No Relaxation

ONE of the leading German newspapers is reputed to have made the remark that "If the Kaiser really has any arrangement with Gott, now is the time when he needs the benefit of it."

In former times military supremacy has been determined by the number of men on the opposing sides, but the comparison has not always been numerical. When the arms and equipment and the directing genius were equal, two opposing armies came to a deadlock. Indeed, a defense of inferior numbers could produce that result, the offense needing always to have a certain superiority.

When, however, an army provided with firearms marched against an army of bowmen and axmen, a numerically inferior force could overwhelm, for one man with a musket was superior to many men armed only with axes.

In the present war the opposing armies were for a long time nearly equal in striking power, but during the last six months the Allies have acquired a distinct superiority, and that superiority is increasing every day, owing to America's exertion of mechanical power. Owing to the latter, each million of Germans in the field may be opposed by a million of Allies multiplied by 3, 5, 10, or some other factor which represents their enginery. The men who are producing the engines in the shops at home are therefore fighting just as much as the men who are using them in the field.

The time is therefore coming, if it has not already come, when the Allies will possess such superior power, through their guns, gas shells, tanks, aëroplanes, motor trucks, etc., that the Germans cannot withstand them at all. Probably the Germans see this, and, being unable to create an equivalent mechanical power, owing to deficiency of material, men, etc., are interested in talking about peace in order to stave off the inevitable and irresistible invasion of Germany.

The job is going to be done, but until it is finished we must not relax one ounce in our efforts. Relaxation is the one thing for which the Germans are praying. Therefore we must be careful not to play into their hands.

Germany's Economic Position

WHEN the war began, the wealth of the German Empire was estimated to be $80,000,000,000. This has now been reduced to about $50,000,000,000, it is said, while the national debt has been increased to about $58,000,000,000; wherefore the statement is made that "Germany's debts now exceed her assets."

We do not know whether the above figures be approximately correct or not, but we do know that the deduction is incorrect. Germany's debt is mainly internal, i.e. the German people as a whole owe it to those Germans who are bondholders. This is a matter of internal distribution of wealth, which may be arbitrarily readjusted. It has nothing to do with the national wealth. Germany possesses the same land, forests, mines, factories, houses, railways, municipal improvements, etc., that she did before the war. She has lost nothing of her material resources and property, except to the extent that her metals, chemicals, etc., have been discharged on the battlefields, or have been supplied to her allies, whose notes are probably no longer good; and to the extent that the fertility of her lands have been robbed and her railways and machinery have been impaired by wear. All of this may be loss enough, but it is a long way from spelling bankruptcy, for if there were really the latter the people would not be able to exist at all.

On the other hand, Germany still possesses the machinery and treasures that she has looted from Belgium, Northern France, and Russia, estimated by M. Cheradame in the billions, which, of course, she will be required to return. It is not unlikely that the financial arrangements of the great settlement will compel the Germans to cancel their indebtedness among themselves and put everything in a common pool to pay up the foreign indemnities for restoration; but pay up they will in the course of time.

In this connection, some of our own people will have to revise their economic ideas. Already there is agitation for protective duties to support some of our producers who have sprung into being during the stimulus of war prices and now foresee extinction unless aid be extended to them. The advocates of a protective tariff are "barking up the wrong tree," as one of our friends has aptly put it.

The war has made us a creditor nation. Now, how are our debtors abroad going to pay their interest and principal unless we buy things from them, and what should we buy unless we take those things that they can supply cheaper than we? How is Germany going to pay her foreign debt? She will have very little to sell except her work. The only way the rest of the world can get advantage of her work is to buy from her. The United States may not have to buy directly from Germany, although of course we will buy some things, such as potash, from her. We may sell to her largely of copper and other things. She will sell goods to China and other countries, and we shall have to buy from them. The bankers will settle the triangular, quintangular, or multi-angular accounts, and this is the only way we can collect our foreign credits.

Coal From Lens

PERHAPS it would be better to say that there is no coal in Lens. Probably more suffering is borne throughout France for lack of coal than for the lack of any other one commodity. Frenchmen have generally felt that if their armies could only recapture Lens a great part of the suffering, which their fellow countrymen have borne uncomplainingly, might be largely or totally eliminated. Lens has been taken, but a dispatch from Paris informs us that the methodical Germans have, as usual, completed their task of destruction in the vicinity of Lens in a thorough and businesslike manner, and that the work of restoration, no matter how actively pushed, will not permit of any coal being mined this winter. A period of reconstruction of a year or two must precede production. To civilians this is a hard blow, but the engineers who know the mines of that district are not in the least surprised.

A French civilian, speaking recently of the fuel situation in France, remarked: "Our soldiers have no fear of German shot and shell. They feel that in some way their women at home will get food; but they know that their children are cold and will be so until after peace is declared. That thing which spurs them to the utmost endeavor is also the thing that may weaken them most."

Some of us were a little inconvenienced last winter for a few days, and thought disagreeable things if we did not say them.

During the coming winter we may have a few more such days, but before complaining let us recall that those who have been holding the front line for us have had four years of coalless winters and are now facing another with so little of complaint that many of us had not heard that they were even short of coal.

Dust Abatement in Mines

IN THE current issue we publish an excerpt from a paper on "Dust Abatement in Mines," presented by Mr. W. O. Borcherdt at the recent annual congress of the National Safety Council. We are glad to note that Mr. Borcherdt takes the position that dust of all kinds is injurious if it is in the air that is regularly breathed by miners or others. Attention has been directed mainly to finely divided siliceous dust, for the injurious effects of this dust have been investigated with a considerable degree of thoroughness in Western Australia, South Africa, and in our own country.

The statement is often made that certain kinds of dust, such as coal dust and non-siliceous dusts, are not harmful, but we think that any dust taken into the lungs in sufficient quantity to overcome the natural rate of elimination must accumulate, and though it may not in every instance do injury to the lung tissue, it at least interferes with the efficiency of the lung cells in performing their function.

The solution of the dust problem, reduced to its simplest form, necessitates the prevention of dust entering the lungs. The problem has been attacked from several different directions. First, an attempt was made to induce the miners to use respirators, but these did not receive ready acceptance. Next, efforts were made to prevent dust from getting into the air. Drilling, blasting, and the shoveling, loading and unloading of ore and waste are the principal causes of dust-charged air. Dust-catching bags were used with certain types of drills, hollow steel and water sprays with others, and outside sprays with still others. The hollow-steel drill with internal spray is without doubt the most practicable arrangement yet devised for the elimination of dust caused by drilling. The result of Mr. Borcherdt's questionnaire bears this out and agrees with our opinion.

Elimination of dust resulting from blasting operations has not been so easily accomplished. The first attempt was to reduce the amount of dust from this source through confining blasting operations to the end of a shift and allowing a sufficient time interval for the dust to settle. This was only a partial remedy. The next step was to increase the quantity of air in circulation so as to dilute the dust in suspension to a relatively small amount per unit of air volume. There are limits to the amount of air in circulation, and, if these are exceeded, dust is picked up and brought into circulation, defeating to a considerable extend the desired end. A great increase in volume of air also operates to dry out the mine and, if anything, to increase the dust nuisance. Ventilation will, however, always be an important factor in dust control.

In handling dry, dusty ore, the most effective preventive seems to be the general spraying of ore piles with water. By wetting the ore sufficiently—and this is not always easy to do—much dust can be eliminated.

We are inclined not fully to agree with Mr. Borcherdt's view that dust respirators do not, in general, present any hope of a solution, although we appreciate the reasons that he presents. Our own experience with different types of respirators inclines to the belief that much can be done to improve them. At the Chemical Exposition, held recently in New York, we had an opportunity to examine closely a new type of respirator, and found that some of the objectionable features of the older types had been removed. This respirator is light, convenient, and as comfortable as such devices can be. The filtering area is large. The filter disk is light, porous and an effective dust-stop.

The development of gas masks may help materially in the perfection of a satisfactory respirator. It is obvious that an efficient respirator with ample filtering surface will meet the primary requirement of preventing dust from entering the lungs, and it is this important fact that leads us to take the position that as much or more attention should be directed to the development of a respirator as to the perfection of the oxygen apparatus. We do not advocate the universal use of respirators, but rather a limited use, particularly in ore shoveling and chute loading.

Dust prevention may properly be considered as much a part of the duties of a mining engineer as mine surveying. The mine office should be equipped with dust-sampling apparatus, and regular surveys of dust conditions should be a part of the routine work of a mine where there is a conspicuous or dangerous amount of dust. There is no panacea for dust, but by intelligent application of the various methods of prevention that mining practice has evolved, its pernicious effects may be greatly lessened, if not eliminated.

In the midst of the war news, the wreck of the "Sophia," in Lyn Canal, with the loss of both passengers and crew, draws attention to far-off Alaska. This is the time of year that miners who have completed their season's work leave for their homes in the States. Doubtless many of them were on board. Our hearts go out in sympathy for those who lost their lives in this accident.

BY THE WAY

A well-known mining man writes us from Africa, his letter being, of course, a long time in coming, as follows: "I see that Hoover is to be the guest of the British nation shortly. If we cannot have him for the House of Lords, we want him for Westminster Abbey, when you have finished with him." Our correspondent, by the way, is an Englishman.

Among the most audacious gold thieves who flourished on the Westralian fields in the boom days was a German mine-manager who worked in with another German, the owner of a treatment plant, and stole amalgam and zinc-box slimes wholesale, writes "Oof Bird" in the *Bulletin*. Both grew very wealthy, and when the Chamber of Mines detective force began to get around they hurriedly left the country. Another was an assayer with a small reduction plant, who had a baker as a partner. The baker collected telluride ore specimens on his rounds and secreted them in the loaves which he delivered to the assayer. A lucrative business was done in this way. A third, head of a syndicate of three, was metallurgist at one of the big mines. A barmaid received the stolen stuff from him and passed it to the owner of an alleged gold-producing show, for treatment. All three shared alike and made a lot of money. Scores got nice-sized parcels of gold together and then went out into the bush and made "new finds." The papers raved about the prospects of these for a little while, and then the announcement of "a return" enabled the finders to lodge their gold in the bank without questions being asked. Nowadays the bank officials are more inquisitive and the police more watchful.

At that time [early in 1859] Comstock, whose name is now heard in all parts of the world in connection with the great silver lode bearing his name, was familiarly known to the miners as "Old Pancake," wrote Dan De Quille in "The Big Bonanza." Some ladies from Genoa visited the mine, attracted by the reports of its great richness which had reached the town. Comstock was delighted, showed them everything, and gallantly offered each lady a pan of dirt, a piece of politeness customary in California in the early days when ladies visited a mine. "Old Pancake" was anxious that each of his visitors should get something worth carrying home, and, by means of sly nods and winks, gave one of the workmen to understand that he was to fill the pans from the richest spot.

One of the ladies was young and very pretty. Although each of the other ladies had obtained from $150 to $200 in her pan, Comstock was determined that something still handsomer should be done for this visitor. When her pan of dirt was being handed up out of the cut (that is, the open cut run into the lead), he stepped forward to receive it, and, as he did so, slyly slipped into it a large handful of gold which he had taken out of his private purse. The result was a pan that went over $300, and "Old Pancake" was happy all the rest of the day.

The Eleventh Engineers

Thomas M. Johnson, staff correspondent of the *Evening Sun*, cabled the following under date of Oct. 13:

> While the New York infantry has swept the Germans from the Argonne forest and the New York artillery has blasted them from their trenches along the Meuse, the New York railroad engineers (the Eleventh Engineers) have been behind them bringing up the rations and the shells that feed the men and guns.
>
> The troops commanded by Col. William Barclay Parsons, who were among the first American units to arrive in Europe nearly a year and a half ago, laid much of the standard-gage railroad track behind the lines that was needed for the transportation of supplies for the St. Mihiel attack. So these men helped in the first American offensive.
>
> They are now laying track and running trains with engines made in the United States, marked "U. S. A.," on the famous Verdun battlefield, hauling monster shells for the heavy guns that are blasting the trenches of the Kriemhilde Stellung.
>
> These famous troops, who jumped into the first Cambrai battle one year ago and fought beside the British, are now so expert that they can lay broad-gage track faster than the infantry can advance.
>
> Maj. Walter T. Chevalieri's battalion broke the record at St. Mihiel. This was the result of experience gained with the British and on American lines of communication, where these engineers spent several months prior to the St. Mihiel attack.
>
> These New Yorkers show long training and experience in every action. Lean, sunburned, husky, they're tremendous workers and have been of inestimable value to the First Army in its two attacks.

The Eleventh Engineers is the regiment in which Dwight and Stehli are officers, and in which, also, was the lamented Irving.

Trust tha Pumps

By D. E. Charlton

I 'as 'eard of pumps gert, I 'as 'eard of pumps small,
I 'as 'andled them many a year,
An' I naws all about 'em an' naws 'ow they act
An' I'll tell 'e, there's nothin' to fear
If there's plenty of steam an' tha gaskets 'old tight,
An' tha win'bore is clear in tha sump.
If it's sinkin' or minin' an water shows h'up,
Don't thee worry or fret—trust tha pump.

W'en I think o' tha minin' I 'as done back long we
An' tha minin' I's done over 'ere,
I can truthfully say that tha troubles I've 'ad
Are a 'eap, but tha one's I 'old dear
Ain't tha troubles with pumps, for I naws bloody well,
That each time there wuz water to face,
I 'as banked on m' pumps an' they hasn't lost yet,
An' they always come firs' in tha race.

I ain't sayin' as 'ow, if tha water's too much,
That there's no chance to drown' h'out tha mine,
But jus' crowd in tha pumps, an' soon thee will see
That tha bailin's a matter o' time.
Thee can fill h'up tha drif' with a bulk'ead an' such,
But w'en water starts in pourin' through,
There's but one way to stop un an' that is, m'son,
To start up tha pumps—see thee do.

'Andlin' water s'like minin', its in all nawin' 'ow,
So jus' take this 'ere bit from me—
Make sure w'en tha driftin' is like to be wet
That tha pumps is all 'andy, an' see
That there's plenty o' gaskets an' pipe lyin' round—
No tellin' 'ow fas' thee mus' jump
W'en tha water starts comin', it's 'urry, m'son—
But thee's safe enough then, trust tha pump.

The Mining Index

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10100—LOCOMOTIVES—A New Type of Mine Locomotive Controller. L. W. Webb. (Gen. Elec. Rev., Sept., 1918; 3 pp., illus. Aug. 17, 1918; 1½ pp., illus.) 20c.

10101—MOTORS—Electric Motor Faults. J. Humphrey. (Iron and Coal Tr. Rev., Aug. 2, 1918; 1½ pp.)

10103—WELDING—Bibliography of Electric Welding. 1918-1914. Wm. F. Jacob. (Gen. Elec. Rev., Sept., 1918; 6 pp.) 20c.

10104—WELDING—Electric Welds. Ernest Edgar Thum. (Chem. and Met. Eng., Sept. 15, 1918; 7½ pp., illus.)

INDUSTRIAL CHEMISTRY

10105—POTASH from Searles Lake. Alfred De Ropp, Jr. (Jour. Ind. and Eng. Chem., Oct., 1918; 4¾ pp., illus.)

10106—POTASH—Recovery of Potash from Iron Blast Furnaces and Cement Kilns by Electrical Precipitation. Linn Bradley. (Journ Ind. and Eng. Chem., Oct., 1918; 3¾ pp.)

10107—POTASH—Recovery of Potash from Kelp. C. A. Higgins. (Journ. Ind. and Eng. Chem., Oct., 1918; 2 pp., illus.) Paper before Fourth National Exposition of Chemical Industries. Sept. 25, 1918.

10108—POTASH—The Prospects of Founding a Potash Industry in this Country. Kenneth M. Chance. (Journ. Soc. of Chem. Ind., July 31, 1918; 7¾ pp.)

10109—POTASH—The Recovery of Potash as a By-Product in the Manufacture of Portland Cement. John J. Porter. (Chem. Engr. July, 1918; 4½ pp.

Personals

The paragraph in this column of our last issue, reporting changes in the management and staffs of the Nevada Consolidated Copper Co. and Chile Copper Co., was incorrect, except that portion of it which said that C. V. Jenkins, of the Nevada Consolidated, had been transferred to New York. The paragraph came from our Ely correspondent, and was supposed by us to be reliable, until it was repudiated by several of the persons mentioned and officially from the Nevada Consolidated office. We regret the error and make haste to substitute this correction.

Morton Webber was in Salt Lake City last week.

Fred G. Farish is examining mining property in Nevada.

Robert E. Cranston, mining engineer of San Francisco, has joined the Food Administration.

Harry Urban has been appointed general manager of the Woodward Iron Co., of Alabama. **E. J. Best** has been made chief engineer.

Frank W. McLean, superintendent of the Morenci, Ariz., branch of the Phelps Dodge Corporation, is recovering from a serious illness.

R. R. Leslie has been appointed general superintendent of the Cubo Mining and Milling Co.'s property at Guanajuato, Gto., Mexico.

Thomas Chalmers has been appointed superintendent of the Fairfield byproduct coke plant of the Tennessee Coal, Iron and Railroad Company.

Anthony Jenkin has resigned as mining engineer for the Seneca Mining Co., Calumet, Mich., and has joined the staff of the Utah Consolidated Mining Co., Bingham, Utah.

D. J. Parker, of Pittsburgh, Penn., mine safety engineer of the U. S. Bureau of Mines, has been in Butte, Mont., arranging to establish a fourth mine-safety district in the West.

Dr. M. Y. Williams, Canadian government geologist, and **H. F. Slater,** general manager of the Rockwood Oil and Gas Co., are making an inspection of the Mosa Township, Ontario.

Charles M. Campbell, superintendent of the Granby Consolidated Mining, Smelting and Power Co.'s mines at Phoenix, B. C., has been examining copper properties in northern Manitoba, Canada.

Frederic Keffer, mining engineer of Spokane, Wash., who has been examining claims at Ainsworth, B. C., in the West Kootenay district, has gone to Lewiston, Idaho, to inspect properties there.

W. V. De Camp has resigned as superintendent of the Consolidated Arizona Smelting Co.'s Blue Bell mine, having been commissioned a first lieutenant of engineers, and has gone to Camp Cody, Deming, N. M., for training.

William H. Hampton has been placed in charge of miscellaneous gas-defense apparatus at the Long Island laboratory, gas-defense division of the Chemical Warfare Service. He is stationed at Long Island City, New York.

H. C. Thomas, formerly chief chemist for the Illinois Steel Co. at Gary, Ind., has been appointed assistant general superintendent of the United Alloy Steel Corporation, of Canton, Ohio, with which company he has been affiliated since June 1.

Prof Edward E. Bugbee, of the mining department of the Massachusetts Institute of Technology, has been granted a leave of absence to become assistant director of education for the students' Army training camps in five Southern states, with headquarters at Raleigh, North Carolina.

Francis N. Flynn has been appointed assistant general superintendent of the Balbach Smelting and Refining Co. at Newark, N. J. Mr. Flynn was until recently in charge of the smelting and refining departments of the Consolidated Mining and Smelting Co. of Canada.

S. S. Arentz is a captain in the U. S. Army. Other Utah engineers in the service include Capt. E. P. Kipp, Capt. Stanley C. Sears, Capt. A. D. Knowlton, Capt. R. M. Croker, Capt. James W. Wade and Capt. C. H. Jones; and First Lieutenants George P. Greenman, Paul R. Arentz, Leland Kimball and H. A. Kleinschmidt.

James Colquohoun, formerly manager of the Arizona Copper Co. of Clifton, Ariz., who was thought to have been lost in Russia, is reported to have arrived in England. He managed to make his way from southeastern Russia into Siberia and eventually reached Archangel, where he secured passage to Norway and thence to England.

Herbert C. Hoover, chairman of the Commission for Relief in Belgium, received on Oct. 24 this cablegram from the King of the Belgians, dated Oct. 22: "On this, the fourth anniversary of the foundation of the Commission for Relief in Belgium, my heart prompts me to thank you once more in the name of all my compatriots for having during four years saved the Belgian nation from starvation.—Albert."

Obituary

W. H. Woodson, a pioneer miner of the Globe-Miami district, in Arizona, died recently in Los Angeles, California.

William Main, a chemist and formerly interested in mining and metallurgical work in the West, died at Piermont, N. Y., on Oct. 18, aged 74 years.

A. B. Clabon, president of the Vancouver Chamber of Mines, Vancouver, B. C., was killed on Oct. 16 by falling over a precipice at Silver Creek, B. C., during a visit to the Wolsely claims, located there.

Stanley C. Way, superintendent of the Coates & Tweed properties of the Mesabi Range, with headquarters at Virginia, Minn., was killed by gas in a test pit, which the company was sinking, near Biwabik, Minnesota.

Branch E. Russell, captain of the San Francisco mine of the Morococha Mining Co., at Tuctu, Morococha, Peru, was murdered on Sept. 18 by a disgruntled employee of the company. He had been in Peru about nine months, having gone there from Arizona.

Eugene N. Engelhardt, superintendent of the Selby Smelting and Lead Co., at Selby, Calif., for the last 11 years, died by his own hand on Oct. 13 at Oakland, Calif. He was a graduate of the Columbia School of Mines, 1885, and a member of the American Institute of Mining Engineers.

William D. Stevens, a mining engineer and a graduate of the Michigan College of Mines, died of pneumonia on Oct. 13 at Aberdeen Proving Grounds, in Maryland, aged 29 years. He was a son of the late Horace J. Stevens, publisher of the "Copper Handbook," and, previous to enlisting in the Army, had been in the employ of the Bethlehem Steel Co. He was buried at Houghton, Michigan.

Harry T. Binder, assistant superintendent of the electrolytic refinery of the Raritan Copper Works, Anaconda Copper Mining Co., Perth Amboy, N. J., died Oct. 24, 1918, in Perth Amboy of heart failure, following an attack of Spanish influenza. He was 36 years old, and for the last 17 years had been in the employ of the company at Perth Amboy. Mr. Binder was well versed in all matters pertaining to selenium and tellurium, and had charge of the production of these elements.

Trade Catalogs

Giant Trucks. Chicago Pneumatic Tool Co., Chicago. Catalog No. 344; Aug. 1, 1918; 9½ x 12¼; pp. 32; illustrated. Descriptive of trucks burning low-grade fuels.

Rotary Dump. Wood Equipment Co., Chicago, Ill. Bulletin No. 180; 8½ x 11; pp. 12; illustrated. Descriptive of a pneumatic rotary dump for unloading mine cars.

"Gone Again." Crescent Belt Fastener Co., 381 Fourth Av., New York. Pamphlet; 5¼ x 7½; pp. 24; illustrated. Pictures in humorous vein the use of Crescent belt fasteners, rivets and plates.

Remco Redwood Pipe. Redwood Manufacturers' Co., San Francisco, Calif. Catalog No. 8; 6 x 9; pp. 112; illustrated. A catalog of redwood piping and flumes with data to guide purchaser in selecting and installing.

Mining Tanks. Pacific Tank and Pipe Co., 318 Market St., San Francisco, Calif. Catalog No. 12; 6 x 9; pp. 128; illustrated. A catalog of mining tanks and cyanide-plant equipment. Much information and data of value to the metallurgical engineer are in this book. Copy free on request.

Remco Redwood Tanks. Redwood Manufacturers' Co., San Francisco, Calif. Price List No. 14; 4¾ x 9½; pp. 36; illustrated. A catalog and price list of redwood water and oil tanks, gravity sprinkler tanks, tank covers, troughs and like devices. A discussion of essentials that insure good installation and instructions for erecting, together with data to guide the purchaser.

Jeffrey Belt Conveyors. Jeffrey Manufacturing Co., Columbus, Ohio. Catalog 175; 6 x 9; pp. 80; illustrated. This catalog is rightfully termed by its publishers a textbook upon the belt conveyor. Primarily it is a price list and catalog of Jeffrey products. In addition, voluminous information and data regarding the best in conveyor practice are placed at the disposal of the conveyor user, both present and prospective.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 15c. each. British patents are supplied at 40c. each.

Alloy of Iron with Ni, Cu and a small proportion of Mn. Henry K. Sandell, Chicago, Ill., assignor to Herbert S. Mills, Chicago, Ill. (U. S. No. 1,279,448; Sept. 17, 1918.)

Copper Ores, Lixiviation of. Niels C. Christensen, Salt Lake City, Utah, assignor of one-half to J. E. Barlow, Havana, Cuba, and one-half to Big Indian Copper Co., of Utah. (U. S. No. 1,278,854; Sept. 17, 1918.)

Flotation Method and Apparatus. Carl C. Thomas, Baltimore, Md. (U. S. 1,279,040; Sept. 17, 1918.)

Furnace, Electrical Heating. Herman V. Finnie, St. Catherines, Ont., Can., assignor to the Canadian Crocker Wheeler Co., Ltd., St. Catherines, Ont., Can. (U. S. No. 1,279,313; Sept. 17, 1918.)

Furnace, Electric. Samuel Peacock, Philadelphia, Penn., assignor to Haslup & Peacock, Inc., New York, N. Y. (U. S. No. 1,279,146; Sept. 17, 1918.)

Furnace. Richard Ziesing, Cleveland, Ohio. (U. S. No. 1,279,486; Sept. 17, 1918.)

Manganese from Lean Ores, Process of Leaching. Edward W. Haslup, Bronxville, N. Y., and Benjamin A. Peacock, Philadelphia, Penn., said Peacock assignor to said Haslup. (U. S. No. 1,279,108-10; Sept. 17, 1918.)

Metallurgy—Method and Apparatus for Subliming and Sintering Ores. William D. Kilbourn, Pueblo, Colo., assignor to United States Smelting, Refining and Mining Co. (U. S. No. 1,278,166; Sept. 10, 1918.)

Mine Cage, Safety Device for. Louis Pichler, Fort Wayne, Ind. (U. S. No. 1,278,742; Sept. 10, 1918.)

Mine Cars, Coupling for. Hopkin J. Williams, Nanticoke, Penn. (U. S. No. 1,278,541; Sept. 10, 1918.)

Mine Car and Tipple. David Scott Allison, Salt Lake City, Utah. (U. S. No. 1,278.551; Sept. 10, 1918.)

Monazite, Extraction of Cerium Group from. Wallace S. Chase, Lakewood, Ohio, assignor, by mesne assignments, to National Carbon Co., Inc. (U. S. No. 1,279,257; Sept. 17, 1918.)

Nickel-Copper Matte or Nickel Matte, Method of Treating. Otto Lellep, New York, N. Y. (U. S. No. 1,278,176; Sept. 10, 1918.)

Ore Dressing—Conical Mill. Harry W. Hardinge, New York, N. Y. (U. S. No. 1,279,335; Sept. 17, 1918.)

Potash—Process of Obtaining Potassium Sulphate. Benjamin A. Peacock, Philadelphia, Penn., assignor to Haslup & Peacock, Inc., New York, N. Y. (U. S. No. 1,279,145; Sept. 17, 1918.)

Steel, Ingot Mold for. Benjamin Talbot, Middlesbrough, England. (U. S. No. 1,279,037; Sept. 17, 1918.)

Steel—Four-Pass Hot-Blast Stove. James I. Larimer, Joliet, Ill. (U. S. No. 1,278,173; Sept. 10, 1918.)

Sulphuric Acid, Manufacture of. Joseph F. Cullen, Midvale, Utah, assignor to United States Smelting, Refining and Mining Co. (U. S. No. 1,278,308; Sept. 10, 1918.)

Tungsten and Nitrogen, Producing Compounds of. Carl Bosch and Alwin Mittasch, Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anlin u. Soda Fabrik, Ludwigshafen-on-the-Rhine, Germany. (U. S. No. 1,278,580; Sept. 10, 1918.)

Tunnel Excavating System. Joseph Perna, Philadelphia, Penn. (U. S. No. 1,279,148; Sept. 17, 1918.)

Zinc, Apparatus for Treating. Charles A. H. de Saulles, New York, N. Y. (U. S. No. 1,279,292; Sept. 17, 1918.)

Editorial Correspondence

SAN FRANCISCO—Oct. 22

Full Constitutional Authority for the operation of the State Industrial Accident Commission is being sought in Senate Constitutional Amendment No. 30, to be voted upon at the fall election. This amendment will give no additional power to the commission. The Supreme Court has decided the compensation, insurance, and safety act, under which the commission operates, to be constitutional on appeal from a compensation award. But no opinion has been given on the safety and insurance provisions of the law. Both these departments are firmly established and are doing commendable work, and as the law has proved itself, the commission believes it is entitled to the approval of the people of the state and to permanent establishment on a firm foundation. It was thought that the constitutional amendment of 1911, upon which the act was founded, was broad enough. The law, with some modifications, has been in operation for five years and generally has given satisfaction to both employees and employers. But there is still some doubt as to the constitutionality of some of the provisions of the act. It is for the purpose of validating all the Legislature has done in the enactment, by making the whole act constitutional and so put the legislative power expressed in the law beyond controversy, that the passage of the amendment is now asked.

Whitman Symmes, for many years mine manager of the Northend Comstock mines, at Virginia City, Nev., has been elected president of the several companies which his management controlled. H. L. Slosson, Jr., for an equal period president of these companies, and who for several years previously directed the business interests, has retired from the presidency. It was thought necessary to levy assessments for the purpose of continuing vigorous prosecution of development work; but Mr. Symmes, it is stated, has raised the necessary money by other means, so that the work will go on without interruption. The group or chain of mines affected by this change in the presidency comprises the Union Consolidated, Consolidated Virginia, Ophir, Mexican, and Sierra Nevada. F. M. Sharon remains superintendent of the Sierra Nevada. The development and production following the unwatering of the mines have been satisfactory in most respects, but extraction of ore has at times been sacrificed to the development of new orebodies or the recovering of known drifts and stoping ground containing ore of profitable grade. A large amount of labor has been expended on the Consolidated Virginia, at the southern end of the group. The shaft of this mine has long been used as the pump shaft for the entire group, and though it was known to contain prospective orebodies and was once one of the large producers of the Comstock, it has seemed for several years, owing to its relative situation, to be of greater economic advantage as the water clearance department of the enterprise. Since the lowering of the water in July, 1917, to a point below the 2900 level, there has been greater opportunity and more time and labor available for the prospecting, exploring, and developing of the ore [illegible] that the [illegible] developed into [illegible] of the Comstock. But [illegible] the lessening of the im- [illegible] In the [illegible] Mexican has [illegible] the Union [illegible] producer, and Ophir was [illegible] Sierra Nevada has [illegible] excellent showings in [illegible] The fact that all of the ore extracted in the North- [illegible] still one thing lacking—the opening of a second upcast shaft. This necessity will be met, as all others have been, by the application of patience, energy, and engineering skill. Labor shortage has greatly retarded operation on the Comstock, as in other districts of Western mines.

SALT LAKE CITY—Oct. 25

Carnotite Ores are being mined and shipped from near Castleton, in the south-central part of Grand County, by the United States Metals Reduction Co., a close corporation controlled by Pittsburgh people. The nearest shipping point is Cisco, necessitating a 30-mile haul to the railroad. The ore of shipping grade carries about 2% uranium oxide. A plant is being installed to treat lower-grade material. The present output is being shipped to Pittsburgh.

Western Salt Producers held a meeting here on Oct. 24 at which 20 of the largest salt producers of the Western states were represented. An association is to be formed. It was brought out that the cost of production had increased to the extent that at present little or no profit was being made, and that producers generally have not raised their prices. The chief expense at present is coal, which has increased in price above all other materials used in production. Although salt is obtained easier in Utah than in most places, the cost of refining is said to make the process as expensive as in the Eastern states for certain grades of salt. The object of the Salt Producers' Association is to coöperate in ways and means of reducing the cost of production. D. B. Doremus is secretary.

Competent Legal Opinion regarding the proposed amendment of Section 4, Article 13, Constitution of Utah, referring to mine taxation, as expressed by some of the leading attorneys in this district, brings out the following, which should be considered by every one directly or indirectly connected with the mining industry. Should the proposed amendment be adopted, the State Board of Equalization would be vested with plenary power to assess and tax metalliferous mines at much more than the full value thereof and possibly at less than such full value; that this power so conferred upon the State Board of Equalization will be entirely independent and beyond the control of the Legislature. Also that Sections 2 and 3 of Article 13 would not in any way limit the right of the board to assess and tax metalliferous mines at either more or less than their full value. And in this connection it is manifest that what may or may not be the full value of a mine is impossible of determination. The proposed amendment, if adopted, would confer upon the Board of Equalization the right to assess and tax mines at some arbitrary valuation, depending entirely upon the judgment, whim or caprice of such board. Regarding additional powers that will be vested in the board over those it now possesses, if the amendment is adopted, the powers of the board in arriving at valuations, with the exceptions set forth in the proposed amendment, will be untrammeled and exclusive and not subject to review or control by either the Legislature or the courts unless it should be ultimately determined that the proposed amendment is violative of the provisions of the Constitution of the United States. Under the present constitutional provisions, the acts of the State Board of Equalization are subject to review by the courts, and its determination may be set aside if found to be arbitrary, discriminating, or not in accordance with legislative enactments. Should the proposed amendment become a part of the organic law of the state, neither the Legislature or the courts would have any power to curb or control the action of the state board, no matter how arbitrary such action might be. The amendment, if adopted, will be self-executing, and no legislative action will be required to set in motion the powers of the board. As to whether the Legislature will be obliged under this amendment to confer upon the board the absolute power to assess and tax mines at a rate and value to be determined by the board, or whether the Legislature will determine the tax rate, how net proceeds are determined, and what multiple or sub-multiple shall be applied, it would not be necessary for the Legislature to take any action whatever to empower the Board of Equalization to determine the valuation to be placed upon mines or mining claims. The Legislature would have the power to define net proceeds and fix what, if any, deductions could be made; but so far as any valuation of mines based upon some multiple or sub-multiple of the net proceeds is concerned, under the proposed amendment the Legislature would be powerless to interfere in any way with the action of the state board, and could not fix or determine what multiple or sub-multiple should be applied in the case of metalliferous mines. In the practical operation of the amendment, existing law would determine what the net proceeds derived from any mine might be; the machinery for determining the rate of taxation is likewise also provided. There are many objections to the adoption of this amendment which can be successfully urged. The most potent objection is that it is contrary to the spirit of American institutions and form of government. To delegate to an appointed board, not responsible directly to the people, the powers contemplated by this amendment, would be to depart from all conceptions of governmental power of taxation heretofore entertained by the people. "What would be thought of a proposal to so amend the Constitution as to clothe the Governor, individually, with a power of taxation such as the proposed amendment seeks to confer upon his appointees? Would not any such attempt be condemned by all sober, thinking citizens? Yet it is manifest that a constitutional provision clothing the Governor with such power would be no more dangerous, would be no more revolutionary, and would be no more objectionable than is the proposal to confer like powers upon his appointees." The above is the opinion of one of the best-known lawyers in Utah.

DENVER—Oct. 23

Zirconium is to be the subject of special investigation by the Rocky Mountain section of the U. S. Bureau of Mines, at Golden. Pure metallic zirconium will be prepared, and its properties will be studied. It is of interest to determine whether pure metallic zirconium exists in a form which is malleable and ductile. Problems that will receive special attention at this time are means of obtaining temperatures sufficiently high for the preparation of metallic zirconium, for its purification, and for converting it into some form suitable for the determination of its physical properties. Equipment for an Arsem vacuum furnace has been assembled, and the necessary installations are being made at the power-house of the Colorado School of Mines. Experiments have also been made with other types of small carbon-resistance furnaces, and some fairly pure metal has already been prepared. In some cases this metal containes 98.5% zirconium. This investigation of zirconium is an important war problem, in which not only the Bureau of Mines but also the War and Navy departments are much interested. The research work in the Golden laboratories will be under the general supervision of Dr. S. C. Lind, and the temporary services of Dr. J. W. Marden, of the University of Missouri, and Lieutenant Malcolm Rich, of the Chemical Warfare Service, have been secured.

BISBEE, ARIZ.—Oct. 21

Walter Douglas, president of the Phelps Dodge Corporation, stated recently that the construction of the new concentrator below Warren had been stopped on account of the shortage of steel, the Government having regarded this work as non-essential during the period of the war, as it could not be completed in time to yield good results for war purposes. The company will go ahead with the necessary grading at the mill site, and will resume construction of the building as soon after the war as it shall be practicable to secure the requisite steel. Concerning the company's production of copper, Mr. Douglas said: "We are making our normal output of copper at our mines in Arizona, notwithstanding the shortage of labor as a result of the war, but we are doing it only at the cost of a cessation of all development. Mining copper is a war measure, and all conditions, ordinary and extraordinary, must be met without excuse and without fail. After the war we shall have to meet the hard conditions that will be the result of our having for so long a time suspended all development work, but they will be overcome eventually. The war has taught us that nothing is impossible."

CALUMET, MICH.—Oct. 25

The Annual Report of the Mine Inspector for Houghton County states that there were 31 fatalities in the mines during the year ended Sept. 30. Figures for mines in Ontonagon and Keweenaw counties are not yet available, but it is stated that a reduction in each of those counties will also be apparent. The number of employes of Houghton County mines was reduced from 16,423 to 12,250 during the last year, owing to the number going into the Army and Navy and those leaving for employment elsewhere. Even with this reduction in the total number of men employed, the percentage of fatalities and the number of minor accidents showed a decrease.

DULUTH, MINN.—Oct. 25

The Canisteo District, which is the largest iron-ore producing section of Itasca County, has had a successful season, from the standpoint of developing and shipping. The Canisteo mine is the largest property and has nine shovels working in the pit, six actively engaged at stripping or removing ore as required. Development work has been under way at this property for a number of years. There is no active shipping at the Arcturus, at Marble, although stripping is being done. The concentrating plant at Trout Lake is now operating two units. The chief construction work in the district has consisted of complete electrification of operations. Work now under way contemplates the abolishment of boilers and steam plants for ordinary purposes and the use of electrical current throughout the district.

Stockpiling and Development Work will be on an extended scale at the leading properties of the Minnesota iron ranges during the winter months, with a view to substantial ore tonnages being available to move at the openings of the 1919 season, says the *Iron Trade Review.* Improvements in the way of new headframes, hoisting and handling machinery are being carried through at several mines, including those of the Oliver Iron Mining Co., M. A. Hanna Co., Republic Iron and Steel Co., and the Tod-Stambaugh Co. Prompted by the urgent demand for manganiferous ores, the Cuyuna Range has set the pace during the present season in development work. Manganiferous ore shipments from that range for the season are expected to aggregate 700,000 tons, as compared with 225,000 tons last year.

TORONTO—Oct. 26

Data on the Cost of Production in the gold mines of the province has been asked for by the British government, and Thomas W. Gibson, Deputy Minister of Mines, has taken up the matter with the officials of the leading gold-mining companies. This step is regarded as foreshadowing some measure of government assistance to the gold-mining industry.

The Canadian government has issued an order authorizing the Canadian War Trade Board to take possession of and operate for a period of five years, if necessary, any mines which are producing or have produced chrome ore. This step is taken to remedy the shortage of chrome ore that has resulted through war conditions. Should the War Trade Board and the owners of mining properties be unable to agree as to the amount of compensation to be paid, the matter may be referred to the Exchequer Court for settlement.

VICTORIA, B. C.—Oct. 25

Aspen Grove Amalgamated Mines, Ltd., of British Columbia, with headquarters at Merritt, B. C., has been formed for the purpose of taking over and operating several large groups of mineral claims in the Aspen Grove district. The property includes 60 claims. Considerable work is contemplated. Officers are: J. A. Bate, president; M. A. Durland, secretary-treasurer; M. L. Grimmett, director and solicitor; Joseph Walters and Dr. J. J. Gillis, directors.

The Need of Developing an Iron and Steel Industry in British Columbia was the keynote of an address delivered by C. F. Law, chairman of the mining committee of the Vancouver Board of Trade, before a convention of the British Columbia Boards of Trade on Oct. 15. He asserted that there were 12,000,000 tons of iron ore in sight in the iron deposits along the coast, the gulf islands, and in northern sections of the province. He advocated a bonus by the dominion government on pig-iron production.

Construction of the Big Bend Road, which runs from the Revelstoke north along the Columbia River, is one of the most important public works undertaken by the Mines Department of British Columbia with a view to opening a promising mineral district to development. The country in this region, generally speaking, is rough and mountainous, and construction has been and is an expensive and difficult work. The road now is open to La Forme Creek, in which place are situated a number of mining prospects from which much is expected.

Several Thousand Miners and Prospectors in the Kuskokwim River district of Alaska are threatened with famine, according to a report brought from the North by the captain of the power steamer "Ruby," which has reached Seattle, Wash., in a damaged condition. This boat, which was the only one to set out with food and other necessities for the miners of the Kuskokwim, was unable to complete her journey, because of heavy storms which drove her into Seward, Alaska, for shelter. The prospect of getting relief to these people, it is said, is slim, as it is believed to be too late for another vessel to make the trip.

The Mining News

ARIZONA

Cochise County

COPPER QUEEN (Douglas)—Employing women in the assay department of the smeltery.

Gila County

AMERICAN ASBESTOS (Globe)—Work suspended on property in the Sierra Ancha Mountains, owing to inability to get needed machinery.

VAN DYKE COPPER (Miami)—To sink 1500-ft. shaft to cut rich ores believed to be at depth. Good-grade copper ore was cut by drilling at 1156-ft. depth at this property. Company desires to purchase headframe and suitable hoist. C. W. Van Dyke is president.

LAVELL GOLD (Winkleman) — Shaft down 240 ft. New 50-ton mill on the ground ready to be set up.

Maricopa County

SOUTH VERDE (Mesa)—Driving tunnel 400 ft. to cut vein. Dave Crismon is in charge.

Mohave County

MOSSBACK (Oatman)—Shaft has been sunk to 500 level, and station will be cut. Hoist, compressor, and pump are being installed. W. H. Holcomb is general manager.

TOM REED (Oatman)—Building pocket at the 500 level of Aztec shaft to handle ore mined at Bald Eagle. Stopes being opened up on 500 level of the Bald Eagle. Aztec shaft down 650 ft. and crosscut being driven to the vein.

Pima County

EMPIRE ZINC (Tucson)—Have taken over old Sahuarita smeltery, seven miles distant. Developing on 600 level of mine, and has blocked out large orebody on three upper levels.

RAMSDELL (Tucson)—Shipping 45 carloads of a copper ore a month from Vail station. Veich mine also shipping from same station.

REINIGER-FREEMAN (Tucson)—Drifting on 330 level to cut three fissure veins.

Santa Cruz County

EXPOSED REEF (Patagonia)—Sinking airshaft to old tunnel, from which development work is to be started soon. Dan Dawson is in charge.

WORLD'S FAIR (Patagonia)—New 225-ton concentrator started. Large tonnage of low-grade ore available. Hiram Whitcomb is manager.

Yavapai County

KAY (Canyon)—Lens of copper ore has been cut 2000 ft. north of the main shaft on the 180 level. George Long, formerly of United Eastern, is manager.

ALVARADO (Congress Junction)—Dismantling its 150-ton mill.

ARIZONA BINGHAMPTON (Mayer)—Mill to be enlarged and new shaft sunk.

ARKANSAS

Marion County

MORNING STAR (Rush)—To start mining and milling operations soon. The property has been idle for some months.

EDITH (Rush)—To start operations soon.

NORTH STAR (Yellville)—To start mill soon. Completing cable to mill.

ONWATA (Yellville)—Building small mill. C. G. Rogers is superintendent.

WASSELL (Yellville)—Installed a small compressor and air drills recently.

CALIFORNIA

Colusa County

PLATINUM DEPOSITS of commercial value are reported at Snow Mountain, in the extreme northwest corner of the county, by John M. Connolly and W. R. Zumwalt, of Colusa.

Monterey County

KING QUICKSILVER (Parkfield) — Sinking 6 x 6-ft. shaft. Treating ore in retorts and will start furnace. Property leased by Patriquin brothers.

Mendocino County

CHROME DEPOSIT on Cow Mountain, operated by Gus Angle, of Ukiah, has 45 tons ready for shipment. Angle has also located copper deposits.

Riverside County

LEAD AND ZINC properties situated in northeastern part of county near Nipton, owned by A. Hamstadt, sold to Thomas Murphy.

Stanislaus County

CHROME DEPOSIT, one mile east of Camp Jones, operated by George V. Borchsenius, has several carloads ready for shipment. Stock company being organized.

Trinity County

ESTABROOK GOLD DREDGING (Trinity Center)—Rushing motor haulage of material and machinery from Southern Pacific R. R. at Redding to complete construction of dredge before heavy weather blocks roads.

Shasta County

AFTERTHOUGHT (Ingot)—New electrolytic-zinc treatment plant ready for initial test. Mine development on large scale.

MAMMOTH (Kennett)—Curtailment of mine extraction threatened by large number of cases of influenza. Keswick and other copper and gold camps likewise disturbed.

IDAHO

Shoshone County

RICHMOND (Adair)—Making regular shipments of crude copper ore.

BIG CREEK (Wallace)—Shipping at the rate of five carloads crude and hand-jigged ore per month. Planning for mill next year.

C. & R. (Wallace)—Prospecting with diamond drill. Development work has disclosed considerable ore.

MICHIGAN

Copper District

CALUMET AND HECLA (Calumet)—Has installed electric furnace for making stamp shoes at foundry.

CENTENNIAL (Calumet)—Seven levels extending under Wolverine territory.

LA SALLE (Calumet)—All rock coming from Kearsarge lode. Second shaft is bottomed at 23 level. Nothing being done on Osceola amygdaloid now, but operations will be resumed when labor conditions become normal.

WOLVERINE (Gay)—Making slow progress in sinking shaft for water system. Foundations for pump and other equipment have been installed.

MAYFLOWER-OLD COLONY (Houghton)—Shaft being sunk by selective service men now being trained at the Army school at the Michigan College of Mines.

MASS CONSOLIDATED (Mass)—Will not suspend operation during the winter.

MONTANA

Jefferson County

LEGAL TENDER (Clancy)—Retimbering 500-ft. shaft.

ECONOMY (Mitchell)—Placing machinery in new concentrator. Charles E. Freyberger is superintending construction.

Lewis and Clark County

COFFEE-BYRNES CLAIMS (Helena)—Has shipped two carloads of high-grade silver ore to smeltery. Owen Byrnes is manager.

SCRATCH GRAVEL GOLD (Helena)—Mine closed, and will remain idle until spring, when a new shaft is to be sunk.

PEERLESS JENNIE (Rimini)—Struck ore in east drift. To raise 200 ft. and crosscut.

LIBERTY MINING (Silver Camp)—Has taken over Mike Horse mine and mill, and will mine and treat silver-lead-zinc ores.

NEVADA

Elko County

NEW TUSCARORA (Tuscarora)—Developing under management of W. J. Craig. Scarcity of miners retarding development of district.

Esmeralda County

TULE CANYON PLACERS, 35 miles south of Goldfield, working again. One Goldfield company has sunk 40-ft. shaft in wall rock, drifted to gravel bed, and is now treating 15 tons daily. Return erratic, but average grade good. North of this Harris and Field have sunk shaft to bed rock, installed gasoline pump, and are now working gravel below water level.

Humboldt County

ROCHESTER COMBINED (Rochester)—New mill started and will be operating to capacity in a short time. Development work in Kroemer workings opening good-grade ore. Other development work to be done when more storage room for broken ore is made available by mill operations.

ROCHESTER MINES (Rochester)—Suit brought against company by Joseph Nenzel, who claims apex of the vein from which the Rochester mines have been extracting ore.

Lyon County

MASON VALLEY MINES (Thompson)—Shipments received at smeltery for week ended Oct. 16 were: Nevada-Douglas, 944 tons; Bluestone, 1770; Mason Valley mine, 1833; miscellaneous, 325 tons; total, 4872 tons. During same period, three cars of [illegible] copper was shipped.

HILL TOP (Yerington)—Producing shipping-grade copper ore.

MONTANA-YERINGTON (Yerington)—Fire on Oct. 16 destroyed shafthouse, hoist, headframe and blacksmith shop. Other similar equipment to be installed at once, and shipments will not be delayed long. Lower shaft is equipped with small gasoline hoist and workings from this shaft will be connected with main-shaft workings by raise and additional production made.

Mineral County

JUMBO COPPER (Mina)—Development on [illegible] level opening copper ore. Lessees previously produced good tonnage, but company has now purchased all rights and will operate exclusively. Company originally subsidiary of Jumbo Extension Mining Co., of Goldfield.

Nye County

TONOPAH DISTRICT ore production for the week ended Oct. 19 was 8417 tons, of an estimated milling value of $143,089. Producers were: Tonopah Belmont, 1086 tons; Tonopah Mining, 2250, Tonopah Extension, 2365; West End, 895; Jim Butler, 214; Rescue, 65; Montana, 338; Tonopah Divide, 200, and miscellaneous, 4 tons.

GREAT WESTERN (Tonopah)—Larger pumping plant to be installed. To accommodate new equipment, shaft will be enlarged from one compartment to three compartments. Work to start at 850 level, and will take four months. Property in west end of district.

MARRIS CHALCEDONY QUARRY (Tonopah)—Operating at full capacity. Quarry furnishes artificially rounded tube-mill pebbles to milling plants of southern Nevada at cost less than half that of Danish pebbles.

MIDWAY (Tonopah) — Drift extended 140 ft. in vein recently opened.

TONOPAH DIVIDE (Tonopah)—New electric equipment installed and operating successfully. Development work on No. 3 level will now be pushed, and shaft sunk another 100 ft. Property situated on Gold Mountain, six miles south of Tonopah.

WEST END CONSOLIDATED (Tonopah)—Connection made on 800 level between Ohio shaft workings and No. 2 shaft. Electric locomotive made by company put into use, and all ore hereafter will be handled through No. 2 shaft, equipment of which has been improved to handle this increased tonnage.

Storey County

CONSOLIDATED VIRGINIA (Virginia City)—Drifting on 1800 and 2000 levels and raising on 1900 and 2000 levels.

White Pine County

CONSOLIDATED COPPERMINES (Kimberly)—September production was 1,196,884 lb. of copper, and mill gave 79% recovery. On the 1200 level, three crosscuts are exploring the ore zone.

OKLAHOMA

Joplin District

LUCKY JENNY (Hockerville)—Expect to have new 300-ton mill completed by December 10.

DALLAS-PICHER (Picher)—Operating new 300-ton mill. A. J. Harrington, Carthage, Mo., is managing director.

GOLDEN STATE (Picher)—Recently resumed operations on shaft where work was abandoned last spring, and is now in ore. John Gifford, of Baxter Springs, Kan., is manager.

JEFFERSON (Picher)—To build mill. One shaft down 240 ft. and second shaft has been started.

MAURINE (Picher)—Completed new 250-ton mill.

MOGUL (Picher)—Sinking shaft. When complete second shaft will be sunk and ground developed. Contemplating mill.

PELICAN (Picher)—Box hopper has been found unsatisfactory, and starting of a new mill is being delayed while new hopper is being built.

AURORA (Quapaw)—New mill ready and will be operated by gas power entirely. John E. Turner is vice president and general manager.

BIG V (Quapaw)—Completing 250-ton mill on 40-acre lease. Operating two shafts, both in ore. J. C. Voorhees is president, and C. S. Voorhees is vice president and general manager.

LIGHTNING (Quapaw)—Has suspended operations.

ONTARIO SMELTING (Quapaw) — Started construction of a refinery which will have a capacity of 600 tons per week.

CONSOLIDATED (Saint Louis)—Sinking shaft to cut ore developed by Huttig Lead and Zinc Co. to the southeast.

KEENO (Saint Louis)—Installing boiler at shaft, now 197 feet.

OREGON

Jackson County

RANIER QUICKSILVER (Beagle) — Building two 12-pipe furnaces of 500 flasks' capacity. Expect to purchase equipment. Samuel Bertleson is superintendent.

CANADA

British Columbia

DRUM LUMMON (Douglas Channel)—Gibson mill and concentrator of 36 tons per day capacity to be completed soon. Mill installed as an experiment, and if results are satisfactory, additional units will be built.

ACTIVE DEVELOPMENT is in progress in the Lightning Peak district near Edgewood, on the west side of the Arrow Lakes and 100 miles from Revelstoke, and six properties are being worked. High-grade ore is being shipped from the Waterloo, and it is the intention of the operators to continue work all winter. Development is under way at the Silver Spot, Dictator and Extension, and the Rampolo. The Lightning group will be worked without cessation, and the Lumpy group, a new discovery, is to be opened up by tunnel. A pack trail is the only means of transportation, and it is understood that the government is to be asked for financial aid in the construction of a permanent trail or wagon road.

ECHO SIVER-LEAD (Silverton)—To make daily shipments soon. Ore has been opened on three levels.

Manitoba

LULEO (Rice Lake)—Operating with a small force in charge of Ellico McDonald. Sinking shaft to 54 ft., open pit. Down 35 ft. and large amount of open-cut work and stripping. Mill to be built during winter.

Ontario

LUCKY GODFREY (Elk Lake)—Examination being made by interests connected with the O'Brien Mining Company.

CLEVENGER-PROPHET (Gowganda)—Operations being carried on under direction of Kirby Thomas, consulting engineer. Shaft is down 300 ft. and lateral work is being done at 200 level.

M'INTYRE (Porcupine)—Annual statement for year ended June 30 showed ore treated of the value of $1,793,197. Estimated ore reserves were valued at $4,490,432. Net profits were $680,361, and surplus was $872,172. Average operating expenses were $5.14 per ton, and average value of ore treated was $10.05. The mill treated 178,327 tons, with a recovery of 95.6 per cent.

LA ROSE-O'BRIEN (Cobalt)—Some confusion has arisen as to the boundary line between the Violet property of the La Rose and the O'Brien. The disputed area is about 56 ft. wide. If the O'Brien contention is correct, its boundary will take in a part of the Violet workings, including part of the shaft. Surveyors have been engaged and are going over the ground thoroughly.

OPHIR (Cobalt)—Winze being sunk has cut Keewatin formation at 141 ft., or 580 ft. below the surface.

TEMISKAMING (Cobalt)—Vein 14 in. wide cut on 400 level.

LAKE SHORE (Kirkland Lake)—Report for September shows production of approximately $44,500 from the treatment of 1860 tons of ore, with a recovery of $23.92 per ton. Mill ran 96.21 per cent of possible running time.

TECK-M'KINLEY (Swastika)—Group of nine claims near Temiskaming & Northern Ontario Ry. being explored by diamond drilling.

MONDEAU (Boston Creek)—Additional machinery has been received. Work will be started soon and shaft continued to 100 level. Property under option to A. McKinnon, of Montreal, and associates.

Quebec

CISCO (Hurricanaw River)—A number of quartz veins carrying gold have been found, and development is in progress.

MARTIN (Hurricanaw River)—Additional machinery being installed.

AFRICA

Belgian Congo

UNION MINIERE DU HAUT KATANGA (Elizabethville)—During September produced 4,887,598 pounds of copper.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsan)—Ore exhausted at Charabowie mine, which has been closed down. Maibong mill permanently closed down.

The Market Report

SILVER AND STERLING EXCHANGE

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
24	4.7500	101⅛	49½	28	4.7500	101⅛	49½
25	4.7500	101⅛	49½	29	4.7500	101⅛	49½
26	4.7500	101⅛	49½	30	4.7500	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Oct.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
24	*26	†	8.05	7.75	8⅜@8½
25	*26	†	8.05	7.75	8⅜@8½
26	*26	†	8.05	7.75	8⅜@8½
28	*26	†	8.05	7.75	8⅜@8⅝
29	*26	†	8.05	7.75	8⅜@8⅝
30	*26	†	8.05	7.75	8⅜@8⅝

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Oct.	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
24	122	122	137	334	334	29½	28½	54
25	122	122	137	334	334	29½	28½	54
26	...	...	...	...	...	...	...	...
28	122	122	137	334	334	29½	28½	54
29	122	122	137	334	334	29½	28½	54
30	122	122	137	334	334	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

All of the markets that are free from Government control, and therefore are able to reflect commercial conditions and opinions, exhibit an easier tendency, owing to the prospects of early peace, which the markets interpret as bound to diminish demand. This is shown most emphatically in the antimony market, while the market for ores—chrome, manganese, molybdenum, tungsten, etc.—is nervous and softening. Zinc continues strong as to the prompt and the November-December position, but there are sellers of forward contracts at concessions of at least half a cent per lb. below what is at present the major market.

Copper, Tin, Lead and Zinc

Copper—The producers are striving heroically to increase their production, but they are the victims of circumstances and are unable to achieve what they would like to.

Official announcement of the continuation of the price of copper to Jan. 1 was made on Oct. 28. Though the agreement with the producers had been made a week previous, it is the policy of the War Industries Board to make no announcement until the agreement has been approved by the President. The official announcement in full is as follows:

"The President has approved an agreement, made between the producers of copper and the price-fixing committee of the War Industries Board (after investigations by this committee in conjunction with the Federal Trade Commission as to the cost of production), that the maximum price of copper shall be continued at 26c. per lb., taking effect Nov. 1, 1918, for shipments after said date, but subject to revision after Jan. 1, 1919, f.o.b. cars or lighters at Eastern refineries, f.o.b. cars or lighters at Pacific Coast refineries for Pacific Coast destinations, and f.o.b. cars or lighters New York if shipped to Eastern or interior destinations from Pacific Coast refineries and from refineries in the interior of the United States. All shipments made after Jan. 1, 1919, are subject to any change in price made by the price-fixing committee to take effect after that date. This maximum price is subject to the additional charges on copper shapes approved by the price-fixing committee to take effect after that date. This maximum price is subject to the additional charges on copper shapes approved by the price-fixing committee on June 5, 1918.

"The conditions are: First, that the producers of copper will not reduce the wages now being paid; second, that they will sell to the United States Government, to the public, in the United States, and to the Allied governments at not above the maximum price; third, that they will take the necessary measures, under the direction of the War Industries Board, in the distribution of copper to prevent it from falling into the hands of speculators, who might increase the price to the public; and fourth, that they will pledge themselves to exert every effort necessary to keep up the production of copper so as to insure an adequate supply so long as the war lasts."

Copper Sheets—The base price of copper sheets is 36c. per lb. Copper wire is quoted at 28¾@29½c. per lb. f.o.b. mill, carload lots.

Tin—Occasional small lots are offered for resale, which is permitted by the American Steel Products Co., but such offerings are only sporadic.

The exports of tin from Batavia to the United States in 1917 were 28,151,325 lb., compared with 30,980,550 in 1916.

Lead—The situation, which in recent weeks has been looking easier, is becoming less so. There is some urgent demand, and the rate of production is rather disappointing. The end of this month will probably find producers still oversold to a considerable extent.

Zinc—The market was very dull. Prompt and November spelter is undoubtedly scarce. On the other hand, there is no particular demand for December. Foreign inquiry for a large block of spelter that we mentioned last week does not seem to have been executed. Spelter for delivery during the first quarter of 1919 was offered at 8@8½c., and some sales were effected between those figures.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb. There is a great scarcity.

Antimony—This market exhibited further weakness, and the prospects are regarded by producers in no cheerful way. Although stocks have been greatly reduced, there is very little demand. We quote spot at 12¼@12¾c.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@$1.75 per pound.

Nickel—Market quotation: Ingot 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—We quote $125@$127.50; market unsettled. San Francisco reports, by telegraph, $118.50; steady.

Gold, Silver and Platinum

Gold—It is stated in Vancouver, B. C., that, despite the efforts of the United States authorities at the border, American gold is continuing to come into Canada for barter and exchange, especially among the Chinese, who pay as high as 35% premium for coinage. This in turn, it is claimed, is shipped out of Canada to the Orient.

Silver—The official price of silver in London remains unchanged at 49½d. The latest advices from London are to the effect that both there and in India the demand for silver for coinage is still large; but in the absence of any competition from China, supplies have been more plentiful. Exports to London for the week ended Oct. 26 were 589,000 ounces.

Mexican dollars at New York: Oct. 24, 77½; Oct. 25, 77½; Oct. 26, 77½; Oct. 28, 77½; Oct. 29, 77½; Oct. 30, 77½.

Platinum—Unchanged.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 26—Blende, per ton, high, $78.55; basis 70% zinc, premium, $75; Class B, $65@60; Prime Western, $55@52.50; calcamine, basis 40% zinc, $40@35. Average selling prices: Blende, $55.47; calamine, $39.05; all zinc ores, $53.62.

Lead, high, $103.10; basis 80% lead, $100; average selling price, all grades of lead, $99.16 per ton.

Shipments the week: Blende, 8313; calamine, 760; lead, 1860 tons. Value, all ores the week, $661,920.

Shipments ten months: Blende, 400,402; calamine, 18,702; lead, 63,375 tons. Value, all ores ten months, $27,235,250.

Buyers falling short of filling orders last week came into the market early this week with higher offerings, and even then most buyers "went short" on filling orders for this week's purchases.

Platteville, Wis., Oct. 26—Blende, basis 60% zinc, highest price reported, $72; base price for premium grade, $75; base price for high-lead blende, $52. Lead ore, basis 80% lead, $100 per ton. Shipments reported for the week were 2268 tons blende, 182 tons galena and 432 tons sulphur ore. For the year to date the totals are 105,823 tons blende, 6551 tons galena and 37,776 tons sulphur ore. During the week 2880 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Offerings exceed the demand, and it is very difficult to make sales.

Iron Ore—Superior ores, per ton, lower Lake ports, Old Range bessemer, 55 iron, $6.65; Mesabi bessemer, 55 iron, $6.40; Old Range non-bessemer, 51½ iron, $5.90; Mesabi non-bessemer, 51½ iron, $5.75.

Manganese Ore—The makers of ferromanganese are reported to have all the ore that they can handle, and there are surplus offerings, stimulated by the high prices.

Molybdenum Ore—High-grade ore is reported held for $1.10, but with no buyers willing to pay that price. A considerable [illegible] of low-grade ore was reported [illegible] this week at prices well below $1.

Pyrites—Prices of domestic pyrites are determined by negotiation between buyer and seller; the range is between 30@35c. per unit. Nobody is anxious to take any domestic pyrites of grade lower than 40% sulphur, and as a consequence owners of properties producing a run-of-mine of lower grade must resort to concentration to secure a marketable product.

Tungsten Ore—Quotations are nominally unchanged, but there seems to be an easier tendency in the market.

Chas. Hardy says: "During the last week business in tungsten ore has been comparatively quiet, on account of the development in the international position. Prompt material and any good-grade ore which can be delivered within the next two months are still finding a ready market. At the moment of writing business in high-grade scheelite has again been done at $26. The whole tungsten position is much under the influence of the importations from China. The market is not yet in a position to exactly gage the influence that these Chinese importations will have on the general trend. On the one hand, the imports are large—on the other, the Chinese ore, on account of its high manganese content and the tin and copper impurities, is acceptible to but few in the American tungsten industry. It has been a feature with new tungsten fields that after the discovery, the production is exceedingly large. It has always been found, however, that, once the easy mining stops, production falls off considerably. It depends now on how soon this period of lesser production in China will set in. In the meantime, efforts are being made in several quarters to absorb the Chinese product while the erection of new plants which can treat this impure ore is being undertaken, and if these plants can be started at an early date, they should handle a considerable quantity of the Chinese ore. In the meantime, the imports from Bolivia have been exceedingly small, and the importations in the previous months of the year, when the imports from South America amounted to well over 330 tons—at times even over 400 tons per month—have dropped to only 150 tons during the last month for which a record is available."

Iron Trade Review

PITTSBURGH—Oct. 29

The epidemic of influenza has risen at some points and decreased slightly at others. In the last week it has become serious in the Shenango Valley, one furnace being barely able to make its charge Sunday night, whereas the Mahoning Valley is scarcely touched, at least as yet. The Ohio works of the Carnegie Steel Co. at Youngstown has only 30 men absent owing to the disease. At the Duquesne Steel Works, near Pittsburgh, where the proportion of men laying off exceeded 20% at one time, more men are returning than are leaving. The Edgar Thomson works, which was not affected at the outset, now has 400 of 6000 men out.

Pig Iron—Distribution of pig iron is proceeding much the same as formerly, on contracts and allocations. There have been few new allocations recently, and furnaces are not in position to accept any, their output already going to preferred purposes. More than half the 100,000 tons of basic iron for export, allocated a few months ago to Northern furnaces, has been shipped. Consumers are showing no interest in late deliveries. Existing prices apply on deliveries to Jan. 1, and contracts for later delivery can only be made subject to Government price ruling at the time of delivery. The market remains quotable at the set limits: Bessemer, $35.20; basic, $33; No. 2 foundry, $34; malleable, $34.50; forge, $33, f.o.b. furnace, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces [illegible]

Steel—There is no market in unfinished steel, all surplus production being under allocation. We quote the market at the [illegible] Billets, [illegible] sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferro Alloys—[illegible] in small lots for early [illegible] is to be noted. Large co[illegible] as a rule [illegible] and do [illegible] for the [illegible] market [illegible] We quote 70% ferromanganese at $250, delivered, and 16% spiegeleisen at $75, furnace.

Coke—Production of coke in the Connellsville region has been materially curtailed by the influenza epidemic, also shipments of raw coal. Many byproduct ovens are short of coal, but they have lost little actual production. Thus far there is no definite shortage of coke at any blast furnaces, but further curtailment in supplies might force the banking of some stacks.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	......	32.361	44.324	......
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year.	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	......	110.000	......	125.000	......
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	(a)	244.038	343.905
October	61.851	......	247.467	......
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	......	6.650	......	30.500	......
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York		St. Louis		London	
	1917	1918	19 7	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8. 73	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	......	7.813	......	54.000	......
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	51.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.10
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.5	34.40
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.[illegible]		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N.Y. EXCH.†	Oct. 29
Alaska Gold M.	4⅛
Alaska Juneau	2¼
Am.Sm.&Ref.,com	87½
Am. Sm. & Ref., pf.	106½
Am. Sm. Sec., pf., A.	91
Am. Zinc	15
Am. Zinc, pf.	50⅛
Anaconda	70½
Batopilas Min.	1¼
Bethlehem Steel	70
Butte & Superior	25
Butte Cop. & Zinc	9⅞
Cerro de Pasco	37⅜
Chile Cop.	22⅛
Chino	41½
Colo. Fuel & Iron	40½
Crucible Steel	55¼
Crucible Steel, pf.	85
Dome Mines	13½
Federal M. & S.	10¼
Federal M. & S., pf.	39¼
Great Nor., ore ctf.	32¼
Greene Cananea	54¼
Gulf States Steel	69½
Homestake	82½
Inspiration Con.	54½
International Nickel	32¾
Kennecott	39⅝
Lackawanna Steel	74
Mexican Petrol	159½
Miami Copper	28¼
Nat'l Lead, com	60
National Lead, pf.	105½
Nev. Consol.	20⅞
Ontario Min.	7⅜
Ray Con.	24¾
Republic I.&S., com.	84
Republic I. & S., pf.	100
Sloss-Sheffield	55
Tennessee C. & C.	17
U. S. Steel, com.	108
U. S. Steel, pf.	111⅜
Utah Copper	90¼
Va. Iron C. & C.	71½

BOSTON CURB*	Oct. 29
Alaska Mines Corp.	‡.12
Boston Ely	.85
Boston & Mont.	.44
Butte & Lon'n Dev.	.12
Calaveras	1
Chief Con.	3½
Contact	‡.15
Corbin	.10
Cortez	.15
Crown Reserve	.18
Crystal Cop.	.44
Eagle & Blue Bell	2¼
First Nat. Cop.	1¹¹⁄₁₆
Houghton Copper	.40
Intermountain	.05
Iron Blossom	.35
Iron Cap	18¼
Mexican Metals	.33
Mines of America	.90
Mojave Tungsten	.07
Nat. Zinc & Lead	.12
Nevada-Douglas	.40
New Baltic	.75
New Cornelia	17¾
Oneco	.20
Pacific Mines	‡.35
Rex Cons.	.06
Yukon Gold	1

SAN FRAN.*	Oct. 29
Alta	.03
Andes	.04
Best & Belcher	.01
Caledonia	.01
Challenge Con.	.03
Confidence	.10
Con. Virginia	.05
Gould & Curry	‡.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.05
Mexican	.10
Occidental	.40
Ophir	.04
Overman	.01
Savage	‡.02
Sierra Nevada	.02
Union Con.	.06
Utah Con.	.01
Belmont	2.40
Jim Butler	.48
MacNamara	.21
Midway	.08
Mont.-Tonopah	.09
North Star	.05
Rescue Eula	.07
West End Con.	.97
Atlanta	.03
Booth	.02
Comb. Frac.	‡.02
Florence	.11
Jumbo Extension	.09
Kewanas	.02
Nevada Hills	.02
Nevada Packard	.22
Round Mountain	.16
Silver Pick	.02
White Caps	.11
United Eastern	4.20

COLO. SPRINGS*	Oct. 29
Cresson Con.	4.93¾
Doctor Jack Pot	.03¼
Elkton Con.	.05¼
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.69
Granite	.18½
Isabella	.05¾
Mary McKinney	.07½
Portland	1.00
United Gold M.	.12¾
Vindicator	.39

BOSTON EXCH.*	Oct. 29
Adventure	‡.60
Ahmeek	80
Algomah	‡.15
Allouez	48½
Ariz. Com., ctfs.	15
Arnold	‡.20
Bingham Mines	10
Bonanza	‡.16
Butte-Balaklava	‡.25
Calumet & Ariz.	70
Calumet & Hecla	450
Centennial	‡11½
Copper Range	49
Daly West	2⅝
Davis-Daly	5¼
East Butte	10⅜
Franklin	4½
Granby	‡79
Hancock	‡6
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	‡26
Keweenaw	‡.70
Lake	‡5½
La Salle	‡3
Mason Valley	‡3⅛
Mass	‡4¾
Mayflower	3½
Michigan	4¾
Mohawk	57½
New Arcadian	‡1⅛
New Idria	‡13
North Butte	14
North Lake	‡.40
Ojibway	‡.75
Old Dominion	‡42½
Osceola	55
Quincy	69
St. Mary's M. L.	‡49
Santa Fe	‡.60
Seneca	13½
Shannon	‡3⅛
Shattuck-Ariz.	‡14
So. Lake	‡1
So. Utah	‡.12
Superior	‡4½
Superior & Bost.	3⅛
Trinity	‡3⅛
Tuolumne	.95
U. S. Smelting	47½
U. S. Smelt'g, pf.	45¼
Utah Apex	2½
Utah Con.	9½
Utah Metal	2
Victoria	‡2½
Winona	1¾
Wolverine	21½
Wyandot	‡.50

N. Y. CURB†	Oct. 29
Big Ledge	¼
Butte & N. Y.	‡.75
Butte Detroit	‡.05
Caledonia	.49
Calumet & Jerome	[illegible]
Can. Cop. Corpn.	2
Carlisle	‡2
Cashboy	.04
Con. Ariz. Sm.	1¼
Con. Coppermines	5¼
Emma Con.	‡.03¼
Goldfield Con.	.18
Goldfield Merger	.01
Greenmonster	‡⅝
Hecla Min.	5⅛
Howe Sound	4
Jerome Verde	⁵⁄₁₆
Louisiana	⁷⁄₁₆
Magma	33
Majes ic	.20
Marsh	‡.03
McKinley-Dar-Sa.	‡.40
Milford	‡.75
Mother Lode	.39
Nixon Nevada	.36
Ohio Cop.	.75
Rawley	‡2½
Ray Hercules	‡4
Richmond	‡.56
Rochester Mines	.33
St. Joseph Lead	14
Standard S. L.	‡⅜
Stewart	‡.14
Success	.10
Tonopah	‡2½
Tonopah Ex.	1¹⁄₁₆
Tribullion	⅜
Troy Arizona	.10
United Verde Ext.	37½
United Zinc	1½
Utica Mines	‡.08

TORONTO*	Oct. 29
Adanac	‡.08
Bailey	.03
Beaver Con.	.28
Chambers Ferland	‡.09
Coniagas	4.50
Hargraves	.03
Kerr Lake	6.00
La Rose	.37½
Min. Corp. of Can.	2.00
Nipissing	8.37½
Peterson Lake	.09
Temiskaming	.29
Wettlaufer-Lor.	.02
Davidson	.25
Dome Exten.	.23
Dome Lake	.10
Hollinger	5.00
McIntyre	1.50
Newray	.13
Porcu. Crown	.16
Teck-Hughes	.20
Vipond	.18
West Dome	.10

* Bid prices. † Closing prices. ‡ Last quotations.

Engineering and Mining Journal

November 9, 1918

Volume 106 Number 19

AN OLD CUSTOM MILL AT SILVER CITY, NEVADA

Co-öperation Among Small Mines

BY GEO. J. YOUNG

The suggestion is made that greater success would attend the development of the small mining district if the owners would coöperate, and the need for standard designs for small milling and mining plants is pointed out. Coöperation in securing geological advice, engineering direction, and metallurgical assistance, and centralized buying, storage and transportation are urged.

MUCH attention may be focused upon the large plant, but the small one usually escapes the consideration that it deserves. The ore-treatment problem that confronts the owner of a small mine is not without its peculiar difficulties. There is, first, the uncertainty as to the size of the orebody. Usually development is not extensive, and the pressure for immediate financial return that follows the discovery and partial development of an orebody is great. The owner of the property, often a practical miner, but sometimes an impractical business man taking a "flier" through the persuasion of a "mining man," wants to see the gold or silver "come out" as rapidly as possible. The result of this entirely natural desire is often the determination to erect a mill before conditions justify the building of one.

A practical millman is consulted, and several pieces of ore are handed back and forth between the interested parties, and a decision to erect a stamp mill or a "cyanide mill" is made in less time than it takes to tell it. The principal mechanical features of the mill are selected, and, after consultation, perhaps, with a machinery salesman, the purchase of the equipment is made. A practical millwright is employed to erect the mill, and a milling plant quickly appears in more or less close proximity to the mine. The success of the outcome depends upon fortuitous circumstances, but the interesting fact is that not all of such plants are failures. Mistakes are many, but if the ore supply holds out, and the various mill superintendents that succeed one another add a little here and there, rearrange equipment and discard useless machinery, a plant is finally evolved that functions moderately well and that may even prove economical. The result is looked upon as a great success, and the relatively large cost of the achievement and the loss of time are ignored. Many attempts of this kind, however, result in complete failure.

The small size of the mine, the local character of the enterprise, and the reluctance of the owners of the property to secure proper technical advice are the principal causes for the difficulties described. To some extent at least it can be said that such enterprises are not particularly attractive to the professional engineer, for they often demand a disproportionate amount of work for the fee involved, and sometimes it is difficult to collect the money due for services. Nevertheless the work is of importance, for the success of the small mine contributes to the success of the mining industry as a whole. It is worth while, and needs only intelligent thought and coöperation of the owners of the several mines that grow out of the discoveries made in the vicinity of the first property developed in a small mining district.

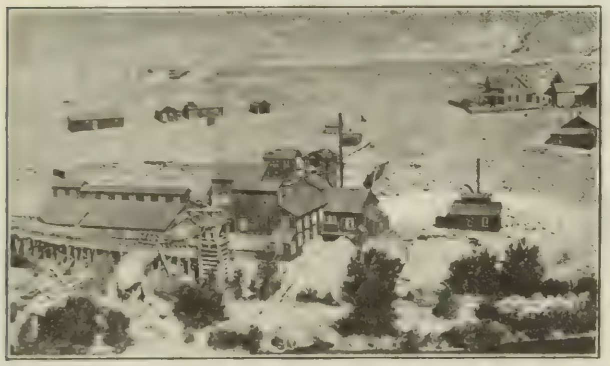

FIG. 1. EUREKA MILL TAILINGS PLANT

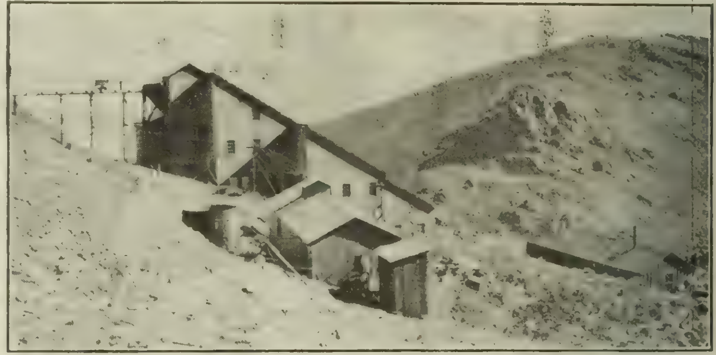

FIG. 2. UNIONVILLE MILL, HUMBOLDT COUNTY

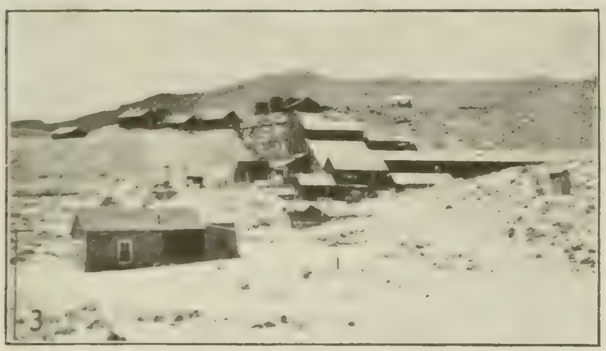

FIG. 3. MAYFLOWER MILL, PIONEER, NEVADA

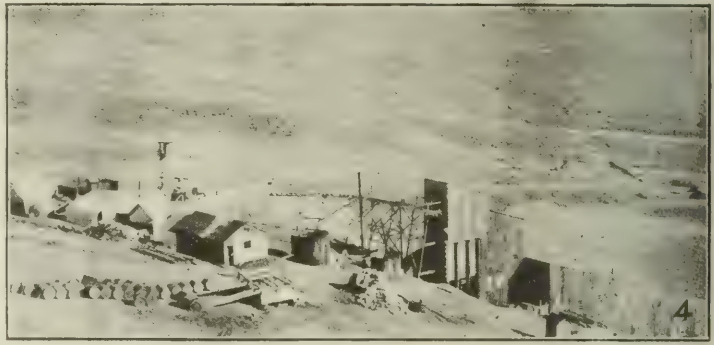

FIG. 4. REX MINE AND MILL, GOLD CIRCLE, NEVADA

To illustrate some of the peculiar conditions that the small mine and milling plant must meet, I have selected six from a number of photographs of Nevada plants given to me by Herman Davis. The first is a small custom stamp mill in Silver City. It is one of three similar plants, all of which are situated close together.

In the vicinity of Silver City are a number of small mines which are worked irregularly by owners, tributers and lessees. The ore is brought down to the mills in large wagons. The haul is down grade in practically every instance. Water power is used generally, as high-pressure water from the Virginia City water system is available. The ores yield 60 to 70% by amalgamation, and the tailings are treated in a small leaching plant which lies below the tailing ponds of all three plants. The ore supply at the time I visited the district was irregular, but sufficient to keep two of the plants in more or less constant operation. Sampling conditions were primitive. It is difficult to conjecture the result of the establishment of a single custom plant of good construction and with proper sampling facilities in a district like the one described, but I venture the opinion that not only would the plant have been a success, but mining would have been greatly stimulated. In this as in other cases the great difficulty would have been the securing of the coöperation of the various mine owners, most of whom were men of small means, and many of whom would have been reluctant to assume a share in a coöperative enterprise.

The second property (Fig. 1) is the Eureka tailings plant, that was operated successfully upon tailings from the early milling operations at Virginia City, and which, before its reconstruction, was a custom mill that had treated Virginia City ores. The illustration is selected to show the conditions in the heyday of Virginia City. Many of these custom mills were situated on the Carson River, that they might take advantage of the water-power available there. They were inconveniently placed with respect to the mine, and the transportation of ore to the plants entailed difficulty and expense.

The third plant (Fig. 2) was erected to treat the low-grade silver ores of the Arizona mine, at Unionville. It was erected in 1911, and was planned as an all-sliming plant. A distillate engine was used for power purposes. A hillside site close to the mine opening was selected. The enterprise proved unsuccessful, owing partly to failure to attain the 50-ton capacity planned and also to the low-grade ore, which yielded a recovery less than the aggregate operating costs. Apparently in this instance the conditions were favorable, but the long haul from the nearest railroad point and mistakes in the selection of the milling machinery contributed as much as did the mining difficulties to the lack of success.

The fourth plant (Fig. 3) is the Mayflower mill, at Pioneer, in the Rhyolite district. It was situated close to the shaft's mouth, and is another example of a mill built in anticipation of an adequate ore supply. The company went into liquidation; and in 1910, when the photograph was taken, the mill was being operated by the receiver. Rhyolite was a boom camp, and what its success would have been had it been operated as a coöperative mining camp with a central custom mill it is impossible to say.

The fifth plant (Fig. 4) is the Rex mine and mill, at Gold Circle. The illustration is an excellent one of the type of mushroom camp that sometimes precedes the establishment of a more permanent one. The plant is compactly arranged, and only timber, supplies, and distillate had to be transported the considerable distance that separated it from the nearest railroad point. It was operated by Herman Davis in 1911. The mill contained a five-stamp battery and a tube mill. The ore was treated by cyanidation. The power difficulty was met by the use of distillate engines.

The sixth plant (Fig. 5) is the mill of the Darby Reduction Co., at Mazuma. It is probably the best attempt of those illustrated to provide an adequate plant for a small district. The mill was equipped with an automatic sampler of the Vezin type, ten 1000-lb. stamps, a 4 x 17-ft tube mill, Dorr classifier, amalgamating plates, four agitators and an Oliver filter. It contained practically all of the elements of a successful custom plant and was well designed and constructed. What its success has been and how well it has served the Seven Troughs and Mazuma district I am unable to say, but details of its past history and present position would be interesting. Some one familiar with the enterprise should present it to readers of the *Journal.*

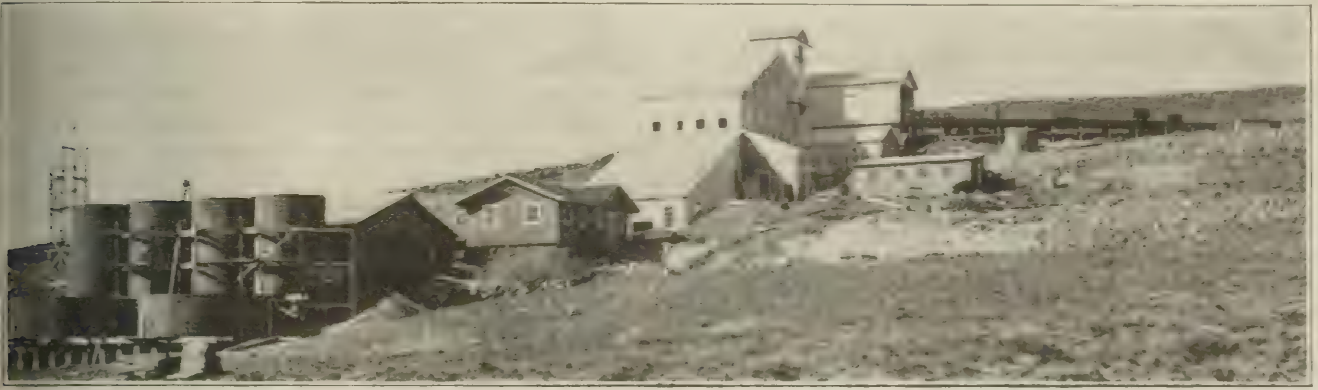

FIG. 5 MILL OF THE DARBY (NEVADA) REDUCTION CO., MAZUMA, NEVADA

These plants and a number of others suggest that here is an opportunity for some metallurgical engineer to thoroughly standardize the small milling plant along the lines of compactness, good mechanical design, wise selection of crushing and power machinery, minimum labor requirement and simple erection. In a similar manner the mining plant could be designed. A standard prospecting unit that could readily be erected and transported and would serve to maintain a moderate output with a minimum of labor and supervision is easily within the possibilities. Portable buildings of a type suitable for initial operations also merit the attention of the designer.

In a review of the small-mine problem as a whole, I am impressed with the fact that there has been much wasted effort both in labor and in the unwise purchase and duplication of equipment, not only in the mining end but also in the milling. The solution that suggests itself is that here is a field for the well-trained technical man, both mining engineer and metallurgist, if coöperation among owners of properties can be secured.

The situation finds its parallel in unrestrained competition in business. Team work directed toward the common interest is essential. If mine owners in a small new district would pool their interests and secure the services of a well-qualified mining engineer to direct their exploration and select their equipment, as well as to assist in attracting the necessary capital, I feel sure that a larger measure of success would be attained and a more substantial development of the small district would result. Discovery would be followed in sequence by development that could be first concentrated upon the most favorable part of the mineral area. Facilities for transportation could be arranged, and road improvement that no one individual could attempt might easily be provided for by a coöperative organization. The same organization, if success followed mining operations, could readily secure the best metallurgical direction; and ore-treatment facilities could be arranged after a plan that larger companies invariably follow. There are many practical difficulties with coöperative organizations, and probably more in mining than in other industries, but I feel that greater and more satisfactory progress will result from consistent get-together effort among the miners in a small, new district.

It is impracticable to lay down hard and fast rules for coöperation that would apply satisfactorily in any particular case, for each would have its own peculiar conditions. It would, however, seem reasonable to suppose that in the following objectives a working plan could be arranged: I refer to the securing of competent geological advice, mining engineering direction, metallurgical engineering assistance, and buying, storage and transportation organization. In the last-mentioned objective, great economy should result, even if the first three suggestions were impracticable of realization. Though I am not aware of actual examples along the lines suggested, the success of coöperation in the Safety-First movement, as exemplified by the Tonopah Mine Operators' Association or the California Metal Producers' Association, is such as to be distinctly encouraging.

Standardization of Mining Methods
I—Standard Raises

By CHARLES A. MITKE*

Standardization of mining methods is one of the essential factors in the operation of mines for the purpose of insuring maximum production at a minimum cost. The aim of this paper is to describe the arrangement and the methods of timbering the different compartments in several types of raises, and the development of a standard raise.

THE subject of standardization is now receiving much thought and consideration and the details of application to various lines of industry have proved of inestimable value, resulting in an enormous increase in production. The satisfactory results obtained from the standardization of certain special phases of mining work have led to the belief that the working out and adoption of standard methods of operation, suitable for average mining conditions, will be of economic importance in offsetting the increased costs of production, and will prove equally beneficial both to the management and to the worker.

Expansion of Operations Makes Standardization Increasingly Important

The daily work in the average mine consists of a great variety of operations. For years it was the custom, and in fact was considered absolutely necessary, for the superintendent to give his personal attention to all matters of daily routine, and to decide even the minutest details connected with the working of the mine. Under these circumstances, everything was conducive to specialized tasks, and no particular effort was made toward standardization of either operations or supplies. Such a condition, though possible in small mines, was not practicable in larger properties, and as the mines developed and production increased it became impossible for one man personally to supervise every detail. Responsibility was necessarily divided among a number of departments, the heads of which were directly responsible to the superintendent. This development led to individualism, and it became necessary to formulate standardized rules and regulations for the guidance of all the different departments.

Need for Uniformity Imperative

In the mining department tools and supplies required by the organization had hitherto been purchased according to the individual judgments of the foreman, in consultation with the superintendent. For example, one foreman preferred one type of machine, though another showed a partiality for an entirely different make. He might have his drifts driven larger, or his timbers cut in different lengths, and so on. This necessitated the carrying in stock of a large supply of repair parts for the different machines, steel, and varied miscellaneous supplies and equipment, and extra cutting of timbers both on surface and underground, all of which contributed more or less toward inefficiency and higher costs. It became evident under such circumstances that there was a great need for uniformity, first of all in the supplies and later in the operations.

As a preliminary step, the question of stope timbers was taken up, and suitable dimensions for the average square set were decided upon and adopted. The same principle was applied to timbers used in other stoping methods, drift timbers, tunnel sets, and similar equipment. Finally, the trend toward standardization was developed to such an extent that practically all the timbers used underground were cut to standard sizes. Efforts were made toward standardizing machines and supplies, but the results were not markedly successful. One company which claimed to have made advances in this direction found upon investigation that there were 28 different types of machines in constant use in its mines and about seven kinds of steel.

The standardization of underground operations also presented a difficult problem. The majority of miners, as a rule, move around a great deal, and in every camp men may be found who have gained their experience in mines where conditions are entirely different from those under which they may happen to be working. Consequently, in order to systematize operations it was found necessary to deviate from the accustomed practice of "telling a man what you want done and leaving the rest to his own judgment," and, as an alternative, to create a new precedent by "telling him what you want done, and then showing him the most approved method of doing it." This rule was especially applicable in teaching inexperienced men how to mine.

Development of the Standard Raise

Raises generally contain several compartments, whic are used as manways, timber slides, ore and wast chutes, and for ventilation. In a few exceptional case a raise is put to one use only, in which event it has bu one compartment, and may or may not have any timber according to the character of the ground through whic it is driven. The importance of raising is evident whe it is considered that between 400 and 500 raises are continually in process of being driven in the Southwest at costs ranging from $3 to $30 per ft. The extractio of ore and the exploratory work necessary to keep u or increase ore reserves require that approximately thi number of raises be kept "running"; and, as a rule, whe some are completed others are immediately started.

Character of Earlier Types of Raises

In the past, raises were driven according to the de signs of individual shift bosses and foremen, and e hibited wide diversity of construction, not only in th different camps and mines, but in the divisions of mine itself. The result was that two raises, side b side, were often entirely different in dimensions an construction. This lack of method proved inefficie and wasteful, as every raise was made a special cas and the men were unable to begin work without minute directions from the foremen and bosses. These bosses, in turn, would have two or three types in mind, and would have one type constructed in one place and another type in the next, and so on. In many of these designs the openings in the landings were so small that the men had difficulty in getting through; and, as there were platforms only about every 50 ft., and in some few cases none at all, this presented a dangerous condition, and one likely to be the cause of serious accidents.

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*Mining engineer, Bisbee, Ariz.

Influence of Safety-First Movement

When the Safety-First movement was introduced in the Southwest, about four years ago, some of the first steps toward improving conditions were to cover all chutes and manways, put in more landings, and pass laws determining the distance between platforms in all manways, which reduced the number of accidents, but decreased the workers' efficiency by cutting off the ventilation almost entirely, the chute and manway covers being practically air-tight. In some mines, ventilated by mechanical means and in which the working places had become comparatively cool, the temperature began to increase, and the mines became almost as hot as formerly. It was, therefore, evident that something had to be done in designing chutes, manways, timber compartments and safety guards, to meet conditions which the natural development of the mines had created. This led to the necessity for a standard raise. It was essential that such a raise should combine the utmost safety with the most efficient working conditions, and at the same time admit a maximum of pure air in order to ventilate the mines thoroughly. Inasmuch as safety and ventilation make for efficiency, and efficiency contributes to economy, it was the consensus of opinion that the proposed raise must meet these four important requirements; and that when designed and adopted as the standard the results would be beneficial both to the men and the company.

In the issue of Jan. 18 of the *Journal*, under the caption, "Training a Mining Organization in Efficiency Methods" (Copper Queen Consolidated Mining Co.), an outline was given of the methods adopted by a corporation to encourage members of its operating force to make suggestions and recommendations which might prove of value in the development and operation of its mines. Recognizing the importance and necessity for a standard raise and the possibilities, in the way of suggestions and helpful criticism, that might result from the united efforts of the entire organization, an announcement was made at one of the Copper Queen company's mining conferences to the effect that every one in the organization was to be given an opportunity of working out a design for a standard raise which would comply with the necessary requirements. It was arranged that all suggestions were to be sent to me, and that I was to aid and assist the men in having their individual designs worked out intelligently, so that these could be presented either in the form of models or drawings, accompanied by descriptive papers. The following specifications were therefore drawn up:

SAFETY

1. Inclined ladders are preferred to straight ladders, as there are cases on record where men who have become unconscious through being gassed have fallen on inclined ladders and remained there until taken to a place of safety, whereas on vertical ladders they would have fallen and suffered severe injuries. Inclined ladders are also easier to climb.
2. A landing in every set. (A set is usually about 8 ft. high.) A man climbing up with tools and supplies is likely to drop something or knock a rock off from the sides of the manway. Should any one be following him, these landings would prevent his being injured by anything falling from above.
3. Manways should be large enough to allow the passage of a man wearing an oxygen helmet.
4. Timber compartment should be of sufficient size to permit an injured man to be lowered through it in a basket.
5. Safety guards, about 3½ ft. high, should be placed around the chute and manway at the top of the raise to prevent men from falling in. Grizzlies, about 8 in. apart, should be put over chutes. These may be rails or large timbers. Small rails or gratings should be laid over timber compartments.

VENTILATION

The area in the timber compartment and manway should be of a size to allow at least 300 cu.ft. of air per min. to pass through for each man in the stope. If there are a large number of men in the stope it will take a proportionately large number of raises to supply the amount of air required.

EFFICIENCY

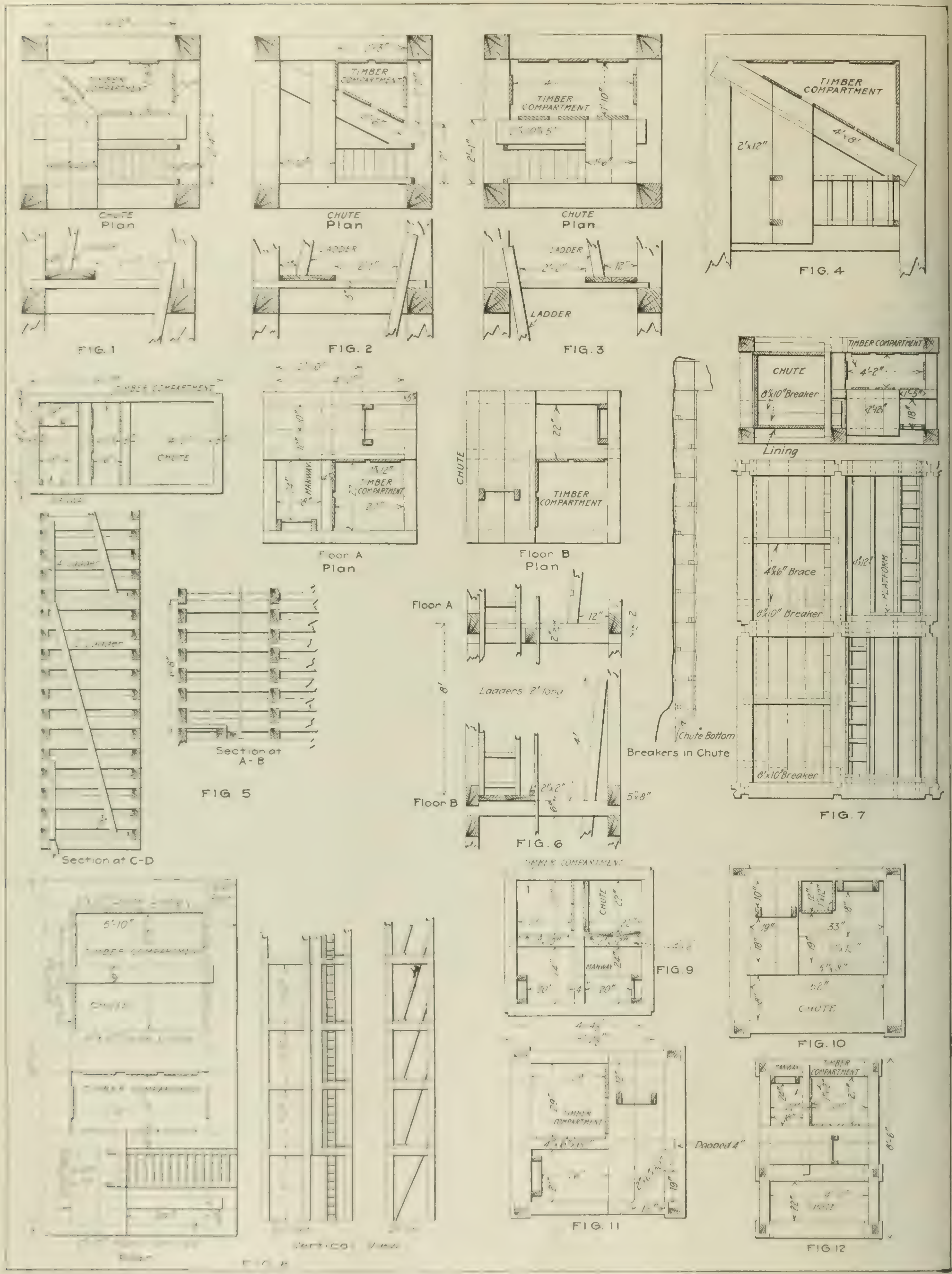
1. The ladders and landings should be so arranged that men can climb up and down without inconvenience, even when carrying powder and other supplies.
2. The timber should all be of standard size, so that when an order is sent to the sawmill, all timber for the raise may be cut on the surface and then sent down to the place where it is to be used. This obviates the necessity of any sawing underground.
3. The raise set, with few exceptions, should be the same height as the stope set, that the timbering of the raise may match the timbers of the stope, and allow workings from the raise set to be continued into the stope.
4. The bottom of the chutes should rest on solid ground, not on wooden flooring. The solid ground will not give way when ore is dumped on it from above, and it requires only a chute mouth, whereas a wooden chute bottom would need a great deal of repairing.
5. The timber compartment should be large enough to allow of timbers being hoisted into the stope.

ECONOMY

As the cost of raising in general is high, varying from $3 to $30 per ft., it is important that expenditures for labor, timber, and other requisites be reduced to a minimum.

The working force evinced much interest and enthusiasm over the specifications outlined, and there was no little friendly rivalry between the bosses of the different divisions. At consecutive meetings of the Copper Queen mining conference, the shift bosses presented outlines of their individual plans, which were discussed, the relative merits and defects being brought out, and several ideas set aside for further consideration. A brief description of some of the more important designs submitted follows:

Fig. 1 represents the first attempt at a new type of raise, showing manway and timber compartment. The manway has incline ladders, arranged as shown in both the plan view and vertical section. This plan was worked out by one of the bosses and is designed for a six-post raise. The area of the chute is equal to that of the manway and timber compartment combined, but the drawing of the chute is omitted. The air space, for ventilating purposes, in the timber compartment is 5.2 sq.ft., and in the manway 3.4 sq.ft., making a total of 8.6 sq.ft. Criticism on this raise was that it was somewhat complicated, as the boards in the landings required extra cutting for each floor. It contained an angular timber compartment, and the manway was situated near the chute, which meant that it would al-



TYPICAL DESIGNS FOR RAISES SUGGESTED BY EMPLOYEES ways be dirty from fine ore working out of the chute. This raise failed from the standpoints of efficiency, economy, and ventilation.

Another attempt at a standard six-post raise is shown in Fig. 2, with a much smaller timber compartment. It is also difficult to make, as miners seldom or never have a full set of carpenter's tools. Another objection is that the timber compartment has an area of only 2.8 sq.ft., and the manway, only 3.5 sq.ft., making a total area of but 6.3 sq.ft. Criticism of this raise showed that the design was inefficient, uneconomical, and imperfect as regards ventilation.

In Fig. 3 the manway and timber compartment contains the largest area for ventilating purposes among the designs thus far considered, the total number of square feet of air space being 10.1. It is designed for a six-post raise, is easily built, and there are few objections from an operating standpoint. It has a large timber compartment, permitting an injured man to be lowered through it in a basket. There is also room for a helmet man to go up and down the manway after two 1 x 12-in. boards are loosened.

Fig. 4 shows a rather complicated manway for a six-post raise and presents many difficulties from an operating standpoint. The air space in the timber compartment is 4.5 sq.ft., and in the manway 3.6 sq.ft., making a total of 8.1 sq.ft. The helmet men can go up and down the ladders, but the building of this manway would be difficult and expensive. It failed in economy and efficiency.

In Fig. 5 the manway and timber compartment is similar to that shown in Fig. 3, but is designed for a crib raise, whereas Fig. 3 is intended for a six-post raise. The timber compartment contains 5.7 sq.ft. and the manway 5.3 sq.ft., making a total of 11 sq.ft. It is therefore especially advantageous from the standpoint of ventilation, and there is considerable room at the different landings to go from one ladder to another, so that it also fulfills some of the efficiency requirements. Also, most miners are familiar with this type of manway, which is a decided advantage. One criticism was that the ladders were 12 ft. long, which was an objection from the point of view of safety.

Fig. 6 shows another type of manway for a crib raise, with a good-sized compartment for hoisting timber—large enough for a man to be lowered through in a basket. In case of necessity a helmet man with apparatus can climb up and down the ladderway. The timber compartment contains 5.1 sq.ft., the manway 3.3 sq.ft., making a total of 8.4 sq.ft. The ladders are inclined. This raise fulfills the requirements regarding efficiency, as it contains a good traveling manway.

The manway illustrated in Fig. 7 shows all ladders arranged vertically, although they are only one set high. As regards ventilation, there is a total area of 9.6 sq.ft. A novel idea is shown in the chutes, as breakers are placed in each set on opposite sides of the chute (as indicated in drawing on the left in Fig. 7). Any ore which starts from the top will not drop down vertically and form a solid mass in the bottom of the chute, but will strike these breakers, zigzagging from one to the other until it reaches the bottom. A chute of this sort seldom needs punching, as it rarely "hangs up." The manway is easily made, but did not prove popular with the men, although it is used in several other camps.

The square set raise shown in Fig. 8 contains a total air space of 13 sq.ft. It has two timber compartments, and may have either vertical or inclined ladders. The illustration is interesting in that it represents a smaller chute but larger air space. The chief objections raised were high cost of construction and cost of upkeep, as the chute would have a tendency to break, not only on the manway side but on the opposite side, where it would be difficult to make repairs.

Figs. 9, 10, 11 and 12 are types of small special raises, containing manways, timber compartments, and chutes, designed for use in top slices, small square set stopes, and similar workings. The advantage of small raises of this kind is that they require openings driven through the ground only about half the size of the standard raise, but they also possess a decided disadvantage in the limited capacity of their chutes.

After considering the various designs, Figs. 3, 5, 6, 9, 10, 11 and 12 were selected as representing ideas having considerable merit. Slight alterations and improvements, however, were made to the original plans of Figs. 3 and 5, as may be seen by referring to Figs. 13 and 14. In Fig. 13 it will be noticed that the changes in the manway are such as to allow greater space for traveling, and stronger construction, heavier timbers being used in the manway and timber compartments than were required in the original design (Fig. 3). Fig. 13 also shows a greater area for ventilation. The chief points of difference between Figs. 5 and 14 lie in the fact that in Fig. 14 the ladders have been shortened so as to make it safer for a man going from one ladder to another. According to the design in Fig. 14, he can fall only 8 ft.; whereas in Fig. 5 it would be possible for him to drop 12 ft. Smaller timbers are used between the manway and timber compartment, which improves the ventilation.

Of the designs illustrated in Figs. 6, 9, 10, 11, 12, 13 and 14, Figs. 9, 10, 11 and 12 are intended for use in the special cases mentioned above, and Figs. 13 and 14 are designed to meet conditions when it becomes necessary to construct a manway in a limited space. Fig. 6 was found to have many possibilities, and, after a few minor changes were made, the improved design, Fig. 15, came nearer complying with the requisites for a standard raise than any of the other plans submitted. It was therefore adopted as the standard for the company's mines.

In comparing Fig. 6 with Fig. 15 it will be seen that the changes were slight. Fig. 15 has a larger timber compartment than Fig. 6, and also larger sized openings in the different landings of the manway. Fig. 15A is identical with Fig. 15, with the exception that the latter gives the dimensions of a manway and timber compartment for a crib raise, whereas Fig. 15A is the same design for a six-post square set raise, using 10 x 10-in. timbers. Experience has shown that there are few accidents in a manway of this kind, as it contains all the safety requirements, is satisfactory as regards ventilation and efficiency, and also possesses the following advantages:

1. The ladders are inclined.
2. It is impossible for a man to fall more than one set, which is about eight feet.
3. A man going up the ladder with supplies would not injure any one below, should he drop anything.

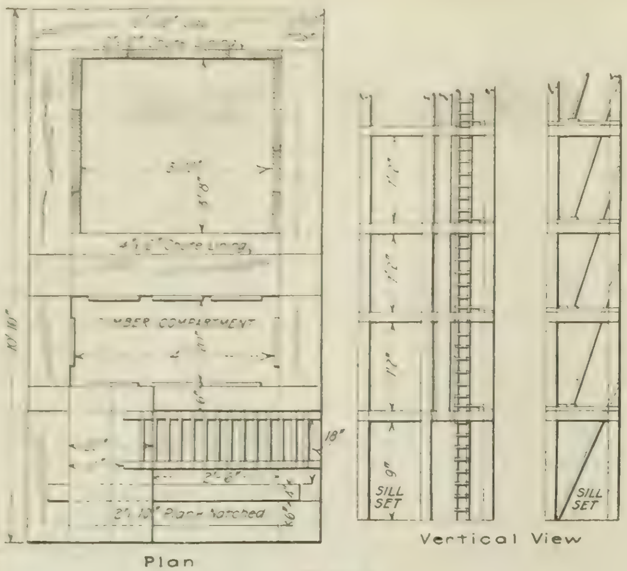


FIG. 13

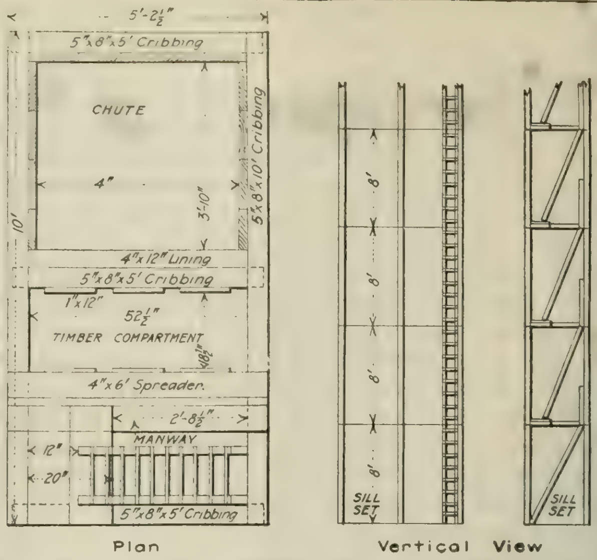


FIG. 14

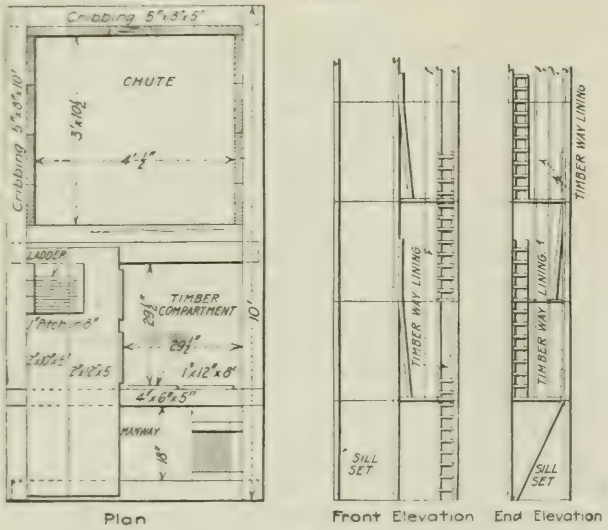


FIG. 15

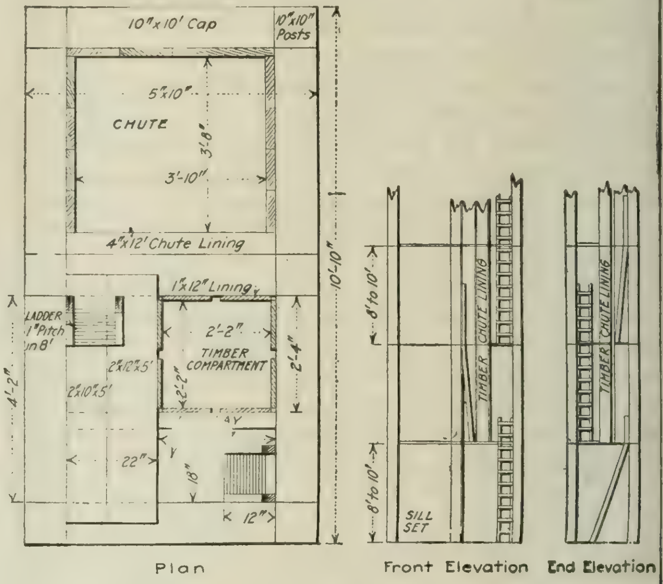


FIG. 15 A

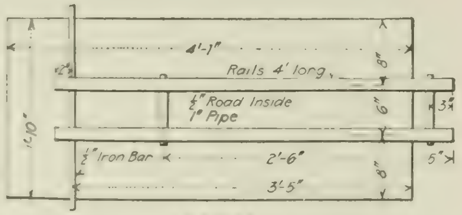


FIG. 16

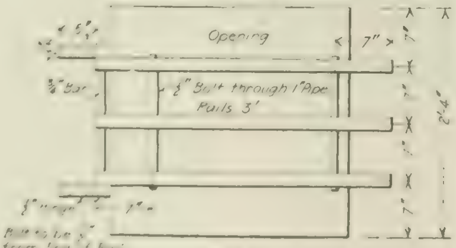


FIG 17

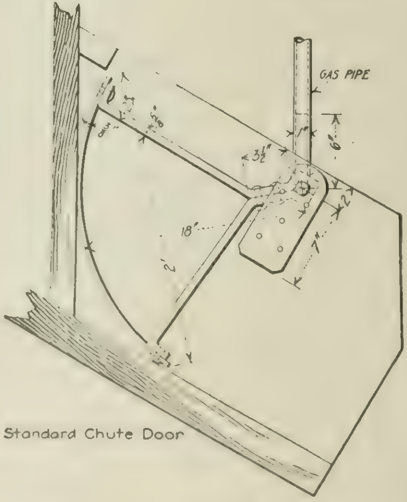


FIG. 18

TYPES OF RAISES, GRATINGS, AND A DESIGN FOR CHUTE DOOR. FIG. 15 AND 15A ARE RECOMMENDED AS "STANDARD RAISES"

4. The timber compartment is large, allowing an injured man to be taken through in a basket.

5. A man wearing an oxygen helmet can get through all the openings.

6. On top of the raise there are guard rails 3½ ft. high around the chute and manway. A grating, illustrated in Figs. 16 and 17, is put over the timber compartment, and grizzlies of either timber or rail are laid over the chutes.

7. From the point of view of ventilation, the area is sufficient to allow 942 cu.ft. of air per min. to pass through when the air is moving at a velocity of 100 ft. per min., which is sufficient for three or four men in a stope of ordinary size. If the stope is larger and has more men working in it, additional raises should be put up to increase the quantity of air in proportion to the number of men. The extra raises will also give additional chute capacity to take care of the increased tonnage.

8. All timbers are of standard size; therefore no cutting underground is required.

9. The openings through the landings are large and roomy, so that a man may easily pass through them.

10. Timber can readily be hoisted through the timber compartment into stopes.

11. The solid ground is left at the bottom of the chute, so that the ore, which drops 100 ft., will strike on the solid and not wear out any chute bottoms, which must be replaced from time to time. Only a chute mouth is put in, which requires little repair work.

12. The construction of such a raise is economical on account of its simplicity, standard length of timbers and the fact that most miners are more or less familiar with it. It has proved a success at the Copper Queen company's mines, and has also achieved considerable popularity in other camps in the Southwest where it has received a fair trial.

STANDARD GRATINGS FOR TIMBER COMPARTMENTS

Fig. 16 illustrates the style of grating to be placed over timber compartments of the Figs. 13 and 14 type, and Fig. 17 represents the grating for Figs. 15 and 15A. These gratings should both be of standard size (as indicated in the drawings) and made in the company's shops on the surface. When they are taken underground, the only thing necessary is to fasten the hinges to the timbers on the sides of the raise.

STANDARD CHUTE DOOR

A circular chute door is shown in Fig. 18 which is to be used in the chute of the standard raise (Figs. 15 and 15A). This door is convenient and is easily operated with a piece of gas pipe, which is used as a lever. Though the raises, gratings, and door described are given as the standards in their particular line, this does not in any sense imply that they may not be changed should a better way be worked out. They merely represent the best-known and most efficient method at the mines in which they have been installed.

The word "standard" is likely to be misleading in that it has two meanings, its most commonly accepted definition indicating something which has attained a state of perfection and is therefore not subject to change. However, in its application to working methods it has a much broader interpretation, and it has been defined thus:

"A standard is simply a carefully thought out method of performing a function, or carefully drawn specifications covering an implement or some article of stores or of product. The idea of perfection is not involved in standardization. The standard method of doing anything is simply the best method that can be devised at the time the standard is drawn. . . . Improvements in standards are wanted and adopted whenever and wherever they are found. There is absolutely nothing in standardization to preclude innovation. But to protect standards from changes which are not in the direction of improvements, certain safeguards are erected. These safeguards protect standards from change for the sake of change. All that is demanded . . . is that a proposed change in a standard must be scrutinized as carefully as the standard was scrutinized prior to its adoption. Standards adopted and protected in this way produce the best that is known at any one time. Standardization practiced in this way is a constant invitation to experimentation and improvement."—Morris L. Cooke, Bulletin No. 5, Carnegie Foundation Series.

Personal Injuries in Utah

By A. L. H. STREET*

The right of alien and non-resident wives and children to recover damages under the laws of Utah for death of their husbands and fathers while engaged in mining in the state, and due to negligence of their employers, is upheld by the U. S. Circuit Court of Appeals, Eighth Circuit, in the case of Bianco *vs.* Bingham Mines Co. (*246 Federal Reporter, 936*), a suit based on death of a miner whose family continued to reside in Italy.

But, reversing a judgment entered by the trial court in plaintiff's favor, and ordering a new trial, the Circuit Court of Appeals holds that error was committed, in the reception of evidence at the trial, tending to show that after decedent was killed through a dangerous condition of a trolley wire, which had been negligently permitted by the employer to exist, as claimed by plaintiff, the wire was reconstructed. "It is the settled doctrine of the courts of the United States," says the opinion, "that in actions for injuries alleged to have been caused by defective machinery, appliances, or places of work, evidence of subsequent alterations or repairs has no legitimate tendency to prove negligence at the time of the accident and is calculated to prejudice the defendant."

Quarry Accidents in the United States in 1916, according to Technical Paper 193 issued by the Bureau of Mines, resulted in 173 fatalities and 13,427 injuries, classified as follows: Resulting in permanent disability, 26; partial disability, 446; other serious, 2194; slight accidents resulting in loss of less than 14 days' time each, 10,761. Reduced to a basis of accidents per 1000 men employed during 300 days, fatalities were 2.26 and non-fatal injuries 175.62. Marble quarrying had the lowest rate of fatalities, 1.16 per 1000, and trap-rock quarrying the highest, 4.45 per 1000. Statistics are given of accidents in the quarries of Belgium, France, Great Britain and Italy, which indicate that the fatalities seldom reach 1.00 per 1000 per year.

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"Sengite," a New Explosive*

By J. P. UDAL

TOWARD the end of last year, when news was received in South Africa that the supply of glycerin for explosives for the mines would have to be curtailed, the staff at the Umbogintwini Factory, of Kynoch, Ltd., gave consideration to the development of an explosive for Rand rock-breaking, with a guncotton base, to take the place of the ordinary nitroglycerin explosive. Tonite is a well-known explosive of this nature, and naturally it was the first to be made, and it was found that, by substituting nitrate of soda for nitrate of barium, which has usually been used for tonite, an explosive of approximately similar strength to gelignite could be produced.

Tonite in its simplest form consists of guncotton well incorporated with nitrate of barium, hydraulically pressed, and afterward dried. In pressing, a recess is left in the cartridge to take a detonator, and it is fired with a detonator in the same way as ordinary gelatinous explosives. Such an explosive, with nitrate of soda in place of nitrate of barium, might be made and applied with satisfactory results as a substitute for gelignite, but research at Umbogintwini showed that it was possible to leave a sufficient proportion of water in the cartridges without appreciably reducing their blasting strength, with the great advantage that the explosive was perfectly safe to handle, as it was so insensitive to shock as to withstand hammering with a steel tool, so that accidents in mining caused by drilling into unfired holes would not occur when this explosive was used. On the other hand, the new explosive cannot be reliably detonated with an ordinary detonator such as is used for tonite or gelignite, but it has been found that it will detonate with absolute regularity if it is loaded in a hole and fired with a primer cartridge of gelignite or gelatin.

The new explosive was licensed for manufacture under the name of "sengite" in January this year. The first four letters of this name are the initial letters of "Substitute explosive—No glycerin," and it has been suggested that the last three letters "ite" mean "in this explosive," but "ite" is the ending which appears to be essential for the name of any new explosive, and without which it will not break rock!

The process of manufacture is to incorporate the various ingredients thoroughly, clean, sieve, blend, and finally hydraulically press them into the shape of the cartridge, under a pressure which is from five to ten tons to the square inch. This requires a set of machines which have to be specially made. For the last four months, several tons per week of "sengite" have been sent to the various mines of the Witwatersrand for use underground, at first experimentally, with the result that, after a month's trial, the industry decided to order it in larger quantities, so that it became necessary to design machinery for this output. Machinery is now being manufactured in Johannesburg to turn out from 5000 to 10,000 cases monthly, and this machinery will be erected at Umbogintwini as it is finished, so that by July it is hoped that half of this output may be produced and the full amount during the next few months.

Owing to the small quantity which it is yet possible to make, only a few cases weekly have been supplied to each of the various mines on the Rand, and the application of the explosive has been usually to charge holes with alternate cartridges of gelignite and "sengite," the primer cartridge always being gelignite. The regular report which has been obtained, as the result of this work, has been that "sengite" cartridges are, as near as possible, an equivalent for the same weight of gelignite, and the various mines which have reported have expressed their willingness to use it as a substitute when it can be produced.

When loaded in this way, with alternate cartridges of gelignite, the value of "sengite" from a safety point of view is lost, because, if such a hole were drilled into after a misfire, the gelignite would make the charge almost as dangerous as gelignite by itself.

Experiments have been made at the Nourse mines with primers of T.N.T. without any gelignite primer at all, in holes loaded with "sengite" only, and the report is that these show equal results to holes loaded with gelignite. It may be that, from the safety point of view, this can be shown to be an improvement over the firing of the holes with a primer cartridge of gelignite, but, on the other hand, it is quite possible that experience may prove that the single primer cartridge of gelignite does not introduce much extra source of danger, as misfires nearly always occur toward the bottom of the hole, on account of the hole being cut off from the top by an explosion in another hole. At any rate, this is a point which can be found by experience when ample supplies of "sengite" are available, and after it has been largely used without alternate cartridges of gelignite, and with only the primer cartridge gelatinous or sensitive to shock.

The cost of "sengite" is, under present conditions, slightly greater than that of gelignite, and, as long as the present pre-war controlled price of glycerin remains, it is probable that this small extra cost of "sengite" will remain, so that, with this difference in cost, it will be required only in such quantities as will make up for the shortage of glycerin. For the present, therefore, "sengite" may be claimed as an explosive which will provide for this shortage and can be treated as an insurance against a serious shortage of glycerin.

Up to now all the "sengite" made has been of a uniform strength equivalent to ordinary gelignite. A great many other derivatives have been made, and it is found that a series of explosives can be produced containing other ingredients, so that weaker and cheaper forms of the explosive can be made to take the place of the series of gelignites and dynamites down to about the strength of 30% nitroglycerin explosives. For the present, it is considered best to make only the one strength, but with machinery available to manufacture a large output, explosives in great variety can be produced.

Remember the Comfort Fund of the 27th Engineers.

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*Excerpt from the South African *Journal of Industries*.

New Mines of the Far East Rand

BY A. COOPER KEY

The development of the mines of the Far East Rand will be of immense importance in maintaining the supremacy of the Transvaal as the foremost gold-producing country in the world. Details are given in this paper of the South African government's new leasing system and the method of calculating profit percentage.

FOR a time, at least, the terms made by the government of the Union of South Africa for the leasing of mining ground in the Far East Rand have been settled. More than a year ago four areas were offered to competition. In October, 1917, it was announced that the tenders for two had been accepted—that of Barnato Brothers for South Geduld-Springs, of 2050 claims, and that of Springs Mines, Ltd., for the Rietfontein East area, of 2235 claims. None of the tenders lodged at that time for Rietfontein West was accepted, and the one tender put in for the eastern portion of Geduld, 2526 claims, was also declined. A reoffering of Rietfontein West, with the special proviso that the area was to be worked as an independent company, and not in conjunction with other ground, as was permissible in the earlier invitations, and adopted in the case of Springs Mines, resulted in the acceptance of a tender from the Anglo-American Corporation of South Africa, Ltd.

OVER 6500 CLAIMS LEASED TO THREE COMPANIES

The government has thus leased areas totaling more than 6500 mining claims, two areas for independent exploitation, one of which was in conjunction with Springs Mines. The extent from north to south is about five miles and from east to west three and a half miles. Allowing for the existing Springs Mines, which occupies a portion of the parallelogram, the area actually leased is about 14 square miles.

ONE COMPANY TO PAY 50 TO 65 PER CENT. OF PROFITS TO GOVERNMENT

The government has obtained remarkably satisfactory terms for these areas. In one case, of South Geduld-Springs, the terms were extraordinarily favorable; indeed, in the opinion of some, the royalty is too high to constitute good business. The royalty offered was on the formula.

$$80 - \frac{750}{X}$$

X = percentage of net product to recovery.

On this scale, the government would receive 55% of the profit after allowing for capital amortization when the percentage of net profit to recovery was 30; 59½% when the ratio was 35%, and 61¼% when the ratio was 40%. It should be remembered that the tenderer makes himself responsible for the provision of £1,500,000 working capital. He takes all the risk, the government subscribing nothing. But as soon as there is any profit the government begins to share. The importance of the arrangement outlined will be determined from the fact that the government's share in the case of the Modder Government Areas mine, the first leased under the system, was £238,745 last year. The name of the new company, registered on Feb. 20, is New State Areas Ltd.; and it is estimated that it can pay from 20 to 25%, on the basis of crushing 1,500,000 tons a year, and assuming a recovery of 35s. per ton. Besides the royalty the company has to pay ordinary taxation. This applies to all recent leases except the government gold-mining areas.

COMPARISON OF SCALES OF TWO AREAS TO BE WORKED BY SEPARATE COMPANIES

The Anglo-American Company's offer to Rietfontein West contained a lower scale than the phenomenal one of Barnato Brothers, but still remarkably good from the government's point of view. The formula is $65 - \frac{650}{X}$ At the most probable ratios in actual working, the royalty scale is 11 to 12½% less. These two areas are comparable if the larger area of Rietfontein West be known in future as West Springs, to compensate for the greater depth at which it is expected that the reef series will be struck. Both are to be exploited as separate entities. The following comparison may be made:

COMPARISON OF PERCENTAGE OF PROFIT TO GOVERNMENT

Percentage of Profit to Recovery	Percentage of Profit to Government New State Areas	Springs West
10	5	.....
15	30	21.7
20	42.5	32.5
25	50	39
30	55	43.3
35	58.6	46.4
37.5	60	47.4
40	61.25	48 75
42.5	62.4	49.7
45	63.33	50.6
47.5	64.2	51 3
50	65	52
52.5	65.7	52.8
55	66 4	53.2
57.5	67	53.7
60	67.5	54.2
65	68.46	55
67.5	68.9	55.3
70	69.29	55.7

Assuming that taxation represents 7% of the profits (it is more at present, owing to the special war levy), it will be seen that the government receives no less than half the profits in the case of the New State Areas (Barnato) when the profit ratio is as low as 20% of the recovery, and in the Springs West case when the profit ratio is 30.

WHAT THE GOVERNMENT WILL ACTUALLY RECEIVE

In practice, the ratio is almost certain to be higher. In the case of Government Areas, the percentage ratio of profit is expected to range between 32 and 51; whereas Springs Mine's recent figures indicate 45%. Taking a mean of about 40, it will be seen that in the case of New State Areas the government will receive 61¼% of the profit (this, by the way, was the maximum in the case of the first Government Areas), and, in the case of New State Areas, the government will receive ordinary taxation. This would bring the figures up to nearly 70 and over 55%, respectively. Strictly speaking, the percentage royalty is on the net product, i.e., the profit less an annual allowance for amortization (say £60,000 to £75,000). This is deducted from the amount payable, according to scale, and to this extent the capitalist is safeguarded.

COMPARISON WITH VENDOR CONSIDERATION

It may well be asked, is not 45 to 60% of the profits a large proportion to be distributed to government requirements. From what I have heard of conditions in America, I gather that it would be considered entirely unjustifiable. As regards the Rand, I would suggest that it corresponds with the vendor consideration in the old-style company finance. That is now (in the leasing system) entirely eliminated, the only concession being a commission of 5% on the capital.

Whether the shareholder has to give up 60% of his profit to the government or to the vendor promoter, surely matters little. The proportion of capital actually taken by the vendors has varied greatly, and it is not always easy to trace the vicissitudes of reconstruction through which the companies have passed. It must also be remembered that, owing to the increase of total capital by the provision of additional working capital, the relation of original vendor capital to ultimate capital is much less than to the original total capital. Of the Rand Mines subsidiaries, namely, Rose and Geldenhuis Deep, the vendors usually took half. In the case of Crown Deep, the vendor consideration was 200,000 shares out of 300,000. In the Nourse Deep it was higher, and in the case of the Crown Reef and the Meyer & Charlton the vendor took over 80% of the original capital, and on that of the New Modderfontein nearly as high a proportion.

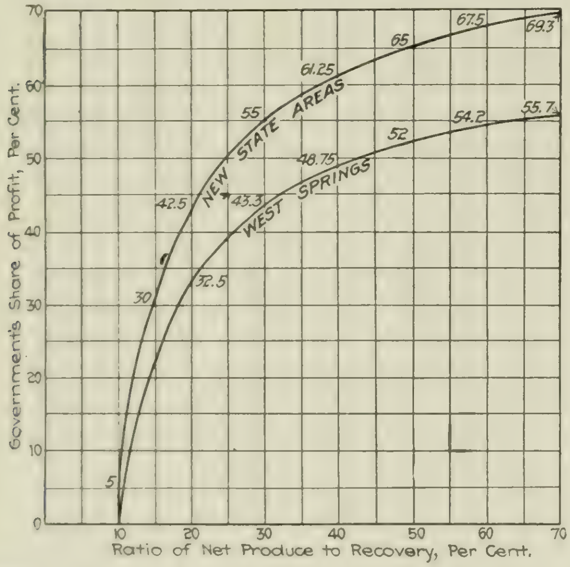


FIG. 1—Comparison of scales of the New State Areas (South Geduld-Springs) 2050 claims. Royalty to government on formula $80 - \frac{750}{x}$ and West Springs, Ltd., (Reitfontein West) 2235 claims, royalty on formula $65 - \frac{650}{x}$ Ordinary taxation also payable in both cases.

THE CASE OF ADJACENT MINES

Much of the foregoing is history, and ancient history at that. What has happened in more recent times? Quite pertinently, the illustration will be more of mines in the same district as that of the new leases, the Far East Rand. In Brakpan the vendors' shares represented £328,514 of the original authorized capital of £750,000, that is to say, 55%. In the case of the Geduld rights, in connection with which the late President Kruger was paid £100,000, the vendors received 185,000 shares out of 400,000, equal to 46¼%. In that of the Springs Mines, the vendor consideration was 300,000 shares out of 795,000, representing 38%. In these three cases the vendors took on the average 46% of the capital for investment in development. This is exactly what the Springs West company has contracted to pay the government when the ratio of profit to recovery is 35%. It is perhaps fair to add that in the case of Modder Deep the vendor consideration was low, only 88,000 shares out of £500,000 capital, approximately 17½%. The property, though remarkably rich, is small, containing only 326½ claims.

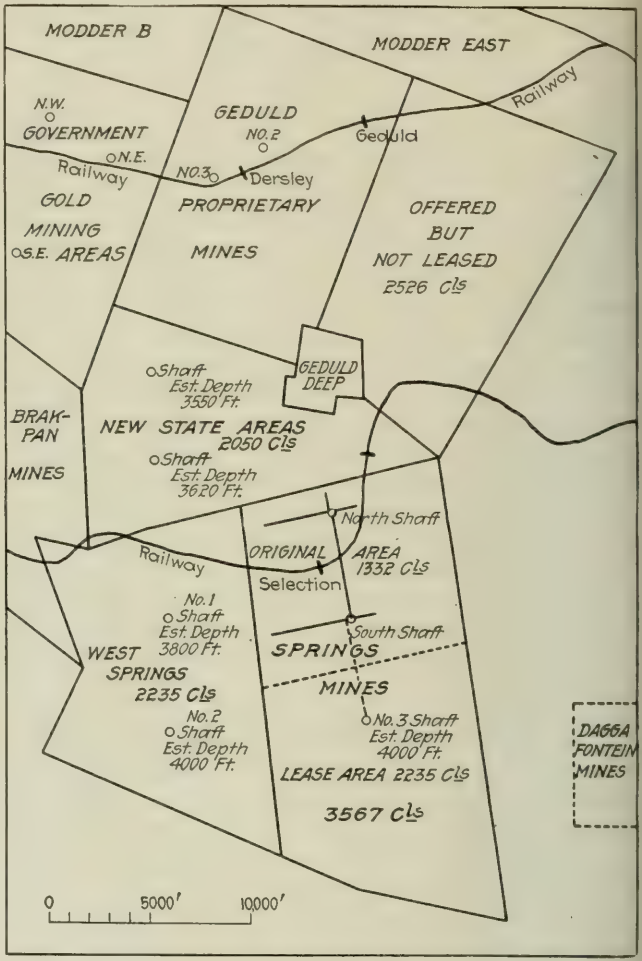


FIG. 2—Two new mines on the Far East Rand (New State Areas and West Springs) and an extension of present Springs Mines recently leased by Union of South Africa government.

THE PROPHETS CONFOUNDED

It was frequently said that the government would never again get such good terms as those secured in the Government Areas (Modderfontein) lease. But the prophets have been proved wrong. The New State Areas lease is from 15 to 20 points better than the first essay in leasing, even on the scale and not allowing for ordinary taxation, which the new company has to pay and from which the first concern was exempt. At 30% ratio, the Anglo-American (Rietfontein West) is 7½% better than the Modder Government Areas scale as amended. At 40 it is about 2½% higher; at 45 (a ratio hardly likely to be realized in actual practice) the scales cross, and at the 60% ratio the Government Areas scale gives 4¼% more. These "high altitudes" of the scales are more or less academic.

AN ANOMALOUS SCALE REVISED

The revision of the Government Areas scale, which after much debate, was agreed to in March past, removed the jumps in the scale at 20, 33⅓ and 49% ratios, and substituted two scientific formulas:

(*a*) *Up to 36.17% ratio of product to recovery* —

$$y = 5.467 + 1.06487 \times \frac{53.66}{x}$$

(*b*) *Above* 36.17%

$$y = 82.5 - \frac{1446.81}{x}$$

x = ratio of net profit to recovery. y = royalty payable percentage of profit.

The original scale had the effect of penalizing the contractors when higher profits were secured by more efficient working, i.e., lower working costs. It actually paid to manipulate the grade (by adding poor development rock), so as to keep the ratio below 33⅓%! The new scale (given here for completeness) is:

PRESENT SCALE OF PAYMENTS TO GOVERNMENT

Percentage of Profit to Recovery	Percentage of Profit to Government
10	10.75
15	17.86
20	24.08
25	29.94
30	35.62
35	41.20
37.5	43.90
40	46.33
42.5	48.45
45	50.35
47.5	52.04
50	53.56
52.5	54.87
55	56.19
57.5	57.30
60	58.39
62.5	59.3
65	60.24
67.5	61
68.08	61.25
70	61.25

The above payments are free of ordinary taxation on mining.

The third area, Rietfontein East, was dealt with on a different basis, by conjoint working with an existing mine, and amalgamating 1332 claims owned with 2236 claims leased. For five years from January, 1918, the company is to pay 5% of its profits; thereafter payments are to be made according to the formula

$$y = 55 - \frac{1175}{x}$$

with a minimum of 12½% royalty, applicable to profits from the entire area, not merely that contributed by the government:

PROFITS PAYABLE FROM REITFONTEIN EAST

Ratio of Net Profit to Recovery, Per Cent.	Government's Participation, Per Cent.
30	15.8
35	21.4
40	25.6
45	28.9
50	31.5
55	33.6
60	35.4

Making allowance for the relative areas of unworked ground, I estimate that at 50% ratio the government will receive about 53% of the profit from the leased area taken. This is practically the same as with the Government Areas and a point higher than in the case of Springs West.

The West Springs, Ltd., is the name of the company formed to deal with the contract awarded to the Anglo-American Corporation of South Africa, Rietfontein West. It will have a capital of £1,400,000, wholly guaranteed by the corporation; and 400,000 shares are to be paid up fully on registration, half of which will be offered for subscription to the public of South Africa.

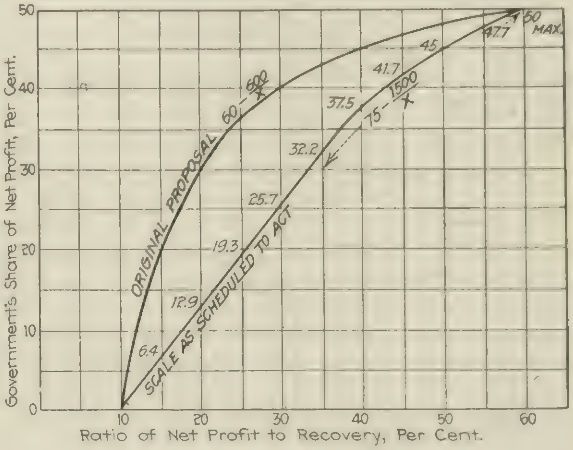


FIG. 3—Additional areas to constitute, with the Mynpacht, "a workable mining proposition." Comparison of scales as scheduled in act, and as originally proposed. Scale shows the minimum royalty payable.

The depth to the reef will, it is estimated, be 3800 ft. in the northern shaft and 4000 ft. in the southern. By an arrangement with Springs Mines, mining through the northern shaft and western drives of that company's mines is to be permitted, the consideration being an option over 150,000 shares at 22s. 6d. for two years, or one year after the declaration of peace, whichever is the later. It is expected that this arrangement will save considerable capital outlay and two years' time. Large ore reserves in the northeastern portion of the ground can be opened up by the time the West Springs shafts are down to the reef, a matter of about four years.

NEW PROVISIONS OF THE MINING LEASES ACT

Apart from the leasing of these three compact, self-constituted areas, fresh legislation has just been adopted for dealing with the cases of owners of mineral lands whose areas, granted under the Gold Law, are not sufficiently extensive to warrant exploitation, in consequence of the high capital expenditure involved, by empowering a Mining Leases Board to lease additional areas. Application is to be made for such additional area at the same time that the principal commission (or mynpacht) is applied for. A minimum royalty on scale is stipulated for, determined by reducing the amount specified in the scale until it reaches the same proportion that the leased area bears to the joint area. The governor-general is to be satisfied that the combined area constitutes a workable mining proposition. If approved by both houses of Parliament, a lower scale may be agreed to. Under the Transvaal Gold Law the owner had the right to locate one or more mynpachts, but the Mining Leases Act permits one only. This may prove inconvenient in certain contingencies. The minimum royalty is in the crucial part of the scale (that is, over 35%) on the formula

$$75 - \frac{1500}{x}$$

This scale, especially in the lower ranges, is much more favorable to the lessor than that originally proposed by the government, which was on the formula

$$60 - \frac{600}{x}$$

The scale adopted is similar to that of the Government Areas as amended after a deduction of 8% to allow for taxation now payable in addition, but from which the Government Areas was exempt. The draft proposal was from 3 to 4% lower than that of the Anglo-American (West Springs).

The minmum royalty as now scheduled in the act is:

ROYALTY EXACTED BY GOVERNMENT

Percentage of Profits to Revenue	Percentage of Profits Payable to Government
10 and under	Nil.
12	2.6
15	6.4
20	12.9
25	19.3
30	25.7
35	32.2
40	37.5
45	41.7
50	45.0
55	47.7
60 or over	50.0

The new act stipulates that persons sinking boreholes shall notify the Mining Commissioner of their intention, and declare the results within one year of completion. Relief is provided for holders of prospecting licenses who prove that they have expended not less than £1 per claim per month on development work.

In 1922 or 1923 it is to be expected that these companies will be producing gold in substantial quantities, and making good profits. Expansion is necessary, as it has been estimated that by that time only 33 of the present Rand companies will still be working, and some of those may have been forced to close down by the ever-increasing war costs.

Roaster Charge Belt Feeder

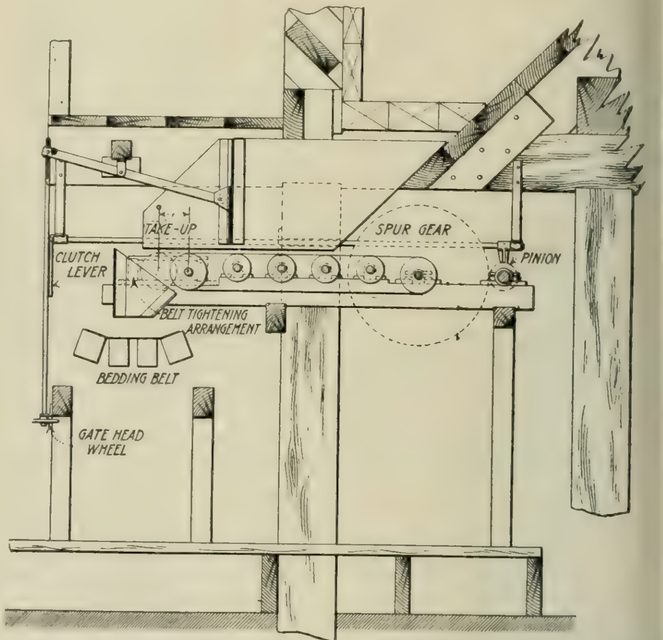
By C. T. Rice

The idea of making up a lead-roaster charge by means of a series of feeders that bed the product from different bins on a conveyor belt seems to have originated at the International Smeltery at Tooele, Utah, where challenge feeders are used—a type that does not permit of close adjustment and gives trouble when certain parts begin to wear. This method of bedding was utilized when the Northport smeltery was remodeled for treating Cœur d'Alene lead ores; but as it was necessary to install the system with bins already built, the type used does not equal the one shown in the accompanying drawing. This was designed by Bradley, Bruff & Labarthe for use at the primary ore bins of the Bunker Hill smeltery in proportioning the roaster charge.

The feeder is of the ordinary belt type and the drive is by spur wheel from a line shaft. The driving spur is carried loosely on the line shaft, and it is thus in constant mesh with the spur wheel of the feeder belt. Connection is made with the line shaft by means of a clutch at each feeder; and an operating lever extends out in front of the bedding belt, so that the spur wheel can be easily thrown in or out of gear.

The feed hopper at the bottom of the bin is fitted with a vertical slide gate at the front, the opening of which can be closely regulated by a lever and hand wheel. As all the ore which goes to the primary bins has been crushed to pass a 4-mm. trommel, and as the feed belt is kept tight, the amount of ore taken from a bin may be easily and closely regulated.

The method used at the Bunker Hill smeltery in proportioning the roaster charge is to draw a predetermined number of units of 20 lb. of product per 15 sec. from the several bins. In order to set the feeder to give the right amount, the discharge during 15 sec. is caught and weighed on a small platform scale, moving the slide gate up or down by means of the hand-wheel and screw-nut arrangement until the right gate opening is obtained.



BELT FEEDER FOR BEDDING ROASTER CHARGE

La Rose Mines, Ltd.

The eleventh annual report of La Rose Mines, Ltd., that for 1917, contains the following information with reference to output:

WEIGHT AND VALUE OF LA ROSE MINING CO., LTD., SHIPMENTS, 1917

	Tons	Ounces Silver, Per Ton	Net Value
Silver-cobalt-nickel ore	188.71	651.84	$94,844.21
Low-grade silver-cobalt-nickel ore	125.16	89.31	12,353.97
Nuggets	0.53	21,621.15	8,640.80
Concentrates	1,186.78	280.57	235,634.70

The production of silver for the year amounted to 437,337 oz. Net profit on production was $71,372.42. The increased price of silver—82.94c. per oz., as compared with 64.89c. per oz. in 1916—was offset largely by increased operating costs. Ore milled during the year amounted to 44,450 tons, the average assay of which was 8.75 oz. per ton. Extraction by concentration is given as 83.30 per cent.

Lime for Fluxing Purposes sold in the United States in 1917 amounted to 209,976 short tons, according to a bulletin of the U. S. Geological Survey.

Taxing the Prospector

By T. O. McGrath*

The present Income Tax Law and Treasury Department rulings governing the collection of income taxes make no distinction between mines in development and mines on a producing basis. This results in taxing the net returns from development ore as income, before it is known whether or not such amounts will be income or capital returned.

In order to bring this matter before the Treasury Department, a meeting was held at Phoenix, Ariz., on Oct. 12, 1918, which was attended by representatives of about 30 mines in the course of development, and the following resolution was adopted and forwarded to the Secretary of the Treasury:

Whereas, The present Federal acts imposing an income tax upon mining companies, and the Treasury Department's rulings governing the collection of the income tax, do not make any distinction between income received by producing mines that have developed sufficient ore to guarantee the return, or to warrant a belief in the return, of the original capital invested in the business to the business, as well as a profit above the return of the original investment, and the income received by prospect and development mines that have not developed sufficient ore to guarantee the return, or the reasonable belief in the return, of the original capital invested in the business to the business; and

Whereas, The said Federal acts and the Treasury Department's rulings do not protect the prospect and development mines that have not sufficient ore to guarantee the return of the original investment to the business from paying an income tax upon the amount that receipts from shipments of ore encountered in course of development work exceed the operating expense; and

Whereas, Under the present Federal acts and Treasury Department's rulings, investors will not be found to prospect and develop mineral ground, requiring a number of years' investment without any interest return, that has not an assured tonnage of ore sufficient to guarantee a return of their investment, as they would not be able to make shipments of ores encountered in development work without paying an income tax upon the return of their principal under the proposed new revenue bill at the rate of 18% if undistributed, and 12% if distributed as dividends, and other charges,

Now, therefore, be it resolved, That the Treasury Department, in revising Regulation No. 33 governing the collection of the income tax imposed by acts of Sept. 8, 1916, as amended by the act of Oct. 3, 1917, and as will be amended by the present tax legislation now pending, include under Article No. 172 of the present issue of the Regulation No. 33 (which article sets forth the method of determining the depletion deduction and the method of arriving at the mine valuation) a paragraph covering the method of determining the depletion deduction against returns from prospect and development mines as follows:

"The net returns from prospect or development mines shall not be considered income subject to income tax until the total net earnings, plus the total net value of the ore in sight, shall be equal to or greater than the investment in mine property and mine equipment, plus a reasonable rate of interest on the actual investment, provided such net returns are set aside as depletion reserves for the return to stockholders of the original investment in the mine property and mine equipment, or for further development of, or for reinvestment in, the mine property.

"Any mine so setting aside its net returns from prospect or development ores shall, at the end of any year when the net value of the ore reserves plus the net earnings to date shall be equal to or greater than the sum total invested in the mine property and mine equipment, plus a reasonable rate of interest on the actual investment, submit to the Commissioner of Internal Revenues a statement showing (a) the total investment in mine property and equipment; (b) the total tonnage mined and developed; (c) the total net value of the developed ore in the mine; (d) and the total net earnings from development ore that have been set aside as depletion reserves.

"From this statement there shall be determined the actual depletion reserves chargeable against past earnings, and the depletion reserve account shall be reduced to the proper amount, by a transfer of the difference to the surplus account as earnings, and upon this amount of earnings there shall be levied the proper income taxes according to the years in which the earnings accrued."

In submitting the foregoing to the Secretary of the Treasury, attention was drawn to the difference between a mine in the prospect stage and one that has reached a point of constant and profitable production. Comparisons were also made between commercial enterprises in general and the business of prospecting and of developing mines.

It is apparent that the Treasury Department should make a distinction between the producing mine that will return the original investment with interest, and the development mine that obtains a net return from development ores shipped intermittently or more or less continuously during a taxable year, but which has not sufficient ore in sight to guarantee the return of the original investment, or a reasonable belief in its return.

The fact that the Government has seen fit to make an appropriation of $50,000,000 to be used to assist the development and production of the rare metals is conclusive evidence that there is no desire to hamper or discourage the development of the commoner metals—including copper, lead, gold, and silver. All of these are essential to the winning of the war, and reserves are being more rapidly exhausted under the stimulation of high prices, and the high pressure of production of the past few years, than at any time heretofore, and the development of deposits has been curtailed by high wages, high prices of materials and shortage of labor.

I believe that the mining industry should present the Secretary of the Treasury with the facts to support the statements that, though the loss of the income tax receipts to the Government from taxing development mines would be small, the injustice of taxing the net returns of the prospect and development mines will prove a great loss to those unable to stand such a loss, and be the means of discouraging the already lagging avocation of prospecting. If the facts can be presented in that proper manner and form, I believe that the development mines will get the relief desired.

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*Auditor, Shattuck-Arizona Copper Co., Bisbee, Arizona.

Moore Filter Litigation

An important legal action, which has been long pending, will soon be settled in the Western Australian courts, states the *Chemical Engineering and Mining Review*. The Moore Filter Co., of New York, is proceeding against the Great Boulder Proprietary Co. for alleged infringement of W. A. patent No. 4566, covering the use of movable frames on slime filters. The Great Boulder Co., in common with many of the other Western Australian mining companies, has used the Ridgway filter for many years, and if the action succeeds a large sum will be due for back royalties. The companies affected have formed a committee to see the matter through. From a legal aspect there is the prospect of a long and expensive suit, and from the technical point of view the case will not be without interest. One unusual feature of the suit is that the patents have expired and the claim is only for the recovery of back royalties. The plaintiffs ask for a commission to fix the amount due.

In Isolated Regions the Blake type crusher is usually preferred on account of simplicity of design and ease of repair. In large plants, and where facilities exist for effecting complicated repairs, the gyratory is generally adopted in preference to the swing-jaw type of crusher.

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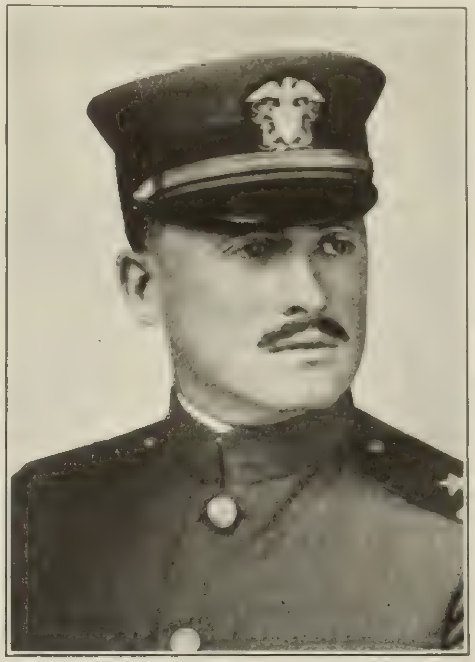

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(Quartermaster's Department)

Military Problems Awaiting Improvement

THE Inventions Section of the General Staff of the United States Army has submitted to the War Committee of Technical Societies the following problems requiring scientific and inventive talent for solution.

The War Committee, therefore, transmits this request of the General Staff to its membership and requests that the engineers of America give them serious thought and consideration.

War Committee of Technical Societies,
3549 New Navy Bldg.,
Washington, D. C.

Washington, D. C.,
October 9, 1918.

Ideas and suggestions should be submitted to:
Inventions Section, General Staff,
Army War College, Washington, D. C.

PROBLEM NO. 1

Liaison Problem

In operations of our troops fighting in France, all have seen the necessity of perfecting liaison between different elements of the command. This is especially true as regards liaison between elements of the front-line troops and between front-line troops and elements further to the rear.

Our infantry advances in spite of the most serious resistance offered by the enemy, and the losses suffered are necessarily heavy. These losses can be lessened by increased artillery activity. Liaison between the infantry is now maintained, in so far as is practicable, by sending forward with the infantry a large artillery liaison personnel, well equipped with the material of liaison—telephones, wire, flags, projectors, rockets, radio, etc.

This personnel is charged with sending back information whereby fire may be directed on the hostile elements causing losses to our troops.

The system of liaison, using the above, does not always give satisfactory results. The enemy's fire frequently cuts off the infantry, and cuts regimental commanders from the units in the front lines. Wire is almost immediately cut by shells; optical signaling becomes impossible on account of smoke and dust, and frequently is interfered with by fog; runners become disabled or killed; pigeons go astray; radio is interfered with by enemy stations, and the antennæ are destroyed by enemy fire; ground telegraph is limited in range, and interfered with.

The War Department is desirous of finding a new means of communication whereby closer liaison may be maintained by the different elements of a command.

A device for this purpose should be small and compact, without antennæ exposed to shell fragments; it should be easily transported by one man, or at the most by three men; it should be capable of being set up quickly, and not present a target to the enemy; it should operate over a distance of at least five miles and be certain of action.

It is believed that the War Department is in possession of the latest developments in so far as radio, telephony, signaling devices and similar apparatus are concerned, but is now seeking for something that is an improvement over all these devices. So far as known, nothing of the kind exists at present, but it is believed, with the inventive genius of the country concentrated along these lines, something desirable may be developed which will be of the greatest assistance in winning the war.

PROBLEM NO. 2

An Aviation Problem

On night bombing expeditions and even in the day time, when passing through fog or clouds, an airplane, like a ship, is guided entirely by a compass. Some of the new instruments designed for this work are beautiful examples of the instrument-maker's skill, but, unfortunately, when placed where the aviator can see them, they are directly between him and the engine, a position which greatly affects their accuracy.

If a compass could be placed near the outer end of a wing, or at the rear end of the fuselage, it would be practically outside of the magnetic influence of the engine, but at present there is no way to read a compass in either of those positions.

What is needed is some device or arrangement whereby a compass can be mounted far enough away from the engine to be outside of its magnetic influence and still be so arranged that it can be easily read by the aviator.

PROBLEM NO. 3

A Better Fire-Control Gear for Fixed Machine Guns on Airplanes

The forward machine gun on an airplane is fixed and fires between the propeller blades in the direction in which the machine is headed at the time of firing.

The function of a fire-control gear is to control the fire of an aircraft machine gun shooting through the propeller so that no shots will be fired when the blades of the propeller are in a position where they are in danger of being struck. This is done usually by a cam attached to the crankshaft or geared to the propeller which sends an impulse by mechanical or hydraulic means to the trigger mechanism of the gun only when the propeller is in a safe position for the gun to be fired. This impulse trips the trigger and a shot is fired. As gears are now designed, two impulses are given to the gun every time a blade of the propeller is in a certain position with reference to the bore of the gun.

Fire-control gears are of two types, hydraulic and mechanical. The advantages and disadvantages of each type are listed below:

HYDRAULIC GEAR

Advantages:

1. Allows gun to be placed in any position with reference to the engine, inasmuch as the hydraulic pipe line can be bent.

Disadvantages:

1. Difficult to fill and take care of. Requires a good deal of special training and experience to get good results. Many small parts to get out of adjustment. Difficulty from leaking.
2. Lag in impulse due to time taken by hydraulic wave to pass down pipe line. This causes a wide dispersion of shots for changes in the r.p.m. of the propeller. Shots fired at low r.p.m. fall too near one blade of the propeller and shots fired at high

r.p.m. too near the other blade; thus the safety margin is cut down and r.p.m. at which the gun may safely be fired is limited.

3. At low r.p.m. the impulse changes from a pressure wave to a simple hydraulic action and the gear cannot then be depended on.

MECHANICAL GEAR

Advantages:

1. Action always positive and certain.
2. No lag of impulse in transmission.
3. Easily taken care of and adjusted.

Disadvantages:

1. Position of gun limited with reference to the engine, as it is difficult to send impulse around corner.
2. In case where impulse is transmitted by rods, difficulty is encountered from whip.
3. Wear in rods and cams affects timing.

Disadvantages of both types of gears:

1. In both types of gears the principal drawback is the dispersion of shots between zero speed and maximum speed, which limits the type of propeller used and limits the safe firing speeds. This is greatest on hydraulic gears.
2. Rate of fire of gun dependent on r.p.m. of propeller. For example, if machine gun is designed to shoot 800 shots per minute and the propeller is turning over at 400 r.p.m., or 800 impulses are given per minute, the gun will fire on every impulse and the rate of the geared gun will be 800 shots per minute. If the propeller is turning at 500 r.p.m., or giving 1000 impulses per minute, the gun cannot use every impulse, but will use every other impulse, and the rate of fire will be only 500 shots per minute or the efficiency will be decreased. This is an important disadvantage of the present system.

The ideal fire-control gear:

1. Maximum rate of fire is obtained at all r.p.m. of the propeller.
2. The time of impulse is advanced as the propeller speed increases, so that shots at maximum speed will fall in the same position with reference to the blades of the propeller at the plane of the propeller as shots at zero speed.
3. Easily placed at any position with reference to the engine.
4. Simple to take care of and adjust.

It is obvious that if the first advantage is obtained, the second must be sacrificed, but a better combination of the two is desired than that which we have at the present.

The problem which presents itself is to devise a fire-control gear which incorporates the above advantages. The solution seems to lie in an electrical system.

Calculations must be based on the following data:

Distance from muzzle of gun to plane of propeller varies from 3 to 6 feet.

Maximum propeller speed, 1600 r.p.m.

Rate of fire of airplane machine gun, 1200 shots per minute.

PROBLEM NO. 4

SPECIFICATIONS FOR NEW REAR SIGHT DESIRED FOR THE UNITED STATES RIFLE, CALIBER 30, MODEL OF 1917

It is desired that designs be submitted for a new rear sight for the United States rifle, caliber 30, model of 1917. The present rear sight is not regarded as entirely satisfactory, wholly because the rifleman cannot readily bring the point of impact of the shots to coincide with the point of aim. The present sight can be adjusted only for hundreds of yards of elevation, it not being possible, for example, to adjust it between 400 and 500 yd.; also, there is no lateral or windage adjustment.

It is desired that the new sight have adjustments whereby the rifleman can readily bring the point of impact to coincide with the point of aim, as was true with the rear sight on the United States rifle, caliber 30, model of 1903 (Springfield). It is not necessary, however, that the lateral or windage adjustment of the new sight have as extended a movement as that on the rear sight of the Model 1903 rifle, a movement of 0.25 in. being sufficient. If this much cannot be obtained, sights which permit of a movement of 0.20 in. on either side of the zero may be submitted.

In connection with the elevation adjustment, an adjustment by means of a strong micrometer screw may be submitted, but this is not necessary. If a micrometer screw is inserted, it should be in addition to the ordinary slide adjustment, and the graduations thereon should read so as to permit of a vertical movement of the point of impact of 1 in. at 100 yd., 2 in. at 200 yd., and so on. In other words, the adjustments should be for minutes of angle.

The lateral or windage adjustment should preferably be actuated by a screw as on the rear sight on the Model 1903 rifle, but may be actuated by a slide and clamp. The graduations of this adjustment should be equivalent to 4 in. for every 100 yd. of range. If a screw is used to adjust, then one revolution of the screw should either move the adjustment over one graduation on the scale or over four graduations.

It is strongly desired that this new rear sight be capable of being placed on the present receiver of the Model 1917 rifle without any modification of the receiver whatever. That is, it should fit between the two rear sight guards on top of the receiver, and be secured thereto by the rear sight joint bolt. If this is not possible, then the rear sight should be capable of being fitted to rifles in the hands of troops by such simple operations as could readily be made by mechanics in the field.

The cost of construction is a serious item. A satisfactory rear sight can easily be designed which will conform with all the above requirements, but its construction will be so complicated that its cost will be prohibitive. No rear sight the cost of which is not prohibitive, and which retains the present desired principle of aiming (a large aperture in a small disk), has yet been presented.

A design is desired in which, when the leaf is laid flat, a battle sight similar to that on the present sight is presented in position for aiming. This battle sight should be of sufficient height for firing at 300 yd. That is, the point of impact and point of aim should coincide at 300 yd. When the leaf is turned up vertical it should permit of elevation adjustment for 100 yd. to 1500 yd. at least.

Ability of the new sight to stand rust and to be readily cleared of dust and mud are very desirable. No fragile parts should stand above the guards of the receiver. All screws used for adjustment should be strong enough to stand the handling which the soldier will give them under service conditions.

The reasons for thus writing the specifications for this new sight are as follows:

AIMING PRINCIPLE

The present aiming principle as seen on the sight for the Model 1917 rifle is believed to be correct. Any peep sight should be as near the eye as possible, and still avoid injury to the eye from recoil. The principle of a large aperture and small disk, the Lyman sight, is correct for a military sight. Such a sight can be used for rapid fire, and for fire against a poorly defined target or one in a poor light. A small aperture with a large disk is better for target shooting, but with such a sight the rifleman cannot find his target quickly if it be not in one set position, as in target shooting; he cannot see to aim at poorly defined targets, nor in poor lights; and he cannot keep a moving target constantly in view.

The rifleman is taught to aim in a normal manner, with the top of the front sight held just below the bull's eye or target at "6 o'clock." With a little practice he has impressed on the retina of the eye a picture of the sights correctly aimed. His eye retains a memory of this picture, and he is able to reproduce this picture exactly, and with great accuracy in aiming. If at any time this picture is incorrect, the error stands out so apparent that the rifleman is at once aware of it and corrects the error. Thus the rifleman when aiming normally aims consistently, the same for every shot, and a small group of shots results—this is accuracy. Accuracy therefore results when the rifleman is able to aim normally, that is, when with a normal aim the group of shots, that is the point of impact, will fall on the point of aim. If, however, it is not possible to bring the point of impact to coincide exactly with the point of aim, through the inability to so adjust the sights, it will be necessary for the rifleman to aim other than normally. Thus, if he is firing at 500 yd., and the rifle requires an elevation of 535 yd. and a lateral deflection of 20 in. to hit the center of the bull's-eye, and owing to the construction of the sight he can only adjust the near sight to 500 yd. elevation, and no deflection, then it will be necessary for him to aim, not normally, but about 15 in. above the bull's-eye and about 20 in. to one side. In practice he must estimate where these measurements will come on the target, and then estimate that he is holding off this much. The picture of the normal sighting which has been impressed on the retina of his eye is of no use to him. He must see his sights aligned differently practically every time he fires at any range, and if in addition a varying wind is blowing he must sight differently at every shot. It has been determined conclusively that if a skilled rifleman fire at 200 yd. a series of ten shots with normal aim, he will attain with the service rifle and good ammunition a group all shots of which will be contained in a circle approximately five inches in diameter. If, however, instead of aiming normally, he is required to aim as nearly as he can estimate eight inches below the bull's-eye and five inches to its left, then his group of successive shots, instead of being contained in a small circle about five inches in diameter, will require a circle about ten inches in diameter to contain them—that is, his error is just about double. We therefore see the desirability of a sight the adjustments of which are such that the rifleman can readily bring the point of impact to coincide with the point of aim at any range.

It is of course known that no two rifles ever shoot exactly alike, and that no two riflemen ever aim exactly alike; hence it is practically impossible to ever set the sights correct for every man or, indeed, for any particular man. Every rifleman must sight in his own rifle.

Zero

It is impossible to set the sights for zero for any particular man, or even for the average man. By means of the triangle aiming exercises conducted at 100 yd., it has been found that when the rifle is held absolutely immovable and sights not moved, riflemen will bring a bull's-eye into line very differently. Almost every man will do it slightly differently. The maximum error among riflemen of national reputation, as determined at the Small Arms Firing School at a range of 100 yd., was found to be about 12 in. That is, if an attempt be made to set the sights of a rifle at zero at the armory, these sights may be found to be as much as 12 in. out of correct alignment for a good shot at 100 yards.

PROBLEM NO. 5

Pyrotechnic Smoke Signals

It is desired to secure, if possible, a suitable chemical substitute for red saxony arsenic now used for the manufacture of yellow smoke signals. The characteristics of such a chemical are that it should produce the effect required, that it should be procurable in large quantities, and that it should be perfectly stable in combination with other chemicals, such as potassium chlorate. The effect desired is a rather deep orange yellow. There is no objection to the use of dyes should these give the effect required and be procurable in large quantities at a reasonable price.

A suitable formula for a red smoke signal is also a desideratum. The effect required is a pronounced and positive shade of red. As in the case of the yellow smoke signal, chemicals composing it should be readily procurable and should be stable. Since, however, the requirements for this signal are considerably smaller than for the yellow smoke signal, a greater latitude may be allowed in selecting slightly less readily available and higher priced material for this signal.

The smoke signals outlined above are displayed from rockets, Very cartridges, Viven-Bessiere cartridges and 35-mm. cartridges. The rockets now used by our forces weigh about two pounds, with an approximate length of eighteen inches. The V-B, Very cartridges, and 35 mm. cartridges have an average length of about six inches, with a diameter, respectively, of two inches, 25 mm. and 35 mm. The V-B cartridges are thrown from the rifle grenade discharger, and the Very cartridges and 35 mm. cartridges from the 25 mm. signal pistols.

Should any person accredited by the Inventions Board become interested in the two pistols outlined above, this office would be very glad to give all the information in its possession.

It should be noted that "Auramine" has already been tried as a dye for the yellow smoke signal and that "Paratoner" has been used in the red smoke signal.

PROBLEM N. 6

An improved hand grenade is wanted with the following characteristics:

Synopsis of Desirable Qualities for Ideal Rifle Grenade and Impact Grenade

1. RIFLE GRENADE

1. Simplicity of construction and operation.
2. Light weight (under 20 oz.)
3. Safety.
4. Sureness of explosion.
5. Long range (between hand grenade and trench mortar).
6. No damage to rifle from use.
7. Should require no special ammunition.
8. Adaptability for use as hand grenade as well as rifle grenade.
9. Designed to secure maximum fragmentation and hold maximum amount of explosive.
10. Should not require special tromblon or discharger.
11. Detonators inserted separately.

2. IDEAL IMPACT GRENADE

1. Must explode no matter what the angle of impact.
2. Must explode on soft ground as readily as on hard ground.
3. Safety.

4. Simplicity of construction and operation.
5. Fit easily in the hand.
6. Light weight (not over 22 oz.)
7. Be adaptable for use in grenade thrower with safety.
8. Should permit rough handling.
9. Weather-sound and flash-proof.
10. Detonators inserted separately.

PROBLEM NO. 7

IMPROVEMENT IN CABLE BRACES FOR AËROPLANES

The present method of attaching the ends of cables to turn buckles and anchorages is by bending the end of a cable around a protecting liner and wrapping the overlapping end with brass wire, which is afterward soldered.

This is an unsatisfactory, wasteful and expensive method. If some very simple method of anchoring cable ends could be devised, it will greatly speed up the production of aircraft.

Safety Laws and the Responsibilities Of Operators

BY CHESLA C. SHERLOCK*

Statutes have been enacted in practically all the states of the Union requiring that mine owners and operators shall take precautions to protect the life and limb of miners, and imposing penalties in case the laws are ignored or violated. Frequently a miner is injured because his employer has been guilty of a violation of mining statutes. The question as to the right of the injured miner to sue his employer for a violation of the mining acts, when such right is not expressly conferred by the statute itself, naturally arises.

Ordinarily, a private individual has no right to bring an action seeking to compel another person to obey the laws of the state or nation. Such action is, properly, within the province of the officers of the commonwealth. But the rule is modified in many instances, particularly with regard to certain mining statutes. In the case of the Sloss-Sheffield Steel and Iron Co. *vs.* Sharpe (161 Ala., 432), the Alabama court held that evidence of a violation of the mining statute of that state is evidence of negligence *per se*, which makes the disobedient mine operator liable in damages to a workman in his mine who is injured, while at work, by an explosion of gas; and the court further held that no other proof of negligence was necessary. The decision means that disregard of the duties imposed by these statutes constitutes actionable negligence; and, if such negligence should be the proximate cause of injuring a person in the protected class, a liability for the injury would follow unless nullified by a defence recognized as good in law.

In the case of the Jellico Mining Co. *vs.* Walls (160 Ky., 730), the Kentucky court held that the operator of a mine who fails to obey the Kentucky statute—which requires that there be supplied and circulated through mines 100 cu.ft. of pure air for each worker, and forbids working places to be advanced further than 60 ft. beyond the air openings—is negligent and answerable in damages to a miner injured, while at work at a point beyond the statutory distance limit, by noxious gases there prevalent and too subtle to be noticeable.

In Illinois, in a number of cases, it has been held repeatedly that disobedience of the state statute on the part of a mine owner or an operator is negligence *per se*, and upon the mere showing of such violation the employee may recover for the injuries sustained by reason of such violation. It will be noted that it is not necessary for the Legislature especially to confer the right upon the injured party to bring legal action under the statutes.

In the case of Ryan *vs.* Manhattan Big Four Mining Co. (145 Pac., 907), the Nevada court held that the inadvertent failure of a mine owner, through ignorance of the existence of a statute—which in the case under review, makes it unlawful, upon a pain of fine or imprisonment, to sink or work through any vertical mining shaft of a depth greater than a stated number of feet unless it is provided with an iron-bonneted safety hoisting cage for raising and lowering the employees—no more excuses him from liability for injury to an employee, consequent upon his neglect to obey the statute, than would wilful disobedience and conscious violation of it.

In Richardson *vs.* El Paso Consolidated Gold Mining Co. (51 Colo., 440), the Colorado court held that the failure of a mine owner to obey a statute commanding all abandoned mine shafts, pits, or other excavations, dangerous either to man or beast, to be securely covered or fenced, rendered him liable in damages for the death of a child who fell into a shaft which was insecurely covered, while lawfully at play. This statute was at one time attacked upon constitutional grounds, but the court held that it had been enacted under the police power of the state for the protection of its citizens, and that it was therefore not subject to attack upon that point.

In the Nevada case mentioned, the court defined the procedure to be observed in determining just what circumstances made it possible for a workman or miner to recover in cases of this nature. It held that to entitle a workman in a mine to recover from his employer for an injury sustained—upon the ground that the latter had negligently disobeyed a statute enacted for the former's benefit—the plaintiff must indeed not only prove that the statute was violated by the employer, but also that such violation of the statute was the proximate cause of the injury. If, however, the culminating catastrophe could not and would not have occurred except for the violation of the statute, that violation should be deemed the proximate cause of the injury, notwithstanding there may have been one or more intervening agencies that were operative to produce the result.

In the same case, the court also held that a miner, merely by entering upon and continuing in the employment of a mine owner who has neglected to obey a statute providing for certain kinds of hoisting cages, does not assume the risk of injury in ascending or descending the shaft without such cage. The only risks which he assumes are those which are unavoidably incident to the employment, and not such as are due to the master's own negligence and violation of an express statute. The abolishment of the doctrine of assumption of risk in all states except Alabama would not affect the right of the workman to bring an action for damages, but would only heighten the mine owner's degree of liability, inasmuch as it would deprive him of even this defensive material.

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*Box 604, Des Moines, Iowa.

Correspondence and Discussion

Labor's Best Friend

The quotations from *Wage Earner* which were printed in the Oct. 19 issue of the *Journal* ought to be read by every man and woman who earns a salary, or works by the day, whether they be union or non-union. The suggestions are valuable for every worker. I do not mean by this that every laborer lacks knowledge as to who is his best friend, but, rather, that many do not know, and others, in the flush of union prosperity, are likely to forget. Each paragraph of that quotation contains food for thought and brings to the front the question: "To whom should I be most loyal when the interests of both are at stake—who should stand first, my union or my employer?" There are times when the question is not easy to answer, but give it thought. Do not jump hastily to one conclusion or the other; use your best judgment in reaching a conclusion, and then stick to that judgment. Get away from the idea that your society or union can make jobs. Drop the notion that you are more a part of your union than you are a part of the mine plant. Use the union for those purposes it is intended to serve, and cultivate the idea that you are a part of the big works, the smooth running of which depends as much on your coöperation as does the smooth running of the hoist on the little pinion wheel. Remember, however, that if one kicks up a rumpus he must look for the same treatment that a pinion wheel gets when it loses two or three teeth. In considering oneself a part of a big machine, it is advisable to remember that parts are replaceable.

With the idea in your mind that you are doing important work in a big industry, and that there is no job that is not essential in the plant, you just naturally take an interest in your work—you can't help but boost it along. The day that the crew makes a record in shaft sinking, you are happy, whether you are in that crew or not, for the record was made in "your mine." When you can think of the plant and the management as a sort of a mother to you, and play the game fair, then when the question comes, "Who is my best friend?" you will have no trouble in answering.

Don't let the money question stand at the front all the time; there are others of equal importance. Wholesome working conditions underground, and a wholesome place in which to live on the surface—good food, good schools, and decent recreation for yourself and family—high wages will not buy; they come from your best friend when you play the game square with him. It is not hard to get a raise when the conditions are ripe, and it's wonderfully tempting when you know that, as in milking the old cow with her head tied down to the rack, if you squeeze just a little bit harder you will sure get a little bit more. But cows have been known to kick if handled too roughly, even though they had their heads tied down, and that was what happened in one Western mining camp recently.

Owing to the advance in price of many necessities, trammers were raised from \$2.75 to \$3, and a little later to \$3.25. This came without any effort—simply as a matter of justice; but it came so easy that one best friend said: "You must ask for another quarter." They got it. With war taking the best men away, production lagged, high wages would not keep it up, and when still another quarter was asked for, the other best friend said "Nothing doing. I have given you more and more, and for each advance I have received less. I have to quit." Things looked a little gloomy for a while, both for the trammers and for the mine. After a time another conference was held, and the trammers thought they might do a little more if they could get a little more pay. Their best friend was agreeable to the suggestion, but stipulated that it would be by contract, and that every man would be paid according to the dirt that he moved. This meant a conflict. The union did not approve of contracts. The manager asked for a fair day's work. A decision had to be made. It was finally decided to go to work on contract, with the result that tramming costs were reduced 30% and the trammers are earning an average of \$5.50 per day, instead of \$3.50 per shift.

Only one difficulty has arisen, that of keeping the machine men on their jobs, paying \$4.25 per shift. All the machine men want to work as trammers. F. F. S.

New York, Oct. 26, 1918.

The Riddell-Davison Grate

I noticed in the *Journal* of Oct. 12 an interesting description of the Trail finger-grate for D. & L. machines, in the course of which reference was made to the Riddell grate.

Mr. C. M. Warner, Australasian superintendent of the Dwight & Lloyd Co., has just called on me in Washington, having arrived last week from two years' metallurgical work in the Australian field, and he brings such an interesting report of the performance of the Riddell-Davison grate at Port Pirie that I understand it is his intention to write up for you an article showing the design of grate and cleaner that is giving such notable results as a labor saver on that side of the water.

The R-D grate bar is really a far different proposition than Mr. Rice has in mind, judging from his reference to it in the article on the Bunker Hill & Sullivan smeltery. Having his attention focused on the grate bar itself, Mr. Rice did not know, or he overlooked, the real function of the R-D system, i.e., the action of the stationary auxiliary scraping tool which effectively removes all sinter from the slots and keeps them free and open without the periodic cleaning of a pneumatic chisel.

Coming at a time when we are bringing the R-D bar to the attention of D. & L. plants the world over—it has been circularized by the D. & L. company, although the latter has absolutely no interest in its licensing other than the increased efficiency it brings to the machine—Mr. Rice's incomplete reference has been a bit of a surprise. I know, however, that it was quite unintentional, arising purely from lack of full acquaintance with the real R-D system.

Briefly, the facts as to the R-D system are these: A continuous elevated slot is provided over the entire length of the machine, through which a plow, disk, or rake device can drag or cut, effecting a thorough cleanup of the slot at each pass. The R-D grate bar alone, on many charges, so facilitates the discharge of sinter by its peculiar shape that there have been long periods when no auxiliary cleaning was resorted to at Port Pirie. This, however, is another story, the real point of the new R-D bar being that it provides opportunity for the continuous entrance of a positive stationary cleaning tool. It is this feature only that makes the R-D system unique—the depression of webs and (or) elevation of slot—no matter how accomplished so long as the resulting structure of the old or new bar permits the continuous entrance of a cleaning tool *below the top surface* of grate.

The R-D system has some outstanding advantages which mean much to the industry in these times of labor shortage and need for increased efficiency of men and tools. This style of grate, with its auxiliary cleaner, eliminates all labor in cleaning and increases appreciably the general efficiency of the D. & L. operation. There is an actual increase of some 25 to 30% in air space over standard grates of same slot width, and this suction area is kept 100% effective by the unfailing duty of the cleaning tool. The tendency to breakage of the pallets and grates arising from the sudden drop at the discharge end of the D. & L. machine can be appreciably lessened by this new system, which does not require a heavy jolt or drop of pallet for the discharge of sinter.

A recent improved design of this new bar has been standardized in malleable casting, at St. Louis, and will soon be ready for distribution by the Missouri Malleable Iron Co. Arrangements are being made also for supplying in ordinary cast iron at another central foundry.

Washington, D. C., Oct. 29, 1918. G. C. RIDDELL.

Valuation of Ore Reserves

The accompanying letter was received some time ago from a young engineer who has assisted me in sampling on several occasions. It was answered and forgotten until recently, when I ran across practically the same thing in a report that I was examining. The questions asked and the answers given are almost too simple to be of general interest, and yet there may be some among the younger engineers who should be cautioned respecting inaccurate or careless statements, statements that may be regarded by the less charitable as willful misrepresentations. The letter is as follows:

> I have recently made an examination of an old property in the San Juan district of Colorado. The sampling was very carefully done, and I thought that my calculations and estimates of value had been computed with equal care, but my report has been severely criticised as misleading or useless. I appeal to you as to how far wrong I have gone.
>
> A typical block of ground sampled at 10-ft. intervals gave the following result: 39-in. wide, 0.04 oz. gold, 7.2 oz. silver, 1.66% lead, 2.01% copper, 1.35% zinc.
>
> In determining the value of this ore I used the following figures: gold $20 per oz., silver $1 per oz., lead 8c. per lb., copper 26c. per lb., and zinc 9c. per lb., i.e., the approximate market price of the refined metals at the time of making the report. This gave the ore a gross value of $23.48 per ton.
>
> I know, of course, that the ore cannot be sold for this price, although fair rates could be obtained from the smelters, after concentration. In order to give my employers some idea of the present value of the ore, I made a calculation, calling the result "market value." This was based upon 100% of the gold value, 90% of the silver, 75% of the lead, 60% of the copper and 50% of the zinc—what I estimated could be recovered from the ore. The market value then became $16.74 per ton, the market value of the block being approximately $175,000.
>
> Though realizing that various charges will be made against the ore in course of treatment and that all of the metals, gold excepted, may sell within a year at half the price I have used, I was not prepared for the letter from my employers telling me that the engineer for parties whom they were trying to interest in the property had said, "Such ore has very little, if any, commercial value, and if by "market value" the writer means commercial value, he had grossly exaggerated the value of the ore and of the property." If I am wrong, can you tell me wherein I blundered?

To the foregoing I answered substantially as follows:

"I would be inclined to agree with your critic in that the value of the ore has been grossly exaggerated; indeed, it is quite a serious question as to whether such an ore can be worked at any profit under normal conditions.

"The sampling of a mine has for its primary object the discovery of what the ore contains. When this has been determined, a second point arises of equal importance. What profit may be derived from working the ore?

"There is certainly no misrepresentation in the statement that the combined value of gold, silver, lead, copper, and zinc is $23.48 per ton, but, on the other hand such a statement is entirely valueless further than to indicate that valuable metals are present to an extent that probably warrants an attempt to determine whether the ore has a commercial value. One might logically include sulphur because of its value in the manufacture of sulphuric acid, and iron because of its value as a flux; but, carrying this line of reasoning a little further to include lime and alumina, it can be seen that one approaches absurdity and that the figure $23.48 per ton has little to do with the value of the ore. Offhand, and without knowing the composition of the ore, I doubt if it could be sold as mined to any smelter at a price sufficient to pay freight and smelter charges. I am very sure that it would not fetch $16.74 per ton. The total values cannot be reduced by any arbitrary factors to obtain a result that will approximate that at which the ultimate products may be marketed.

"To ascertain the value of this ore one should, after sampling, determine the method of concentration best suited to it, and, by laboratory tests, learn the losses incurred and the composition of products. Jigs and tables with this ore would probably give complex concentrates for which the smelters would pay but a small price, and one would find himself obliged to separate the various valuable constituents by selective flotation or other method. Then and not until then is any 'market value' ascertainable. Not until one has secured his final results can he give his client any suggestion as to the value of the deposit. When this stage of the investigation has been reached—when the engineer knows approximately the composition of each product, what was lost in making the product, and approximately what each step will cost, when he has learned through the smelter schedules the value of each product—he can give his client the information that was sought, the profit that can be made out of the ore reserves."

New York, Oct. 25, 1918. ENGINEER.

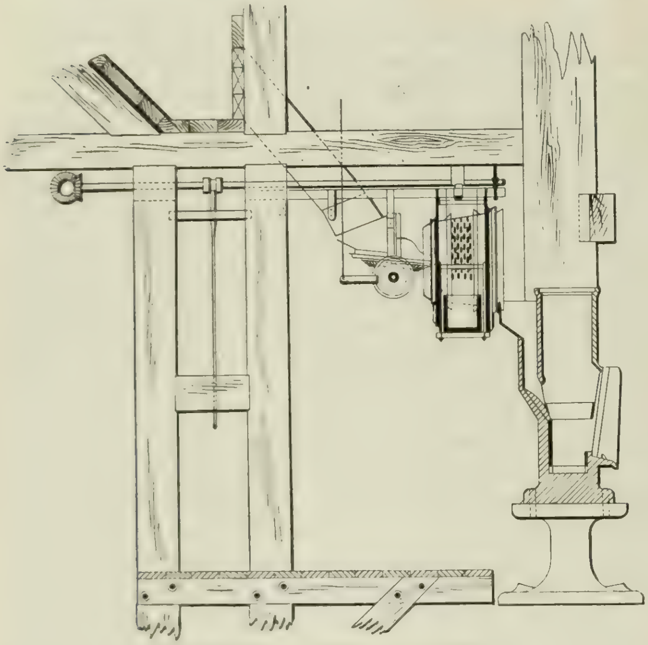
Details of Milling and Smelting

Bypassing Fine Ore From Stamp-Mill Feed Chute*

By E. H. Johnson

For some years the device shown in the accompanying illustration has been used on the Rand for the purpose of deflecting that portion of the ore which was finer than the screen on the mortar box, and sending it direct to the tube mills.

The device consists of a bell-mouthed trommel 1 ft. 9 in. long and 2 ft. 2 in. in diameter at the narrow end, and 2 ft. 6½ in. at the wide end, and operates as a revolving perforated chute between the Challenge feeder and the mortar box. The screening on the trommel is a perforated plate with holes ⅜ x 1¼ in., and the material passing the screen falls into a launder passing outside the kingpost into the launder leading to the tube-mill cones. The effect on crushing is not only to eliminate from the mortar box the material fine enough for tube milling, but also avoids the cushioning effect on the stamps caused by this material. The trommels are driven through an intermediary shaft from the line shaft and revolve at 16 r.p.m. The maintenance cost is light, the perforated screen (¼-in. plate) lasting nine months, and the only other parts requiring renewal are the small supporting rollers. The rate of feed is, of course, governed entirely by the Challenge feeder.



STAMP-MILL FEED TROMMEL

This device is now superseding the fixed gizzly which was often built in the bottom of the feed chute but which failed except where a very dry ore was being milled.

Simplifying a Zinc-Box Clean-Up*

The following method of cleaning up zinc boxes in cyanide plants has proved to be economical and successful: A light trommel, either circular or hexagonal in section, and about 18 in. in diameter by 3 ft. to 3 ft. 6 in. long, is constructed, and covered with battery screening of 600 holes per square inch. This is mounted on a tank, or water-tight box, so that, when the latter is filled with water, part of the trommel body is immersed. The water should contain a little sulphuric acid—sufficient to show action on zinc. Charge the trommel about one-third to half full with zinc from the extractor box, and revolve it by hand several times to allow the gold slime and very fine zinc to pass through the screening into the tank. Lift the trommel with its zinc contents and transfer to a similar tank filled with water. Give it a few revolutions to remove traces of acid from the zinc, which is then returned to extractor box. The advantages of the method are that clean zinc is always returned to the extractor boxes, less zinc is destroyed during the clean-up, and eventually a higher grade of gold slime will be obtained.

Notes on Amalgamation Practice†

By H. Ward

The mercury question opens up an important discussion, especially to those who realize the importance of recovering as much gold as possible at the mill. I would appeal to millmen to always keep in view the importance of their percentage of the total "recovery," especially during this critical period.

Mercury loss with a higher percentage of extraction by amalgamation should not exceed 0.10 oz. per ton milled with a plate area of from 1.25 to 1.5 sq.ft. per ton crushed. My experience is that a large plate area is necessary when from 68 to 72% of the total gold recovered can be recovered by amalgamation.

Some plants seem to be arranged to pass as much gold as possible to the cyanide works. This, in my opinion, is bad practice. All pulp leaving stamp and tube mills should pass over an amalgamated surface of sufficient area, the higher recovery being of considerable help and guidance to the management as to daily grade of ore to mill.

Loss of mercury through steaming plates should be a thing of the past, as this is absolutely unnecessary. Proper dressing and daily scrapes will prevent any accumulation, except what can be recovered by hard scraping and scouring at the end of the month. I can call to mind plates which had not been steamed for

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*Excerpt from the *Journal* of the Chem., Met. and Min. Soc. of South Africa.

*Abstracted from 1918 Report of the Rhodesia Munitions and Resources Committee.

†Abstracted from the *Journal* of the Chem., Met. and Min. Soc of South Africa.

three years. After that period only 7 oz. of gold was available per plate of 9 ft. 6 in. by 5 ft. This is not in accordance with the theory advanced as to the locking up of gold on plates. These plates had recovered 70% of the total gold obtained during this period.

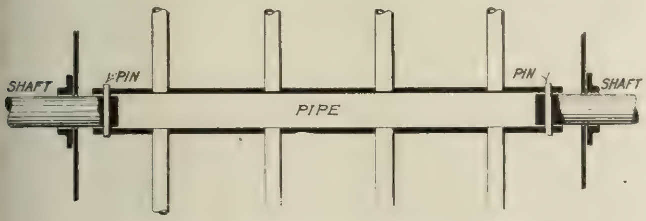
Assuming that mercury will become more difficult to obtain, I am of opinion that corduroy is the best substitute.

Replacing Oliver-Filter Shafts

By Algernon Del Mar*

In the *Journal* of Aug. 3, F. Dean Bradley, in an article entitled "Filter Adjustments at Packard Mill, at Rochester, Nev.," mentions the difficulty of replacing the worn paddle shafts in the packing glands of an Oliver filter, and says that the drum must be taken out to withdraw the shaft.

Will Anthony, the mill foreman at the Techatticup mine, Nevada, evolved a suitable method which is of more than passing merit. Two short pieces of shaft are used to protrude through the stuffing boxes, and on these ends is pinned a piece of iron piping that will make a close fit. The paddle blades are all bolted to the pipe. If a shaft wears and needs renewal, all that is necessary is to take out the two pins that hold the pipe to the shaft, and pull out the short pieces of shaft. New ones are put in, pinned to the pipe, and all is ready. Those installing such a filter would do well to make this change at the outset, for with gritty ores the packing glands certainly give much trouble.



SECTIONAL VIEW OF FILTER SHAFT

The Economy of Cork Inserts†

Cork inserts are as much an economy factor as other devices that stop belt slip, for their principal function is to stop all avoidable slip, and, by so doing, save considerable coal and money. If 2000 tons of coal, costing \$3 per ton, are burned during a year, and the over-all belt slip amounts to 8%, the cost of the belt slip in terms of the coal pile alone is \$480.

To compute the cost of belt slip, it is first necessary to find the percentage of slip. That is, if a driven pulley rotates only 95 times while it should rotate 100 times, the proportion of belt slip is 5%, or

$$\frac{100 - 95}{100} = 5\%$$

Multiplying the determined ratio of slip by the number of tons of coal burned per year, and then by the cost of the coal per ton, gives the yearly cost of belt slip, for example, 2000 × \$3 × 0.08 = \$80.

However, to arrive at the actual and accurate cost is not easy. It is plain that more than \$480 is lost in such a plant as I have mentioned, because coal is not the only thing lost. Belts wear out more rapidly where they are permitted to slip than where this is prevented, and the cost of slip on this account can be approximated. Assume, for example, that with cork inserts a plant manages to keep its belts going for 10 years. The first cost of the belts is, say, \$5000. The average cost, then, is \$500 per year. Without cork inserts the belts year out in eight years, and the average cost is \$625 per year. This would mean a saving of \$125 per year, or \$1250 in 10 years. As these figures will not apply to every plant, this formula may be used and the reader can substitute his own conditions:

Dollars saved with cork inserts, from a belt cost standpoint only, equal

$$\frac{(Nc - N)\,K}{N}$$

where

Nc = Life of belt in years with cork inserts;
N = Life of belt in years without cork inserts;
K = First cost of belt in dollars.

The cost of lost product must also be considered. The value of cork inserts appears again here, and the problem can be approximated mathematically, as, for example, in the plant to which reference was made, where over-all belt slip is 8% and where the output should be worth, without slip, \$2000 per day. With 8% slip it is evident that the machines are running 8% too slowly, and the product is, therefore, diminished by 8%, and the daily output is approximately \$2000 — (\$2000 × 8%) = \$1840.

To make the formula clearer, and to enforce this cost on the mind of the plant owner, I have thrown it into this form: Dollars output lost per day =

$$\frac{1 - S}{D} - D$$

where

D = Present daily output in dollars;
S = Per cent. of belt slip.

Thus, if the present daily output amounts to \$1500, and if the over-all belt slip is 10%, there results after substituting in the formula

$$\frac{1500}{1 - .10} - \$1500 = \$1667 - \$1500 = \$167.$$

A loss of \$167 per day is considerable, and may mean the ruin of a small plant, unless discovered and rectified. This "product loss" is often saved by speeding up the driving engines or motors to the extent that after belt slip is deducted the final speed is what it should be. That method is better than none at all, but it is only a makeshift. The best practice is to eliminate all belt slip.

Inefficient methods of production result in increased costs. Where belt slip is permitted, the product frequently suffers on that account. The loss cannot be figured mathematically, because it is too uncertain. It may vary from a trifling to a serious amount. To reduce this loss to the minimum, belt slip must be completely eliminated. By so doing, all machines are driven at uniform speeds. There is no bunching here and thinning there. Production is uniform, day in and day out, which is the ideal condition, further emphasizing the value of cork inserts.

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Events and Economics of the War

In desperate plight through internal disorder and military reverses, Austria-Hungary agreed to the armistice terms submitted by the Italian leader, General Diaz, and dropped out of the war on Nov. 3. Trent and Trieste were occupied by Italy. In the rout of the Austrian forces, 300,000 prisoners were taken and 2200 guns. Socialists are said to rule in Vienna. A Magyar republic was proclaimed in Hungary by Count Karolyi.

Previous to the Austrian collapse, Turkey had signed an armistice effective Oct. 31, giving the Allies absolute military domination over her affairs; questions as to territory were not considered in the terms granted. The Serbs have reoccupied Belgrade, their capital, and have recovered all their former territory. In Bulgaria, King Boris abdicated after reigning for 30 days; a peasant government has been set up at Tirnova.

The German front between the Meuse and the Aisne was pierced on Nov. 1 by Pershing's men, who advanced 10 miles in the first two days and threaten to cut the enemy's main supply line. The progress of the Allies in Belgium continued. Representatives of the Entente nations convened in Versailles during the week.

In the United States the report of Charles E. Hughes on his investigation of the aircraft situation was made public on Oct. 31. The President transmitted the Allies' message to Germany, and notified the latter to apply to Marshal Foch if an armistice were desired.

Certifying Advisors Named

Van. H. Manning, Director of the U. S. Bureau of Mines, the certifying advisor for the metal-mining and metallurgical industries (excluding iron and steel), announces the organization of district certifying advisors in the metal-mining sections of the country, to have charge of the furloughing to the industries of indispensable men who have enlisted in the U. S. Army.

Mr. Manning urges that the officials of the companies confer with their district certifying advisor to see that their industries, so essential in obtaining war material, are protected. Mining companies, he says, should consider it their patriotic duty to attend actively to this at once.

The district certifying advisors appointed are as follows: For the State of Washington, Conrad Wolfle, 217 Symons Bldg., Spokane; for Oregon, Harold N. Lawrie, Oregon Bldg., Portland; for California, Edwin Higgins, care of California Metal Producers' Association, San Francisco; for Idaho, Frederick Burbidge, Wallace; for Montana, John Gillie, Butte; for Utah, Walter Fitch, 304 Boston Bldg., Salt Lake City; for Nevada, Walter S. Palmer, University of Nevada, Reno; for Arizona, Dr. L. D. Ricketts, Warren, Ariz.; for New Mexico and western Texas, John M. Sully, Santa Rita, N. M.; for South Dakota, W. J. Sharwood, Lead; for the Missouri, Kansas-Oklahoma zinc district, Percy B. Butler, Joplin, Mo.; for the southeast Missouri lead and Kentucky fluorspar district, H. A. Buehler, Rollo, Mo.; for Alabama, Clarence E. Abbott, 1405 Minnesota Ave., Bessemer; for Tennessee, Wilber Nelson, Nashville; for Georgia, S. W. McCallie, Atlanta; for Virginia, Thomas S. Watson, Charlottesville, Va.; for the Wisconsin lead and zinc district, W. O. Hotchkiss, Madison, Wis.; for the Michigan, Wisconsin and Minnesota iron ranges, George H. Crosby, Duluth, Minn.; for the Michigan copper range, Frederick I. Cairns, Houghton, Mich.; for northern New York and New England, Lewis W. Francis, Witherbee, Sherman & Co., New York. For southern New York, New Jersey and Pennsylvania, the name of the advisor will be announced later; in the interim, inquiries from that district should be addressed to the U. S. Bureau of Mines.

All matters pertaining to furloughs for the return to industry of men enlisted in the Army should be addressed to the district certifying advisor in which the particular plant is situated. Application forms and information concerning the operation of this particular organization can be obtained through the various district advisors.

Fuel Supply Adequate

The country's fuel supply for the coming winter is adequate and well distributed, according to a statement issued on Oct. 26 by the U. S. Fuel Administrator. Continued coöperation by the public and all agencies, however, is required. Stocks on hand are larger than ever before—also the needs. For the country at large, the average coal supply is enough for eight weeks. The Administration is ahead of its program regarding deliveries of anthracite, as shown in the following table:

ANTHRACITE ALLOTMENT AND DELIVERIES

States	Allotment for Year Beginning Apr. 1. 1918, in Tons	Delivered Oct. 1
New England	10,331,000	5,537,779
Middle Atlantic	31,314,754	15,246,331
Virginia	102,400	73.640
Western	3,481,945	1,835,398
Northwestern	2,374.000	1,701,561
Canada	3,602,000	1,963.700
Export (chiefly Newfoundland and Cuba)	51,930	29.742
Totals	51,258,029	26.388,151

By the zoning system, coal has been supplied throughout the United States from the nearest available mines, and cross-hauls have been eliminated. During the six months beginning Apr. 1, 1918, 38,000,000 tons more of bituminous coal was produced than ever before, with fewer workers. Operation of less essential industries without curtailment of fuel supply would have seriously reduced available stocks. The oil and natural-gas situation will probably be somewhat acute because of the increasing demand for oil and decreasing production of gas. The present coke supply is slightly less than the maximum demand of blast furnaces and war industries.

Reconstruction Conference Called

Plans for assembling at Atlantic City, N. J., on Dec. 4, 5, and 6, the members of the more than 300 industrial war-service committees, for a war emergency and reconstruction conference, have been announced by the Chamber of Commerce of the United States. The main purpose of the conference will be the determination of practical methods whereby industry may coöperate still more closely with the Government through a more centralized plan of organization. This probably can be best accomplished by the creation of a federation of all the war-service committees, it is said. Questions of reconstruction will also be taken up.

It is evident that, however far away or near the end of the war may be, it is necessary to begin to outline a general program of organizing business for the period of reconstruction. Single industries, acting individually, can scarcely hope to prepare on the scale that will be necessary. Speakers who will appear at the conference include Secretary of Commerce Redfield, A. C. Bedford, James A. Farrell, and Paul Warburg.

French Industry and the War

The invasion by the German army of the coal-mining basin of the Departments of Nord and Pas-de-Calais has compelled more intensive production of coal in the center of France, writes Pierce C. Williams, Commercial Attaché at Paris. Likewise the occupation of the rich iron-mining and steel-melting region of Meurthe-et-Moselle has caused a great increase in the manufacture of steel around Lyon and St. Etienne. As a direct result, the industrial center of gravity of France is no longer in the northern and eastern sections but in the central and southern.

This fact lends importance to the news that U. S. Army engineers are in agreement with French experts in holding that, by the expenditure of a reasonable amount of money, Nantes-St. Nazaire, on the Atlantic seaboard, can be made the leading port of entry of France and a rival of Bremen and Hamburg for the trade of Switzerland and central Europe. St. Nazaire is at the mouth of the Loire, and Nantes is 32 miles up the river.

In the addition to the advantages of excellent port facilities, a double-track road reaching the center of France, and ample ground for factory sites, the Loire basin is near to the Segre iron-ore deposits, which are now being exploited, and which form the basis for a future prosperous iron and steel industry, as well as insure export cargo. At Chateaubriant, near Nantes, are other deposits as yet untouched. The chief export from Nantes-St. Nazaire before the war was Segre iron ore, which went to Holland for delivery to German blast furnaces. The quantity exported, however, was never large, and exports have fallen to almost nothing since the war began.

For many years after peace comes, and perhaps permanently, the central departments of France will constitute the workshop of the country, according to Mr. Williams. In consequence, an enormous quantity of imported raw materials, such as pig iron, lumber, and steel products, must flow to this section of the country from the Atlantic seaboard.

Women in Chemical Work

The British Ministry of Munitions has issued a circular containing a list of processes in which women are successfully employed in connection with various industries, according to a bulletin of the Chemical Alliance. It is stated that the possibility of using female labor on some of the operations scheduled depends on local circumstances, such as plant layout, locality, and type of labor available. Among the industries listed are chemicals, explosives, gas, and mineral-oil refining.

The operations performed by women have been classified as follows: A, simple laboring operations; B, operations requiring care, intelligence and resourcefulness; C, skilled operations; and D, dangerous operations, or those requiring resistance to unpleasant conditions, such as heat, dust, and fumes. Among the sections of the chemical industry in which women are employed are the following:

Fertilizers—Grinding slag in cake mill, BD; grinding phosphate in Kent mill, BD; mixing guano, AD; general laboring, A.

Laboratory—Research chemists, C; routine testing, C; laboratory attendants, B; controlling chemical laboratory, C; acting as chemist in charge, C.

Oleum—Unloading pyrite, attending breaker, AB; hauling broken pyrite, weighing charges of pyrite or sulphur, AB; charging and attending sulphur burners, B; sampling and testing, C; grinding and calcining magnesium sulphate, AD; impregnating granulated anhydrous magnesium sulphate with platinum chloride, B; filling, sealing, and packing carboys, AD; general laboring, A.

Sulphur—Melting crude sulphur, A; breaking out sulphur from sulphur beds, A; emptying sublimers, dressing flowers of sulphur, A; preparing molds for roll sulphur, B; removing from molds after casting, A; general laboring, A.

Sulphuric Acid—Feeding and attending pyrite breaker, A; screening pyrite, A; weighing out charges, B; charging furnace (or burners), B; controlling valves on de-arsenicating plant, C; filling, sealing and packing carboys, AD; sampling and testing, C; coking Kessler concentrators, BD; helping on cascade concentrators, BD; operating Gaillard tower concentrators, BD; feeding Kessler producers, including hoisting and wheeling material, B; pumping vitriol over Gay Lussac and Glover towers, B; working iron oxide briquette plant, B; general laboring, A.

Tungsten—Crushing, screening, and packing, A.

Zinc Distillation—Making fireclay molds and condensers, B.

Gold Notes for China

To facilitate foreign trade, China has authorized certain banks, to be named by the Peking government, to issue gold notes. Until gold coin is ready, the notes will be used only for domestic circulation and for drawing bills of exchange, and will not be convertible until then. Gold equivalent to the amount of the notes issued will be reserved, and the standing amount will be announced every 10 days.

The organization of the Currency Bureau consists of nine articles. It belongs to the direct control of the Premier and supervises the currency system covering the whole country. It will have one controller, one president, and one adviser. The office of controller will be assumed by the Minister of Finance, and the adviser will be hired from abroad. The Currency Bureau will be organized on a 10-year basis, and the chiefs of the Chinese government mint printing office, and the supervisors of banks will be placed in control.

Fuel Administrator Garfield has authorized an average wage increase of $1 per day for anthracite miners, effective Nov. 1. The new scale insures a rate of 42c. per hour and up, for surface laborers, to $6.63 per day for contract miners.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Potash and the War-Minerals Act

Rather than place all war minerals under the control granted by the War-Minerals Act, it is believed that authority to use the powers of the act will be given only in cases where the War Industries Board advises that there is a shortage. At present there are acute shortages in potash, arsenic, zirconium, and vanadium. Investigation of these shortages, and efforts to stimulate domestic production, probably will be undertaken under the powers conveyed in the act. As the Department of Agriculture is interested in the potash and arsenic situations, it will be a party to such efforts to increase production as are found to be necessary. The Geological Survey also will be represented, and the work, it is expected, will be under the direction of the Bureau of Mines.

Question has been raised as to whether the language of the War-Minerals Act does not preclude any regulation of war minerals of which there is no shortage. If this interpretation should be sustained, it would prevent any action with regard to such minerals as chromite, manganese and pyrites, of which there is now overproduction. The question has been referred to legal authorities for determination.

With unmistakable signs of an insistent demand for potash from Maine to Florida, the Department of Agriculture is insisting that more potash must be made available for fertilizing purposes. Prior to the war, German propaganda had brought about an excessive use of potash, in the opinion of W. W. Mein, Assistant Secretary of Agriculture. Since the war, the high price of potash has caused the fertilizer companies to discourage its use, and most of the fertilizer recently marketed has contained no potash. Mr. Mein advises that sufficient potash be used to reach the mean between these extremes. One of the striking facts brought out by Mr. Mein's investigation is that there is 40,000 tons of potash in Southern and Western warehouses, and that additional stocks are being put into them at the rate of 500 tons a day. It is held that this supply should be absorbed, but it is realized that when the farmers make a general demand for potash this small surplus will be absorbed quickly.

Domestic sources of potash, which will be considered in the campaign for stimulating production, are as follows: As a byproduct from blast furnaces; as a byproduct of cement plants; as a primary product from insoluble minerals, such as greensand and alunite, and as a primary product in natural salts and brine.

Prof. C. B. Lipman, of the University of California, is now in Washington conferring with officials on the potash situation. He is particularly hopeful of a considerable production of potash from Searles Lake. He points out, however, that the uncertainties of the international situation are discouraging to an industry which requires the large capital expenditures needed in the development of potash.

Arbitrators Favor Eight-Hour Day

Commenting on the decision of Henry Ford, in his capacity of umpire, in the labor dispute between the Wheeling Mold and Foundry Co. and the Internationa Association of Machinists, Frank P. Walsh, of the War Labor Board, said:

> Mr. Ford found for the straight eight-hour day. More and more we are coming to this. The actual and not the basic eight hour day is essential. The decision of Mr. Ford will give impetus to this tendency.
>
> Every arbitrator who has been called by the National War Labor Board has decided in favor of the eight-hour day. These arbitrators are drawn by lot from a panel selected by the President. They include some of the largest employers in the country The first was Otto M. Eidlitz, the builder. Judge Clark, of the Supreme court of North Carolina, who reached the same conclusion, considered the matter from the standpoint of the business of war productions, of the welfare of the workers, and of the general prosperity.
>
> In addition, the board has put the basic eight-hour day into effect in many industries. Therefore it is my hope that this question is being finally settled and that the practice may become uniform.

Gold Substituting Platinum

The report of Secretary Lane's gold committee has been completed and is now being reviewed by Hennen Jennings, the chairman. It is to be made public a the earliest possible moment.

Plans for regulating the use of gold in the arts are being discussed by the War Industries Board. The restrictions which have been placed upon the use o platinum have caused numerous users to turn to gold This has resulted in a rapidly increasing commercia use of gold, which has reached a point that, many believe, calls for prompt regulatory action.

About 3500 licenses have been issued to users of platinum. Applications are being received at the rate of 300 per day, most of them coming from jewelers Few applications have been received from chemica laboratories. As it is known that practically every chemical laboratory in the country comes under the platinum regulation, it is believed that the necessity of applying for licenses has not been impressed upon those in charge.

Gold Committee Appointed

A committee to study the gold situation has been appointed by the Secretary of the Treasury. It consists of Albert Strauss, Vice-Governor of the Federal Reserve Board; R. T. Baker, Director of the Mint; Emmet D. Boyle, Governor of Nevada; Edwin F. Gay, of the War Trade Board, and Pope Yeatman, of the War Industries Board. As Mr. Baker is in Nevada and does not expect to return to Washington until Nov. 15, no meeting of the committee is expected prior to that date

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Experiments with the Jones process for the beneficiation of manganiferous iron ores are in progress a the Lake Superior station of the Bureau of Mines.

The Long Reach of the Comfort Fund

It would be a sorry policy to leave our men in the ditch after they have taken the last one from the Germans. Even though peace be declared tomorrow, it may be a year or more before the troops are returned from abroad, and in this period smokes and other comforts will be as greatly appreciated by the mining regiment as they have been in the past. The time to remember the 27th Engineers is now, and the way to do it is through the Comfort Fund.

The Comfort Fund has a longer reach than the individuals for whom it acts, and it has been able to furnish the miners abroad with those comforts for the purpose of supplying which it was established. Whether this shall continue, it is up to the regiment's friends to decide, and the only way to decide it in the regiment's favor is by sending in a contribution today.

A letter recently appeared in the *Tribune* in which the writer, a resident of Cambridge, England, urged that Americans establish a fund to be spent abroad for the benefit of American soldiers. The letter reads in part:

> We know the Americans are properly supplied with the necessaries of life, but they are too far from their families to receive the little packages of comforts that help soldiers to feel that they are not entirely cut off from home circles and that serve to lessen the loneliness of the camp and the trench. Transatlantic mails are now very slow, and we understand that packages have in any case been practically prohibited.
>
> The men are not likely to complain, but there is risk that when they see home packages arriving for their British comrades, and none for them, they may feel a wee bit homesick.

The situation described is at once recognized and remedied by the Comfort Fund. Money can be cabled to agents abroad, even though packages may not be sent or else may be lost in the sending.

HOW THE COMFORT FUND STANDS

Previously Acknowledged	$18,492,77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johann	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hulst	20.00
Lawrence Addicks	20.00
R. R. Boyd	25.00
Total	$18.792.77

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Because of the work involved in administering the Comfort Fund contributions are acknowledged only by publication in the *Journal.*

Molybdenum in Norway

A limited company for the purchase and operation of the "Knaben" mines in Fjotland, Norway, is being formed in Christiania, says *Commerce Reports.* These are molybdenum mines, and they have belonged since 1905 to an English company, the Blackwell Developing Corporation.

The plant comprises "Knaben" mines 1 and 2. Number 1 has been worked intermittently since 1885. Mine No. 2 is, however, the main one. The plant is in working order, and an ore zone of large size has been discovered. The head office of the new company will be in Christiania.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for September, 1918, and the figures for September, 1917, as finally revised, are as follows:

IMPORTS, SEPTEMBER, 1917, and 1918

(In pounds, unless otherwise stated)

Metal and Ore	September, 1917	September, 1918
Antimony ore, contents	1,475,335	
Antimony matte, regulus or metal	5,609.906	6,201,579
Copper:		
Ore, contents	10,308,267	4,253,028
Concentrates, contents	2,971,254	4,936,050
Matte, regulus, etc., contents	3,613.346	1,639,732
Imported from (in part):		
Canada	2,536,556	2,168,703
Mexico	5,056,161	4,892,799
Cuba	4,742,302	2,736,644
Chile	2,969,790	768,970
Peru	494,977	35,744
Colombia	170,881	
Venezuela	922,200	
Unrefined, black, blister, etc	21,409.698	37,570,650
Refined, in bars, plates, etc	620,752	1,472,451
Old, etc., for remanufacture	752,254	103,516
Composition metal, copper chief value	13,997	16,548
Lead:		
Ore, contents	959,428	5,202,110
Bullion, contents	10,458.447	17,905,345
Imported from (in part):		
Canada	160,828	5,475,572
Mexico	11,013,899	17,622,554
Pigs, bars and old	1,559,196	13,163
Pyrites, long tons	80.844	50,651
Imported from:		
Spain, long tons	48,327	4,349
Canada, long tons	32,517	43,623
Zinc:		
Ore, contents	7,888.290	4,030,201
Imported from:		
Canada	964,000	598,800
Mexico	6,924,290	3,431,401
Blocks or pigs, and old	29,055	7,762
Manganese ore, long tons	36,755	72,685
Imported from (in part):		
Cuba, long tons	5,843	12,664
Brazil, long tons	26,472	50,414
British India, long tons	4,100	2,775

EXPORTS OF COPPER, LEAD AND ZINC

(In pounds)

	September, 1917	September, 1918
Copper:		
Ore, contents	380,100	132,242
Concentrates, contents	64,584	42,716
Unrefined, black, blister, etc	2,017,838	
Refined, in ingots, bars, etc	60,601,803	73,302,985
Exported to, (in part):		
France	37,484,619	8,938,231
Italy	9,871,457	15,564,737
Russia	2,989,074	
United Kingdom	7,221,518	45,975,753
Canada	2,306,067	2,668,470
Composition metal, copper chief value	1,179,589	3,548
Old and scrap	4,347	
Pipes and tubes	470,899	327,325
Plates and sheets	2,817,476	1,166,832
Wire, except insulated	665,035	665,332
Lead:		
Pigs, bars, etc., produced from domestic ore	8,692,397	8,097,118
Pigs, bars, etc., produced from foreign ore	1,595,945	9,389,476
Exported to (in part):		
Denmark	1,921,566	
Canada	1,830,482	3,045,633
United Kingdom	324,800	11,061,754
Argentina	46,386	224,000
Japan		2,351,316
France	447,969	
Brazil	246,430	358,400
Zinc:		
Dross	4,313,501	2,366,669
Spelter:		
Produced from domestic ore	13,620,119	10,513,200
Produced from foreign ore	39,249,110	3,794,068
Exported to (in part):		
France	16,467,576	3,287,303
Italy	7,137,059	1,908,298
United Kingdom	24,725,657	5,661,518
Canada	1,109,072	340,167
Mexico	341,595	502
Japan		3,009,924
In sheets, strips, etc	3,877.704	1,893,699

Spassky Copper Mines.—The general manager cabled about Oct. 1 that the new government in Siberia has ordered the company's mines and properties to be handed back, and that the company's representative has again taken over the control and management. Of the copper stocks, amounting to about 1000 tons, one-third has been pledged for an advance by the Siberian government of one million rubles. The new Siberian government has accepted the company's claim for compensation in connection with the temporary nationalization of the property. Work at the properties has already been resumed on a restricted scale.

Chronology of Mining, October, 1918

Oct. 1—Increase of 25c. in the base prices of Lake Superior iron ores effective. Eight-hour basic day effective for U. S. Steel Corporation employees.—Regulations for licensing platinum became effective.

Oct. 2—Henry R. Merton & Co. announced voluntary liquidation, owing to the fact that they were refused a license under the Non-Ferrous Metal Industry Act.

Oct. 5—War-Minerals Bill signed by the President.—Explosion of a Government shell-loading plant at South Amboy, N. J.—Peace overtures renewed by Central Empires.

Oct. 9—Utah Apex Mining Co. filed suit to restrain Utah Consolidated Mining Co. from mining ore on contested ground.—American Metal Co. surrenders holdings in Consolidated Interstate-Callahan Mining Co. and cancels smelting contract with that company.—Important A. I. M. E. meeting at Milwaukee, at which tin conservation was discussed by members, representatives of the government and of many large firms.

Oct. 12—Northern Minnesota devastated by forest fires, resulting in heavy loss of lives and property and retarding iron-ore output.

Oct. 14—British Treasury fixed maximum price of $48\frac{13}{16}$d. per oz. for silver.

Oct. 15—Fuel Administrator Garfield approves of wage increase for anthracite miners.

Oct. 20—Outstanding licenses for importation of tin revoked by War Industries Board.

Oct. 25—Loss of Canadian-Pacific steamer "Princess Sophia," which foundered in the Lynn Canal, west of Juneau, Alaska, with all on board, including many mining men.

Oct. 28—Official announcement of the continuation of 26c. per lb. for copper until January 1.

McIntyre Porcupine Mines, Ltd.

The annual report of the McIntyre Porcupine Mines, Ltd., operating at Schumacher, Ontario, Canada, covers operations for the year ended June 30, 1918. During this period, 178,327 tons of ore was treated, containing gold and silver valued at $10.05 per ton. Bullion valued at $9.61 per ton of ore treated was recovered. Mining costs amounted to $3.2563 per ton, primary crushing and ore transport cost $0.1487, and milling $0.9039.

The company has spent approximately $300,000 in additional plant and equipment during the last two years. Amalgamation is not practised, and, owing to the fouling with base metal in the course of treatment (all-cyanidation) and in spite of a comparatively heavy outlay for refining (over 11c. per fine oz. recovered) the bullion shipped has averaged only about 834 fine, in gold and silver, during the year. Marketing charges are to be reduced by a drastic modification of normal practice—by the adoption of the Miller chlorine process—and a fine gold (999) will be produced. The necessary equipment is now being installed; and the economic results obtained by the production of fine gold, as compared with ordinary high-grade bullion, will be awaited with interest.

Ore reserves as of June 30, 1918, were estimated at 459,276 tons, containing gold and silver of a total value of $9.80 per ton.

Tin Smelting in Northern Nigeria

By R. T. Hancock*

Tin smelting in Northern Nigeria, an art long practiced by natives prior to the British occupation of the country, though only on a small scale, as the jealously guarded secret of a few families, has been revived. The appearance of tin in the form of thin rods, cast in molds formed by placing straws in damp sand, caused the officials of the Royal Niger Co. to penetrate the then unknown North in search of their source. After the British occupation of the country, the furnaces were ordered by the government to be destroyed, but they have recently been rebuilt, and are running with their former crews and under the supervision of the Department of Mines.

Alluvial tin ore was purchased from the smaller mine operators—none of the larger concerns operating being asked to tender—at about £180 a ton, metallic tin in England being then quoted about £320. The ore carries an average of 72% metal, and a yield of about 72% of the theoretical content is obtained in smelting. A ton of ore, therefore, produces about half a ton of metallic tin. The whole of the output is taken by the government engineering workshops for babbitt metal, solder, and similar uses. The net saving to the government is considerable, as the expense of shipping the ore to England and its return as metal is avoided.

No alluvial tin ore from Nigeria reaches the United States, there being a penal export duty on any shipment not consigned to British smelters.

Spain's 1917 Mineral Production

The mineral production of Spain, excluding some of the non-metallic products, is given in the accompanying table, which has been compiled from data which appeared in the Sept. 24th issue of the *Revista Minera:*

1917 MINERAL PRODUCTION OF SPAIN

	Metric Tons	Value in Pesetas
Anthracite	324,756	12,366,866
Antimony ores	502	629,400
Argentiferous lead ores	13,218	32,962
Asbestos	110	11,000
Asphalt	1,817	21,370
Bismuth ores	13,900	7,456
Bituminous coal	5,042,213	240,486,675
Clay	4,245	60,295
Copper ores	83,501	13,967,663
Copper pyrites	1,817,839	47,511,900
Fluorspar	250	7,000
Garnet	2,667	93,345
Gold ores	50	650
Graphite	1,980	5,100
Iron ores	5,551,071	39,625,578
Iron pyrite	376,918	19,491,604
Kaolin	1,220	34,760
Lead ores	240,368	61,528,830
Lignite	637,841	23,450,120
Manganese ores	57,474	2,099,121
Manganiferous iron ores	50	400
Quicksilver	18,705	3,505,322
Salt	309,413	1,840,862
Silver ores	96	78,270
Sulphur	84,979	7,904,605
Tin ores	77	105,800
Tungsten ores	546	1,644,284
Zinc ores	123,485	9,151,438

Henry R. Merton & Co. has issued a circular, dated Oct. 2, stating that in consequence of the refusal by the Board of Trade to grant it a license under the Non-Ferrous Metals Industrial Act, it has decided to go into voluntary liquidation. It is understood that the Central Mining and Investment Corporation has already acquired the controlling interest in one of the Merton subsidiary industrials.

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*With Nigerian Tin Corporation, Jos, Northern Nigeria, Africa.

Crystalline Quartz Wanted

The Naval Consulting Board desires to obtain prompt information regarding available deposits of crystalline quartz for certain urgent naval use. Crystals should plainly show location of crystal faces, should be free from internal flaws, cracks or bubbles, and should weigh from one to six pounds. Coloring matter in crystals is not necessarily detrimental, but water-clear crystals are preferred. Probably fifty tons or more of suitable crystals will be ultimately required. If you know of any promising deposits and have small samples, communicate with Lawrence Addicks, of the Naval Consulting Board, No. 6 Church St., New York.

Tin in Nigeria

At the recent meeting of the Nigerian Tin Corporation, Oliver Wethered, chairman of the company, said:

"The company's tin production is materially increasing. There has been a serious shortage of native labor and supplies of all kinds, but an improvement of these conditions can be looked for. The price obtained for the tin was a remunerative one, in spite of the greatly increased cost of everything, including royalty, freights, and insurance. There has been an almost daily persistent shading of a pound per ton for the last few weeks, due, it is said, to the buying of tin by the Allied governments through one channel. If this control had limited speculation and brought down the figure in a healthy and legitimate way, no producers of tin would complain, but I found a widespread fear that in the laudable pursuit of cheap tin we might find our great national asset of the control of some 70% of the world's tin production placed in jeopardy, and even seriously affected. We are confronted today with a price for our output which has no relationship whatever to supply and demand, but is entirely subject to whatever may be the whims or the intentions of the man or men who are regulating this matter on principles unknown to the public; and whose actions, so far as we know, are not disclosed except by their effects. I think I am right in saying that the first attempt to bring tin under the control of the government was made by the institution of a committee of the Board of Trade, known as the rubber and tin exports committee. I do not know that the names of the members have ever been published; at all events, I cannot find them, and I do not know that they have any formal constitution or any published regulations. Apparently they are acting with such discretionary powers as somebody or other vested in them.

The procedure of that committee apparently did not meet with the entire approval of those who wanted to force down the price of tin regardless of and without consultation with those who produced the tin, or, at all events, those who produced tin in the British Empire. Therefore, the Minister of Munitions, in the exercise of his power under the Defence of the Realm Regulations, declared in December of last year that tin was a metal required for the production of war material, and therefore coming under the Defence of the Realm Regulations. This led to control of speculative dealings in the metal and to drastic change in the regulations. But the regulations have been modified still further, and what tin producers are to get is now to be determined by an Inter-Allied Executive Committee. I am not able to say how far the control of tin by this executive committee affects adversely Nigerian tin, but I can speak with some confidence of the biggest factor in the world's tin production—namely, the Federated Malay States, with which I am largely concerned. I say emphatically that this committee has practically created a monopoly in the tin market. It has placed large profits in the hands of a small number of privileged dealers, and, speaking generally, they have deprived the tin producer of the benefits of his efforts, while unnecessarily benefiting intermediaries at the expense of the producer.

"I do not know what right any body of men has got to say what shall be the price we shall receive for our produce unless they balance it (as it has been done in the case of agriculture) by putting a maximum upon the price of what the tin producer has to buy. The present control of the tin metal market is not in the national interest, and the objects desired could have been obtained without inflicting the injustices which at present are borne by those who produce and sell tin. The Nigerian Chamber of Mines is taking the matter in hand, and the Cornish Chamber of Mines is doing so also, and as vice-chairman of the F. M. S. Chamber of Mines I may tell you that we, too, are taking action."

Russo-Canadian Corporation

Last December, shareholders of the Irtysh, Kyshtim, and Tanalyk companies agreed to vest the control of their properties in a new concern, the Russo-Canadian Development Corporation, says the *Statist*, so as to obviate any possibility of paramount influence being obtained by German interests through the purchase of shares of the English companies on the London market. The control of the three English companies remains unaltered, the method adopted being to issue to them a series of debentures secured upon and entitled to the whole of the profits of the Russian companies, which own and work the properties. Apart from these debentures, the Russo-Canadian Development Corporation has an authorized capital of $15,000,000 divided into $5,000,000 7% non-cumulative preferred stock and $10,000,000 in common stock, both in shares of the denomination of $5. All of this capital has been issued, and to ensure continuity of control, the common stock will be vested in a voting trust consisting of 15 members, including the directors and engineers of the three Anglo-Russian corporations. It will be understood that the corporation is intended to be a powerful supporter of Anglo-Russian mining interests.

Much depends, of course, upon the future internal conditions and the government of Russia, particularly of Siberia. Those responsible for the management of the group—and they are known to be well informed—consider that with the advent of Allied assistance the outlook can be regarded with confidence, and that a rapid return to normal working conditions in Siberia and the Urals can be anticipated. Steps are consequently being taken with a view to resuming operations at the properties at the earliest date possible.

Pure Crystalline Calcite ground to an impalpable powder is now being placed on the market as a substitute for commercial chalk.

Editorials

The End in Sight

THE Great War draws nearer to its close. Six weeks have seen Bulgaria, Turkey, and Austria pass definitely out of it, with Serbia regained and the Turkish armies destroyed. The main Austrian army was in peril, and Austria herself is disintegrating, with the separation of Hungary and Bohemia and the approaching establishment of the kingdom of the Serbs, Croats, and Slovenes. Germany maintains resistance on the Western front while the terms for her are being drafted, but the Allied power on that front alone is increasing every day and the entire south of Germany is about to become open to invasion by the Italians, the Czechs, and to the great British and French armies liberated by the cessation of hostilities with Bulgaria and Turkey, which may be sent up the Danube now that the Black Sea has become open. The latter development affords also easy access to Russia, the lack of which was for three years a sad drawback to Allied efforts.

Besides this external military situation, there is every reason to believe that internal affairs in Germany are desperate. With man-power depleted, essential supplies exhausted, and finances in chaos, unconditional surrender to superior power cannot long be delayed.

The Gold Question

THE appointment by the British Treasury of a commission, headed by Lord Inchcape, to survey the gold question and listen to the appeals of the gold miners of the British Empire for aid, is the first official action in this important matter. Following this, Secretary McAdoo appointed a committee consisting of Albert Strauss, member of the Federal Reserve Board; Raymond T. Baker, Director of the Mint; Emmet D. Boyle, Governor of Nevada; Edwin F. Gay, representing the War Trade Board, and Pope Yeatman, representing the War Industries Board.

The gold question has therefore acquired an official status. It is, however, rather a question for the decision of economists and financiers than for gold producers and mining engineers, although the latter may give valuable evidence as to gold resources, and the producers may make unchallenged representations respecting the disappearance of their profits and the merit of their claim for relief from taxation.

But in claiming aid for the maintenance of normal production and profits, the cost of production has nothing to do with the case, except as to how much the aid ought to be. The only sound ground for such a claim is that gold, if it had been left free, would now be at a premium, of which gold miners have been arbitrarily deprived. In neutral countries gold is at a premium. In Great Britain and America it has disappeared as currency, its exportation is forbidden, and its industrial use is limited; wherefore its true status is obscured.

If the quantity doctrine of money be accepted, the plight of the gold producers is just what it ought to be. If gold be at the root of inflation, the automatic curtailment of gold production is what ought to happen as the true corrective. If the gold producers are being arbitrarily deprived of a premium, so much the better. But, as we have previously pointed out, that doctrine is vigorously challenged, and the simple fact that the governments want more gold is distinctly in evidence.

Standardization of Mining Methods

ONE of the great needs of the mining industry at the present time is the working out and adoption of standardized methods, in order to:

1. Lower the cost of prospecting and development work, which, of course, ultimately means lowering the cost per pound of metal produced. If drifts, raises, and winzes can be driven for less money and at greater speed (without a reduction of wages or "speeding up" the men), it will be possible not only to produce more metal with the same expenditure of money, but large bodies of low-grade material, which cannot be mined profitably under present conditions, will become commercial ore.

2. It is essential that attention be paid to prospecting and development work, in order to maintain present production, to say nothing of the great need of increasing the output.

3. As there is now a great shortage of labor, and as in all probability this will continue for some time, it is absolutely necessary to standardize operations and plan the work ahead in order that the efforts of every man may count. This does not necessarily mean "speeding up," or "more work per man per day" (although the latter is highly desirable), but it is important to effect a concentration of labor where it will be productive of the greatest results.

When the war broke out in 1914, prospecting and development work was dropped by practically all companies. Later, when the price of metals went up, labor troubles set in, and the process of "finding ore" was neglected again, while the major efforts were directed toward maintaining production. Some of the larger mines which had good ore reserves in 1914 have made a steady production, but at the expense of their ore reserves, which have been considerably depleted. For instance, to quote an extreme case, in one division of a large mine in southern Arizona, 300 men were employed daily four years ago, producing 10,000 to 14,000 tons of ore each month. This record has now dropped to 165 men per day and 5000 to 7000 tons monthly, the decrease being due largely to the postponement of prospect and development work, which is rapidly shortening the apparent life of the mine. In the future, therefore, it is important that the cost of finding ore be reduced to a minimum, in order that this necessary expenditure shall yield as great an addition to the ore reserves as possible.

In this number we publish the first of a series of seven articles by Charles A. Mitke, dealing with the standardization of mining methods, with a view to economy. Mr. Mitke is an engineer of experience, and has attacked his subject with enthusiasm. Each article deals with a single phase of mining practice.

It is evident that in the growth of the metal-mining industry each individual mine will develop to a greater or less extent a certain degree of standardization in its various operations. Ground-breaking, timbering, raising, shaft-sinking, and other features of mining practice follow in a general way what past experience has shown to be more or less effective.

Formerly managers of mines allowed their foremen to establish much of the detail of mine operation; and intelligent, experienced foremen have done much not only for the individual mine, but for the industry as well. In some cases mining practice has followed, as a mere duplication, the procedure instituted by another mine. No attempts are made in these cases to establish a practice that is peculiarly adapted to the mine in question. The net result has been the growth of practices that are more or less local in character, although the migratory miner has done his share in transplanting the good as well as some of the bad features of mining practice from one locality to another.

The past and present decade have witnessed a steady progress in good engineering. A first-class manager now places upon his staff the duty of studying mine conditions and the working out of methods that are safe, economical, and peculiarly adapted to the mine in his charge. Materials, tools, and appliances are also carefully studied, and only those which stand the test of the mine conditions and meet with the prime requirements of safety and economy are retained.

Standardization implies preliminary experimentation, careful consideration of observations, and selection. It does not imply that the standard practices at one mine are necessarily the best for another, although often some features can well be adapted by another mine. Mr. Mitke presents the results of his thought and his selection in a helpful spirit, rather than with the idea of saying the last word. We feel that many of our readers will benefit greatly from his articles. Some may differ with Mr. Mitke, and thus be prompted to contribute suggestions along the lines he has taken, as well as on others. The subject is worthy of the attention of mining engineers at any time, but under present conditions it is extremely important, as large output, safe operation, and economy in labor and materials are vital. We hope that these illuminating and suggestive articles will be studied not only by the operating heads of mines, but also by their foremen and shift bosses, upon whose intelligence and initiative so much depends.

United War Work Fund

MORE money is needed. You are going to be asked to subscribe again. The war is not over. Our people have just contributed to a huge Liberty Loan to help bring the war to a successful conclusion. We have invested our money in equipment for our soldiers. We are now asked to give our money for the upbuilding of the morale of that army. No war has ever been fought with as clean an army as America has sent to the Old World. General Pershing has said that every hut that is established adds 10 men to a quota of one hundred.

The task of upholding the morale of the Army should peace be declared tomorrow is even greater than that during the war. Under the inspiration of patriotic purpose, men forget their petty vices and put into their work the enthusiasm and the self-sacrificing spirit that come from high ideals. It is human after a great crisis to let down. Should peace be declared tomorrow, it would be human for men to let down. If our men and boys are to come back fit for the work of the world which will face them on their return, if they are to take a vital part in the tremendous tasks of reconstruction which face us in this country after the war, they must come back clean and whole; they must come back with the same moral courage to meet the problems of commercial life that they have learned counts for so much in military life.

To set forth these self-evident facts is simply to state the fundamental value of pushing this campaign for United War Work to a successful conclusion. Presidents and generals, business men and soldiers, have only words of commendation for what has been accomplished. May each individual take to himself a part of the moral responsibility of the world and see that he does his part in the drive that starts on Nov. 11. The money that you subscribe is not for any one organization; it is for all of the agencies that are so efficiently performing a vitally necessary work. It is to be equitably divided.

At the front, on the transports, or in the cantonments, the Y. M. C. A., K. of C., Y. W. C. A., the Jewish Welfare Board and the Salvation Army are working to keep men clean for the work of the world. These admirable societies are worthy of your support, and you can get behind them by making your subscription a generous one.

Taxing the Prospector

IN ANOTHER column we publish an article containing a resolution adopted and forwarded to the Secretary of the Treasury by representatives of about thirty mines, all of which are in the development stage. The distinction between mines that are in the development stage and mines that have passed this condition is not easy to make. In many instances a mine is in process of development while ore is being mined and milled, and continues in this condition until almost worked out. Outside of the notable exceptions of the porphyry copper mines, certain iron mines of Minnesota, and a few metal mines, the delineation of the limits of the orebodies that have been discovered cannot be made without the expenditure of an unreasonable amount of money. By first partly developing, and then continuing the development as the mine is worked, there is a reduction in the gross amount of capital required. Without this arrangement many smaller properties would find it difficult to operate. To tax the net returns of such mines, in the manner proposed under the income-tax laws, is a questionable procedure, and, if this is done, the miners will be discouraged.

The resolutions adopted at Phoenix propose the plan of setting aside as not taxable the net returns from prospect or development mines until the net returns from the ore, plus the calculated expectant returns from blocked-out ore reserves, equal the total investment. Due allowance of a fair rate of interest on the invested capital is also to be made. To define "ore in sight" and to settle upon a "fair rate of interest" are apparently the only difficult points in the proposed plan. We believe that both terms can be equitably interpreted. The plan has considerable merit, for it sharply discriminates between the taxable and the non-taxable mine. It also insures, as far as it is practicable to do so, the return, to the investors, of the capital invested.

The last paragraph of the resolutions is not entirely clear, but we presume that the term "earnings" is established by the following equation:

["Earnings (or surplus account) = (Net ore-returns + calculated expectant returns for blocked-out ore) — (invested capital + interest on invested capital)."]

The proposal to tax the "earnings" that accrue each year after having been determined in this way is eminently fair. The simplicity of the basic plan commends itself to us, and we believe that it is worthy of considerable discussion. The practicable operation of the proposed plan is not without its obvious difficulties. Naturally, much must be left to the management of each property, but the supervision will be in the hands of the Department of Internal Revenue; and, if that department will exercise its control through competent technical men, a satisfactory outcome may be expected.

The Tin Control

THE international tin control has become an almost perfect example of a buying monopoly. Large sources of the world's tin supply are within the British Empire, but especially within its colonies. Practically the whole of the world's consumption is within the Allied countries, wherein but little tin is produced. The control of the metal is exercised by centralizing the buying through one agent in Singapore, another in Batavia, another in Hong Kong, and another in Australia. These agents are in each case well-known firms of tin merchants, who thus acquire a privileged character. It might be considered preposterous that rude hands should thus be laid on the Chinese and Dutch markets, but the answer is that licenses for the importation of tin into Great Britain and America will not be granted for any except what is purchased by Mitsui & Co. and Maclaine, Watson & Co., respectively.

The Bolivian, Nigerian, and Cornish tin that is smelted in Great Britain comes, of course, into the jurisdiction of the Ministry of Munitions. The Bolivian tin smelted in the United States will similarly fall under the power of the War Industries Board, though no proclamation about this has yet been made, and our producers have been left free to sell on their own terms. Nor has any arrangement been published governing the purchase of Bolivian tin ore. Finally, nothing has yet been made known as to what the controlled price of tin is going to be.

These developments have created a good deal of dissatisfaction. Numerous tin merchants have been put out of business, while a few large houses have been favored by their appointment as official buyers. Resentment respecting this is natural. The placing of the entire tin business of the United States in the hands of a subsidiary of the United States Steel Corporation, the largest consumer of the metal, is severely criticized as the conferring of a national prerogative upon a private and very much interested party. The delay in making and publishing the terms as to price, purchase of ore, etc., is irritating and apparently is inexcusable. Great indignation over the whole assumption of the business is expressed not only by the merchants who have been dispossessed, but also by the producers in Cornwall, Nigeria, and Malaya, whose grievance is that they have been deprived of a free market.

In a cataclysm such as has afflicted the world during the last four years, private rights have had to be overridden. Many persons have had to be injured, not only in the war zone but also in remote places. Those who have lately been injured in their tin business may class themselves in the latter category. The real question is whether the tin control is going to secure more or less tin than heretofore. The experience with controlled industries in this country has been that generally they have yielded less. Those which have been left free to respond to natural factors have been the ones that have improved in production. The future of tin supply will depend a great deal upon the intelligence of the control. In our opinion some inept and even dangerous persons have a hand in it. Of one thing we can be certain, viz., the tin business has been stupidly managed from the time when the conditions of acute shortage first began to exhibit themselves.

In an old French palace at Versailles a notable group of men is gathered. General Foch, Lloyd George, Georges Clemenceau, Baron Sonnino, Admiral Benson, General Bliss, Colonel House, and representatives of other nations of the Allies are in conclave. Their task is a weighty one. They will either settle the present strife, or will order it to go on until the occupation of German lands by the Allied armies crushes further resistance. The successful fulfillment of an ideal is in the air. Justice stands forth, not blindfolded but with flashing eyes and uplifted sword. The choice to Germany is limited to two things—she may stop the struggle and devote herself to the giant task of reparation for her crimes against civilization, or she may prolong the existing strife to her own extinction. There is no alternative. The meeting is the climax of more than four years of bloody strife and human woe. Will the war end? Will justice prevail? Our faith is in the Allied Council and in the armies of the Allies.

The exigencies of the war and the readiness to overcome them are aptly shown by the substitution of a new high explosive in place of the gelignite manufactured for and used by the gold-mining companies of the Transvaal. In place of a nitroglycerin base, a guncotton base, well impregnated with sodium nitrate, is to be used. By leaving a certain proportion of moisture in the mixture, an explosive not only effective in blasting but safe to handle is produced; and the insensitiveness of the explosive has been overcome by the use of a primer cartridge of gelignite. There is apparently no advantage in cost, but there is a saving in the amount of nitroglycerin used in the local factories; and this, in view of the pronounced shortage of glycerin, is an important consideration.

BY THE WAY

Western mining camps are often afflicted with a wave of legal controversy over titles to mineral ground. In a small mining town one of the leading citizens met a prospector who owned a claim that was in dispute. "Well, Pat," he said, "I see your claim is in litigation." "In litigation!" said Pat. "Some one has misinformed you. It's not in litigation; it's in blue lime and porphyry, and damned hard porphyry at that."

When the war began in 1914 a man named Godfrey Jones, a coal miner in Wales, enlisted as a private. He soon became a non-commissioned officer, and a little later earned a commission. At Saloniki he showed such conspicuous courage that he was awarded the Distinguished Service Order. The other day Colonel Jones, still serving with his countrymen and in command of Welsh soldiers, was made a brigadier general. The miner now outranks the heir to the British throne.

In a certain gold-mining district which shall be nameless in consideration of its spotless reputation at the present time, a boom was in progress. A "prospect" had developed into a hole in the ground, sometimes miscalled a mine; and from this hole had been extracted a number of specimens of glittering quartz spotted with real yellow gold. These were carefully boxed and sent to the far-distant center where the business end of mining was carried on. A company was floated without delay, and there was no trouble in raising more than enough money to build a mill, which was erected in haste, and turned a "sleepy hollow" into a busy township. At last the plant was completed, and the glad tidings were telegraphed to the head office. An ominous silence followed the announcement; and the board of directors, growing restive under the absence of news, sent a telegram asking when the mill was to start. The reply was laconic: "When you return the mine."

Samuel Untermyer, who advocates Government ownership of public utilities, says there is no socialism in that policy. That is true, says the *Wall Street Journal.* There is only an inevitable and increasing inefficiency. The postoffice is not socialistic. It is merely stupid, and Mr. Burleson is rapidly reducing what was a few short months ago the best telephone service in the world to the level of incompetence of the department over which he presides. There is no war necessity involved in this change for the worse, and the same may be said of the railroad service we are receiving under Government management. Where it was cheap and efficient it is now dear and inadequate. Wages are based not upon the value of the services given but upon a ransom scale. The effect of this, indeed, has been so serious elsewhere that England is already considering, so far as her politicians dare, the disfranchisement of employees in government-owned utilities, for the protection of the rest of the people, so that liberty shall not die out into a sterile bureaucracy.

A Joyous Story

Silence.
A white-hot sun.
A boiling atmosphere.
A hot breeze.
A distant mountain range.
A joshaway here and there.
A burro.
A trudging prospector—
On and on.

A rocky, white-seamed reef.
The prospector trips and falls
Over a white rock.
His hand clutches a quartz fragment.
He arises.
He looks long at the piece.
He throws it down.
He rubs his eyes.
He picks the piece up again.
He fumbles in his pocket.
He spots a glass on the piece.
He jumps into the air.
He waves his arms.
He yells.
He dances.
He talks to the burro.
He builds a monument of stones.
He sets stakes.
He writes a location notice.

Silence.
A burro and a man fast disappear
Across the alkali flat
Toward the Santa Fé.

A crash and a roar.
A clank of bells.
A honk of horns.
A swirl of auto.
A crash of truck.
A scare-faced man.
A 75-story building.
An office.
A sleek, fat man.
A hat-in-hand prospector.
A piece of quartz.
A map, a story.
An agreement.
A check.
A bank—money in hand.

Honk-honk!
Back to the desert.
Back to the reef.
An auto truck.
A shaft begins.
Ten buildings appear.
Streets and a town.
A saloon.
Red's bar.
Miners stroll up the street
Ping! Pank!
Chuck-a-chuck! bang, blast, bing!
The vein is deep and rich.
A mill springs up.
Wells Fargo's agent.
Doré bars galore.
The stock is high.
Dividends pour forth.
Stockholders smile.

Riverside Drive.
The Angelus.
An apartment house of degree.
Opulent wealth.
A twelve-cylinder car in shining splendor
Rubs tires with the curb.
In the doorway a figure appears.
Top hat, gloves, spats, cane, cutaway,
Shiny shoes, sweet-smelling cigar.
Tim Kelly,
Stockholder,
Wealthy mine owner.
Honk-honk!

Personals

Have You Contributed to the Association of the 27th Engineers?

John T. Chapman has moved his office from Joplin, Mo., to Baxter Springs, Kan.

M. H. Wasler, a chemist of Reno, Nev., is equipping a laboratory at Batesville, Arkansas.

Edwin J. Collins, of Duluth, Minn., is examining copper properties near Saltese, Montana.

Fred Hellmann and **F. S. Shaw** are making a visit of inspection to the various Guggenheim mines in Mexico.

Albert J. Houle, formerly professor of metallurgy at the Michigan College of Mines, has been visiting in Miami, Arizona.

Frank H. Skeels, recently with the Success Mining Co., Wallace, Idaho, has been ordered to Camp Humphreys, Virginia, for training.

Frank Blackwell, formerly engineer at the Newport mine, Ironwood, Mich., is assisting in teaching at the Michigan College of Mines.

George C. Stone, formerly of the New Jersey Zinc Co., has been added to the staff of the non-ferrous metals section of the War Industries Board.

E. D. Gardner has been appointed a mining engineer on the staff of the U. S. Bureau of Mines, and will be placed in charge of one of the Western rescue cars.

R. R. Seeber, formerly superintendent of the Winona Copper Co., of Michigan, has resigned. He is succeeded by **Gustav Arthur Braun,** chief engineer of the Victoria Copper Mining Company.

L. Reinecke and **H. L. Smith,** of the Geological Survey of Canada, have returned to Ottawa, after investigating the mineral resources along the Pacific Great Eastern Ry. in British Columbia.

Bennett R. Bates, who recently resigned as general superintendent of the Cubo Mining and Milling Co., Guanajuato, Gto., Mexico, has passed his examinations for a commission in the engineers.

Arthur Yates, lecturer on mining at the Royal School of Mines, London, is assistant officer-in-charge, Ministry of Munitions, controlling the output of a mining district in the north of England.

E. R. Jones, until recently superintendent of the H. W. Johns-Manville Co., of Asbestos, Que., Canada, has been appointed instructor for the Student's Army Training Corps, at the Michigan College of Mines.

Robert Marsh, Jr., formerly general mine superintendent of the Nevada Consolidated Copper Co., Ely, Nev., who enlisted in the aviation service last year, has reached the rank of major after successive promotions.

Willis Werner was recently appointed chief chemist of the Republic Iron and Steel Co., Youngstown, Ohio, to succeed **T. J. Davies.** He will have charge of the blast furnace and the openhearth laboratories.

J. Austen Bancroft, professor of geology at McGill University, has returned to Montreal, after spending some time in the region of Anyox, B. C., on geological work for the Granby Consolidated Mining, Smelting, and Power Company.

F. J. Longworth, smeltery superintendent for the Canada Copper Corporation at Greenwood, B. C., has accepted the position of superintendent of the Tennessee Copper Co.'s smeltery at Copperhill, Tenn., succeeding **T. W. Cavers,** resigned.

John F. Coats, of the engineering staff of the Granby Consolidated Mining, Smelting, and Power Co., has returned to headquarters at Vancouver from a visit to Idaho. **Palmer J. Cook** is superintendent of the company's Midas mine, in Alaska.

T. E. Mitchell, who recently resigned as manager of the Burma Mines, Ltd., at Namtu, Burma, on account of ill health, was in San Francisco on Oct. 26 en route to London. Mr. Mitchell has been with the company for four and a half years.

Charles Legrand, consulting engineer for the Phelps Dodge Corporation's Copper Queen reduction works at Douglas, Ariz., accompanied **Walter Douglas,** president of the corporation, on his recent visit to Morenci, Ariz., and Tyrone, New Mexico.

M. F. Fairlie has been placed in charge of the mines of the Mining Corporation of Canada, hitherto managed by Charles E. Watson, who met his death in the "Princess Sophia" disaster. Mr. Fairlie was recently manager of the reduction works of the company.

A. G. Langley, provincial resident mining engineer, with headquarters at Revelstoke, B. C., has been appointed to represent the provincial government at the pending inquiry into the rates charged by the Consolidated Mining and Smelting Co. of Canada for the treatment of custom ores at the Trail smeltery.

Leslie Urquhart recently returned to London from a prolonged visit to Russia, during which his associates in London completely lost track of him. Mr. Urquhart, who is considered one of the highest of British authorities on Russian industrial affairs, returned with rather favorable reports respecting the situation of the Anglo-Siberian mining companies.

Arthur J. Baldwin, vice president of the McGraw-Hill Publishing Co,, is one of a party of trade paper publishers and editors which sailed on Oct. 26 for England on a tour of inspection of British industry under war conditions. Others in the party are H. C. Parmelee, of "Chemical and Metallurgical Engineering"; Floyd W. Parsons, editor of "Coal Age"; and W. W. Macon, of "Iron Age." The trip will take six weeks and will include a visit to the battle areas in France.

Obituary

Thomas Feigh, of Duluth, Minn., died recently in Chicago. He owned the fees of many mines in Michigan and on the Cuyuna Range, in Minnesota.

Morgan S. Baldwin, son of Arthur J. Baldwin, vice president of the McGraw-Hill Publishing Co., died on Oct. 9 from wounds received in battle Sept. 29.

Daniel E. Bruce, mining engineer and graduate of Nevada University, died of influenza recently at the Mare Island Navy Yard, where he had been in the service. He was 27 years old.

Frederick Lee Crouch, general manager of the United Zinc Companies, Joplin, Mo., died recently in Joplin. He had been with the company eight years and manager for the last four years.

Capt. James Alexander, owner of the Engineer mine, near Atlin, B. C., was lost, with Mrs. Alexander, on the "Princess Sophia," on Oct. 25. He fought in the Boer War, where he won his title, and at its close went to Alaska.

Robert Lee Downing, of Keewatin, Minn., general superintendent for the western district of Pickands, Mather & Co., died Oct. 27 of Spanish influenza. He was a graduate of the Michigan College of Mines in the class of 1906.

Malcolm M. Stuart, mining engineer and a graduate of the Colorado School of Mines, died recently in Butte, Mont., of Spanish influenza. At the time of his death he was in the employ of the Clark interests at the Elm Orlu property. He was 36 years old.

George O. Randolph, mining engineer of Cobalt, Ont., who accompanied Charles E. Watson, manager of the Mining Corporation of Canada, on his trip to the Yukon and was lost on the "Princess Sophia," was a graduate of the Michigan College of Mines, 1907, and was for a time employed by the corporation as manager of its property in Rickard Township.

Clarence S. Verrill, mining engineer, was among those lost on the "Princess Sophia." He was a son of Prof. A. E. Verrill of Yale, and a graduate of Yale himself. Mr. Verrill had had 20 years' experience in the mining sections of Colorado, California, Idaho, and British Columbia. He had been an assistant to John Hays Hammond in the latter's work on the Independence mine, at Cripple Creek. It was he who held the option under which the Surf Inlet mine in British Columbia, was recently bought by the Tonopah Belmont Development Company.

Charles E. Watson, of Cobalt, Ont., manager of the Mining Corporation of Canada, was one of the passengers lost on the steamship "Princess Sophia," wrecked on Oct. 25, off the Pacific Coast. He left Cobalt several weeks before, to examine a mining property in Alaska in the interests of the company. Mr. Watson was formerly manager of the Cobalt Townsite mine. Subsequently he was appointed to the position he held at the time of his death. He was a brother of R. B. Watson, a director of the Nipissing Mining Company.

Col. William Hamilton Merritt, a mining engineer and metallurgical expert, died at Toronto, Ont., Oct. 26, from influenza. He was born at St. Catharines, Ont., and was graduated from the Royal School of Mines, London, England. He was sent to the Paris Exposition by the Canadian government to study matters relating to engineering, and was a member of the royal commission chosen to investigate the mineral resources of Ontario. Colonel Merritt saw active service in the Canadian Northwest rebellion in 1885, and served with distinction through the Boer War. Upon the outbreak of the present war, he did much to advance the cause of aviation.

Howard S. Lee, mining engineer, died of influenza at Silverton, Colo., on Oct. 25, aged 38 years. He was born in Golden, Colo., and was a graduate of Leland Stanford University. At the time of his death he was associated with the United States Smelting, Refining and Mining Exploration Co. Mr. Lee entered the employ of the company 10 years ago and had managed several of its properties and, until recently, was general manager of the Leadville unit, the large unwatering project undertaken on Fryer Hill three years ago. He had just been appointed assistant to A. P. Anderson, chief consulting engineer of the company, and had expected to leave soon for headquarters in San Francisco. He was a member of the Sigma Nu fraternity and of the American Institute of Mining Engineers.

Societies

International Mining Convention will be held at Vancouver, B. C., Jan. 8 to 10, 1919, under the auspices of the Vancouver Chamber of Mines.

Mining Circle of El Paso has been recently organized at El Paso, Texas, with the purpose of promoting interest in mining and allied industries, and has now a membership of more than 80. The headquarters of the society are at the University Club. Meetings are held monthly.

Arizona Mining Men's Association was organized on Oct. 12 at a meeting in Phoenix for the purpose of promoting interest in the mining industry. About 40 members were enrolled. Charles P. Reininger was elected president; W. W. Lawhon, secretary; Cleve W. Van Dyke and Edward Bush, first and second vice presidents; and W. S. Humbert, treasurer. Fifteen directors were chosen, representing nearly every district in the state, as follows: J. J. Hannigan, T. O. McGrath, William McDermott, H. C. Harrison, Dave Morgan, J. B. Harper, W. B. Twitchell, B. A. Gillespie, W. J. Graham, John Fowle, A. Smith, Murray Day, B. Rosenberg, Ezra Thayer, and D. W. Hall. A committee was appointed to draft a constitution and bylaws.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Compressed Air, Centrifugal System for Making. Robert V. Morse, Ithaca, N. Y. (U. S. No. 1,280,276; Oct. 1, 1918.)

Crucibles, Heating Device for Metal Melting George L. Fort, Kansas City, Mo., assignor to Fort-ified Manufacturing Co., Kansas City, Mo. (U. S. No. 1,279,682; Sept. 24, 1918.)

Drill, Rock. Milford Shingler, Ashville, Penn. (U. S. No. 1,280,092; Sept. 24, 1918.)

Drilling Apparatus. George H. Gilman, Claremont, N. H., assignor to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,279,532; Sept. 24, 1918.)

Furnace, Recuperator. William H. Stubblebine, Allentown, Penn. (U. S. No. 1,279,932; Sept. 24, 1918.)

Furnaces, Charging Devices for. James Hundley, Middleport, Ohio. (U. S. 1,280,037; Sept. 24, 1918.)

Heat Treatment of Castings of Special Steels. Federico Giolitti, Turin, Italy, assignor to Societá Anonima Italiana Gio, Ansaldo & C., Genoa, Italy. (U. S. No. 1,279,533; Sept. 24, 1918.)

Tunnel Mold Form. Howard B. Loxterman, Pittsburgh, Penn., assignor to Blaw Steel Construction Co., Hoboken, Penn. (U. S. 1,279,561; Sept. 24, 1918.)

Zinc, Furnace for Treating. Leopold Van Gulck, Uplands, Swansea, Wales. (U. S. No. 1,280,593; Oct. 1, 1918.)

Editorial Correspondence

SALT LAKE CITY—Oct. 29

Ore-Smelting Furnaces in Salt Lake Valley and vicinity at the end of October were as follows: United States Smelting Co. had five lead furnaces in blast at Midvale; American Smelting and Refining Co. had five at Murray, and the Garfield copper smeltery of the A. S. & R. had four reverberatory furnaces and two blast furnaces in operation. A recent cloudburst at Garfield washed a quantity of gravel and boulders into the plant, and necessitated considerable cleaning up around the tracks and upper part of the furnaces. At the International smeltery, at Tooele, the lead section was running five furnaces and was operating at nearly full capacity. Two reverberatory furnaces were in blast here, treating copper ores. Shortage of labor at most of the plants has held back operations. Ore-shipping conditions are favorable at this season, and a fair tonnage from Utah, Nevada, Idaho, and surrounding states is being received.

DENVER—Oct. 29

The Influenza Epidemic in Colorado is interfering seriously with important mining operations. Among the large enterprises that have been forced to shut down are the American Metal Co.'s molybdenum properties at Climax and the United States Smelting, Refining, and Mining Exploration Co.'s Sunnyside properties at Eureka, near Silverton. It is reported that more than 100 men have left the Sunnyside recently through fear of the disease, and that about 40 employees of the company are ill at the mine boarding house. The mining camp of Silverton is one of the greatest sufferers. It is said that of about 1200 inhabitants, more than 400 are victims of the epidemic, and more than 35 deaths are recorded. Only one doctor is now available in the town to look after the sick. During the last two weeks miners have left the camp in large numbers for Ouray. Boulder, Idaho Springs, and Georgetown have also been hit by the plague, and in the first-mentioned city many deaths are recorded. Although reports have been published to the effect that the epidemic has passed its crisis here, medical authorities admit that it is far from being under control.

WALLACE, IDAHO—Oct. 27

Production of the Cœur d'Alene Mines is seriously curtailed through the shortage of labor, and this has been further accentuated by the prevalence of influenza. Practically all work by development companies, which is usually an important factor in the mining activity of the district, has been suspended, partly on account of labor shortage and partly on account of the present high cost of mining. For the same reason, there is nothing in the way of new mill construction or the expansion of present plants. Everything waits for the conclusion of the war, and the feeling prevails that when that time comes, after allowing for a period of readjustment, there will be a mining revival that will rival that remarkable period just preceding the entrance of America into the war.

YELLVILLE, ARK.—Oct. 29

Smelters in the North Arkansas Region, for the first time in the history of the zinc-mining industry here, are inquiring for prices and available tonnage on carbonate and silicate zinc ores, and never before have operators been asked to set a price, as formerly the buyers made the offer. Manufacturing chemists are also making strong bids for this class of ore, some offers being as high as $48 per ton for 40% ore. For the last six weeks, the entire output of the Zinc, Ark., camp has been bringing $40 per ton for 40% ore f.o.b. shipping point. The grade of these ores ranges from 40 to 49% zinc, and they contain no iron, lead or sulphur. The demand seems to be centered entirely on this class of ore, there being little or no demand for jack. In the Zinc camp, large bodies of tallow clay lie with and adjacent to the orebodies, which carry from 14 to 37% metallic zinc. Samples of this clay are now being submitted to manufacturing chemists with a view of determining if it cannot be utilized in the manufacture of various products of which zinc is the essential ingredient.

Interest in Manganese Mining in the Batesville district is slowly increasing and much new development is promised for the winter months. The deposits of crude wash ore which run from 5 to 25% disseminated through the clay gangue are being treated extensively and soon most of the tonnage will consist of concentrates of this class of ore. Besides the washing plants now under construction and those completed, there is machinery on the ground for six new ones, and others are contemplated. Steam-shovel operations are becoming more extensive. In June only two shovels were working in the entire region; now there are at least a dozen. The ideal washing plant for the district has not yet been constructed, and it is likely that no one type plant of will be built that will answer the needs of all, as different classes or ores will require different treatment. The first plants consisted of log washers only, and these showed a great loss in the fines. Jigs have been added to the log-washer equipment, and a better saving has been made, although still greater saving can be effected with the addition of tables. It is the opinion of operators that some grades of the ore can be saved better without the log washers, and this is particularly true of the softer ores.

DULUTH, MINN.—Nov. 1

Mines Near Nashwauk are reducing their summer's activity. The Hawkins mine has ceased operations at the concentrating plant, but will do considerable stripping during the winter. The Harrison mine has also closed, but will use six shovels on stripping. Winter activities have started at the Lone Pine; the La Rue will be kept busy with repair and underground operations; the Crosby plant is now closed, but 100 men will be employed in underground mining and exploration, and the York and Pearson mines anticipate a busy winter with repair and development work.

Royalties From State-Owned Iron Mines will exceed $1,000,000 during 1918. There are 22 mines and approximately 2,300,000 tons was forwarded during the months of July, August, and September, which produced an income of $575,000. The largest producer was the Missabe Mountain, which shipped 581,991 tons during the last three months, which netted $145,498 in returns to the state. The Leonidas was second, yielding $103,699. These royalties are turned into the state school funds, excepting those from the Majorca mine, near Coleraine, which total $38,548 for the last three months and revert to the state university fund. Madera mine, near Hibbing, has been exhausted, and the lease held by R. B. Whiteside and associates cancelled. The mine was a small one, yielding in all only 195,000 tons of ore.

GOLD HILL, ORE.—Oct. 29

Manganese Mining is a new industry in the Lake Creek district, actual development work having been begun since late in 1917. Both Government and state engineers have reported favorably on the quality and quantity of the ore in these deposits. Since early in 1918 the Manganese Metals Co., of Tacoma, Wash., has been operating a 20-ton mill on the property, which has been producing 45% manganese concentrates. Since this company began work, the known limits of the manganiferous area have been extended by prospectors and a number of claims have been located. Though the extent of the workable orebodies has not yet been demonstrated, there is evidently sufficient ore in the district to warrant extensive operations.

Chrome Producers of southern Oregon and northern California met in Grants Pass recently and organized the Oregon Chrome Producers' Association, which will affiliate with the Pacific Coast Chrome Producers' Association, recently organized in San Francisco. These organizations were brought about by the fact that there is no market for the sale of chrome. Operators have been induced to develop chrome deposits in this region on the theory that the production would be paid for at least at the prevailing prices of last summer, and, owing to the fact that there is no market, hundreds of the operators have been unable to get back money already invested. These associations will select capable men to present the Pacific Coast chrome interests to the authorities at Washington. It is not the object to protect operators in developing new properties, but only those who are already in the field, to save them from further loss. Frank S. Bramwell and O. S. Blanchard, both of Grants Pass, were elected president and secretary respectively of the local association. Questionnaires are being sent out to chrome producers, as to situation of their mines, the quantity and quality of ore, and money invested, and the data will be forwarded to the authorities at Washington.

TORONTO—Oct. 31

The Premier Langmuir Barite Mine, situated in Langmuir Township, 20 miles southeast of the Porcupine gold field, is now producing barite steadily, the ore being mined from a vein averaging four to six feet in width. Mining costs are low, owing to the soft nature of the deposit. The ore is treated by a mill of 30 tons daily capacity, the crude ore being first crushed, after which it is passed into a drier, and, having been subjected to the required heat, goes to a roller mill, where it is reduced to the desired fineness. The process is dry throughout. Native silver occurs in one of the walls of the Keewatin formation inclosing the barite vein, which will be recovered as a byproduct.

The Gold-Mining Industry of the Yukon, already hard hit by the war, for which the territory has contributed about one-tenth of its total population, will be seriously affected by the loss of the ill-fated steamer "Princess Sophia" on Oct. 25, on which 343 persons perished. Two-thirds of the passengers were from Dawson, including many mining men, the more prominent being Walter Barnes, an extensive hydraulic operator at Lovat Gulch, in the Klondyke, and his brother Allen Barnes, of Vancouver; Fred Steinburg, who had large mining interests in the Stewart River country, and William Scouse, of Seattle, a pioneer of the Eldorado Creek district. Many others were connected with enterprises more or less closely associated with the mining industry, and their untimely deaths will be a severe blow to the prosperity of the territory.

VICTORIA, B. C.—Nov. 1

Arrivals From the Klondyke state that the remarkable exodus of miners from the North is due to the fact that the Government has exempted prospectors from remaining on their claims during the war. It is asserted that there will be just as great a rush back to the Yukon in the spring, providing peace is declared in the interim.

The Cariboo District of British Columbia and its gold-producing possibilites have been reported upon by B. B. McKay, of the British Columbia branch of the Dominion Geological Survey. The district already has a gold output aggregating $65,000,000 and notwithstanding the heavy increase in the cost of mining operations and the comparatively low or standard price of gold, production is going on steadily. Mr. McKay predicts that in many parts of the country there will be much gold recovered, but does not look for this development until after the war, when labor becomes more available. With men looking for employment, and equipment cheaper and more readily secured, he declares that the ground will be made to yield richly, the use of hydraulicking, dredging, and drag-line scraping making this possible, where, in the old days, it would have been considered impracticable. Lack of transportation facilities, he says, is holding back development, there being areas in the vicinity of Keithley and Harvey creeks which lack even the roughest of wagon roads.

JUAREZ, MEX.—Oct. 26

Three American Mining Men are being held for a ransom of $50,000 by Epiafano Holguin, a Villa leader, near Villa Aluimada, Chihuahua. The men, E. F. Knotts, D. B. Smith, and a Mormon prospector named Tinney, were seized while at the Erupcion mine, 83 miles south of the international boundry. Efforts are being made to secure their release.

The Mining News

ARIZONA

Cochise County

HELEN DOME (Courtland)—Operations have been resumed on property under a lease to purchase.

COMMONWEALTH (Pearce)—Making regular shipments of silver ore. Considerable new development under way.

Gila County

RAY CONSOLIDATED (Hayden)—J. A. Carter, of Los Angeles, has begun work on the compressor plant and concrete reservoir near the old pumping plant. Clampitt & Moss, of Los Angeles, have a contract to sink 10 new wells, which will replace the old surface wells.

SOMBRERO BUTTE (Hayden)—The suit of this company vs. the Copper States Mining Co., in which adverse claim was laid to certain mining properties in the Bunker Hill mining district at Copper Creek, was recently decided in favor of the plaintiff. The case was the outgrowth of the settlement of the estate of G. F. Jewell, a well-known Copper Creek miner, who was murdered in 1916.

Mohave County

EMERALD ISLE (Kingman)—A precipitation unit has been added to the equipment, increasing the production by 2000 lb. daily.

Pinal County

ARIZONA HERCULES (Kelvin)—New concentrator now handling about 1200 tons daily and producing copper at the rate of 500,000 lb. per month. By the end of the year the mill will be handling 1500 tons daily.. Plans are already under way to double capacity.

MAMMOTH DEVELOPMENT (Mammoth)—Old Mammoth mill has begun treatment of molybdenite ores, hauled by motor truck from the Mammoth mine, at Schultz. H. Pomeroy is in general charge.

MUSSER (Mammoth)—Flotation mill being overhauled for operation on molybdenum tailings, under the management of W. W. Pierce.

COPPER BUTTE (Ray)—Development by the original company through the old lower tunnel has opened a large tonnage of shipping ore. Shipments have been increased from three to six cars weekly.

COPPERFIELD (Ray)—Sinking in progress and preparations being made to ship at the rate of three cars a week.

RAY HERCULES (Ray)—Mill town of Belgravia, two miles from Kelvin, hereafter will be known as Hercules.

SILVER DIP (Ray)—Lease has been given to Joplin interests, which will do additional development through the shaft.

Santa Cruz County

CONSOLIDATED ARIZONA (Patagonia)—Developing through two shafts, 500 ft. apart, and installing new sinking machinery. W. J. Mitchell is superintendent.

MORNING GLORY (Patagonia)—Installed compressor plant. Shipping copper ore.

Yavapai County

DUNDEE ARIZONA (Jerome)—Shaft being sunk five feet a day is now in quartz porphyry. Vein matter was cut at 156 ft and dips toward Jerome Verde ground. Latter company drilled to point near Dundee line and failed to cut ore.

GREEN MONSTER (Jerome)—Contact cut near station on 930 level. Drifting in both directions in porphyry and diorite, speckled with pyrite. Little water has been struck.

Yuma County

ARIZONA ENTERPRISE (Bouse)—Started to sink two shafts. Property equipped with new headworks and compressor; is situated about 11 miles south. [illegible] is in charge.

CARMELITA (Wenden)—Shaft sunk 60 ft. At 160-ft point a 20-ft crosscut will be driven to the vein. Second vein has been cut by a 165-ft crosscut from the bottom of the 200-ft shaft. George Way[illegible] of Kansas City, is in charge.

COLORADO

Boulder County

TUNGSTEN PRODUCTS (Camp Loveland)—Has taken over and reopened the old Carrie Nation mill. Plant now in use for concentration of both company and custom ores. N. W. Head has been appointed superintendent.

NILS DESPERANDUM (Sunshine)—Recent development has opened a shoot of milling ore. Trial shipment has been made.

Clear Creek County

CHAMBERLAIN SAMPLER (Idaho Springs)—Plant, which has been in operation for the last 30 years, discontinued receiving ore on Oct. 26, and has been closed. Shortage of labor is given as the reason for closing. This is the last of the Chamberlain Ore Co.'s samplers to close. The Georgetown and Black Hawk plants closed some time ago. Ore which was formerly shipped to the Idaho Springs sampler will now be received by the Argo Reduction and Ore Purchasing Company.

Lake County

FANNY RAWLINGS (Leadville)—Surface plant destroyed by fire Oct. 20. Company is going to rebuild and will install new electric hoisting equipment. A 50-hp. hoist and motor, together with cables and other accessories, will be purchased. W. C. Frost is superintendent.

San Juan County

SPANISH INFLUENZA is responsible for 42 deaths in Silverton during the last week of October, and more than 400 citizens are suffering from the disease. Miners have left the county in large numbers, and mining is all but demoralized. The epidemic is not yet under control.

IDAHO

Boundary County

IDAHO GOLD & RUBY (Leonia)—J. M. Schnatterly, president, has announced that the hydraulic plant will begin operations in January. Company has 2500 acres of placer ground and quartz claims. A 56-ton steam shovel is digging a canal.

Shoshone County

MARSH (Burke)—Plans to raise development fund from sale of stock and surplus equipment with which to explore vein on tunnel level, as cost of further sinking now is prohibitive.

SUCCESS (Wallace)—Body of ore seven feet thick has been opened on 1600 level, and equally good showings are reported on the 1400 and 1500 levels. Mill is running one shift.

INTERSTATE-CALLAHAN (Wallace)—Long crosscut from No. 6 level has cut Nipsic vein at depth of 1000 ft. below upper workings and shows considerable lead-silver ore.

MICHIGAN

Copper District

FRANKLIN (Demmon)—Opening stopes on 30 level north; ground in Pewabic amygdaloid.

QUINCY (Hancock)—Extending both mills for installation of more Wilfley tables.

AHMEEK (Kearsarge)—To rebuild shaft from sixth level to surface, and expect to complete work in two months.

COPPER RANGE (Painesdale)—Receiving Isle Royale stamp sand to be used in filling old slopes and to make working platforms for the men.

WINONA (Winona)—To sink King Phillip No. 1 shaft deeper.

NEVADA

Esmeralda County

GREAT BEND (Goldfield)—Development on 370 level has opened oreshoot stoped on 160 and 265 levels. Three veins are exposed on company ground, but so far work has been largely confined to middle one, which is opened for 1000 ft. east of main shaft. J. K. Turner is consulting engineer, and L. L. Dellinger is superintendent.

Lyon County

M'CONNELL (Mason)—Regular shipments of fair-grade copper carbonate ore being made to Thompson smeltery. Property in limestone belt west of Mason, but development work not extensive.

UNEVIDA GOLD (Mound House)—To install large metal flume to divert part of the water. Sands will be worked to recover amalgam and quicksilver lost from old Virginia City mills. Sand is to be lifted by centrifugal pumps and run through sluices fitted with Hungarian riffles and coca matting.

EMPIRE NEVADA (Yerington)—Large tonnage low-grade copper carbonate ore developed by churn drilling some years ago, when it was under option to the General Development Co. Leaching experiments by the sulphuric-acid process have proved that the ore is adapted to this process, as the gangue is altered granitic porphyry, no lime being present.

Nye County

MONITOR-BELMONT (Belmont)—Operated under bond and option by Nevada Wonder Mining Co. Old county courthouse has been used as a clubhouse and dormitory for employees.

CONSOLIDATED SPANISH BELT (Tonopah)—Drift being extended on tunnel level to drive under Earnst stopes 600 ft. to east on levels above, where ore was of good grade. All lower workings drained, making old work accessible. Expected shipments will be made soon. Concentration tests have given excellent results.

TONOPAH EXTENSION (Tonopah)—Receipts from mine and mill operation during September were $112,190.50; current expenses, $79,483.95; leaving an operating profit of $32,706.55.

WISCONSIN

Zinc-Lead District

CONNECTING LINK (Cuba City)—Now operating 150-ton mill, which is model mill of entire district. New mill to be erected soon will be of 100 ton daily capacity.

ZINC HILL (Cuba City)—New shaft completed, and 100-ton mill recently constructed has been placed in operation on property formerly known as the Little Dick.. Charles Wolfe is manager.

FIELD MINING AND MILLING (New Diggings)—Indefinitely closed, owing to unfavorable mining conditions. Property produced the highest value of concentrates of all mines in the district during 1916 and 1917, making an annual production of 10,000 tons, assaying 40 to 44% metallic zinc from 6% ore. Milling was started in June, 1915. In January, 1917, made a hoisting record of 20,000 tons.

LITTLE PLATTE (Platteville)—Mining and milling operations started on the James Tracey land, six miles west of Platteville, the site of the Old Mexico. A 75-ton mill has just been completed. Raymond Piquette, of Platteville, is general manager.

OLIVER IRON MINING (Shullsburg)—Prospect drilling being continued on the John Lyons lease, 3½ miles south of Shullsburg. Mulcahy mine temporarily closed, and prospect drilling resumed on this tract.

CANADA

British Columbia

CANADA COPPER CORPORATION (Princeton)—Railroad grade completed from mine to Princeton. Machine shops completed and foundation for 2000-ton concentrator in place.

DELTA COPPER (Skeena)—Installing new plant in preparation for winter operations.

ECHO SILVER-LEAD (Slocan)—Will begin production of ore early in November at mill of Standard Silver-Lead Co., which Echo has leased for six months. Installing two-bucket tramway. Ore been opened on three levels for 1000 ft. in all.

SILVER BELL (Slocan)—Large quantities of supplies and equipment have been secured for the continuation of operations by R. F. Green and Sam Green, owners

The Market Report

SILVER AND STERLING EXCHANGE

Oct. Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
31	4.7550	101⅛	49½	4	4.7550	101⅛	49½
1	4.7550	101⅛	...	5			49½
2	4.7550	101⅛	...	6	4.7550	101⅛	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Oct. Nov.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
31	*26	†	8.05	7.75	8⅜ @ 8⅝
1	*26	†	8.05	7.75	8⅜ @ 8⅝
2	*26	†	8.05	7.75	8⅜ @ 8⅝
4	*26	†	8.05	7.75	8⅜ @ 8⅝
5	...	.	. .	.	
6	*26	†	8.05	7.75	8¼ @ 8½

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
Oct. Nov.	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
31	122	122	137	334	334	29½	28½	54
1	122	122	137	334	334	29½	28½	54
2	...	...	...	.		..	..	
4	122	122	137	334	334	29½	28½	54
5	122	122	137	...	. .	29½	28½	54
6	122	122	137	.	.	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Nov. 6, 1918

The free markets continue to show the handwriting on the wall that the trades find no difficulty in interpreting.

Copper—Governmental orders show no abatement, the copper producers being pressed urgently for deliveries, as heretofore. The October production was considerably less than that for September, but just how much less is not yet known. The bad conditions produced by the influenza epidemic are now improving.

Copper Sheets—The base price of copper sheets is 36c. per lb. Copper wire is quoted at 28¾@29¼c. per lb. f.o.b. mill, carload lots.

Tin—The physical situation in this country is without any doubt distinctly easier, stocks, especially of Straits, being ample for immediate purposes. This results from the curtailment of tin consumption for nonessential purposes. Tin of 99% grade has been sold at 74c., which is an index of the present value of tin, but, for reasons that are well known, there is nothing that can be characterized as a market.

A statement issued last week by the War Industries Board adds but little to what was previously known, except that the United States Steel Products Co. "will distribute at cost to the consumers, jobbers, and dealers in the United States who hold purchasing licenses" the tin that it has acquired by purchase. "No selling price has been announced on the tin that has been purchased by the Inter-Allied Tin Executive and allocated to the United States, but this price will probably be announced between now and Dec. 31, 1918."

This means an international buying monopoly in the interest of consumers, and a distribution of the purchases among consumers. There is no competition and no market anywhere in the world, and no price except the arbitrary one at which the executive will take in tin. American smelters seem so far to have been let alone, but they are not in a position to make a market. The matter of Bolivian ore does not seem to have been touched upon, but at present that is under the domination of the British smelters, who, in turn, are under the domination of their government.

The following is a paragraph translated from the "Boletin Comercial" of Oruro, Bolivia, which merits attention:

"There is a large stock of tin concentrate in New York. The smelters are not buying. Cables from New York advise shippers here not to buy tin for export.

"The smelters in Liverpool buy all the tin concentrate that reaches that port. As the result of this, the liquidation of the lots sent to England is rapid. Producers of tin in Bolivia for more than a month past have given orders that their tin should be shipped to Liverpool. The United States market does not offer any security either as regards price or prompt sale. There are lots of concentrates remaining unsold for more than six months."

The stock of tin in Hong Kong on Jan. 1, 1918, was 1500 long tons. The quantity imported into Hong Kong from Yunnan during the first six months of 1918 is estimated at 6000 long tons.

Lead—Producers are oversold, and the general situation is rather tight again.

Zinc—During most of the week there were no inquiries worth mentioning, and, on the other hand, there being no pressure to sell, the quotation of the market was mainly nominal. November spelter is scarce, or looks to be, but December is easily available. Some sellers are interested in placing contracts for January and later delivery, but buyers will not become interested. This market in its dullness is for the moment reflecting the general bewilderment. Nobody wants to buy except for immediate requirements. Today there were a few small orders from Western galvanizers. Brass special was offered at 8.60c., November shipment. Intermediate sold at 10½c., New York. High-grade is worth about 11½ cents.

The failure of smelters, except one, to buy ore in the Joplin market last week under the new agreement was due only to the fact that the latter had not really gone into effect. The majority of smelters had assented to it, but several important concerns have not yet signed. The terms of the agreement will probably be more generally effective this week.

The Burma Corporation, in combination with Tata & Co., is going to build a zinc smeltery and sulphuric-acid works near Calcutta. The plant will be operated more or less in conjunction with the iron and steel works of Tata & Co. The enterprise has been backed by the Indian government by the promise of a loan of £200,000.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of February 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—This market exhibited demoralization, the quotations on spot at the close ranging from 10 to 11c., a decline of fully 2c. from the previous week. We quote 10½c. as an average. Everyone who had any antimony to sell was trying to get rid of it, while buyers were conspicuous by their absence. The fact that the market declined below what is considered by some authorities to be the present average cost of production makes no difference.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—We quote $125@127.50. San Francisco telegraphs $120.

Silver and Platinum

Silver—Nothing of interest has occurred in the silver market since our last report. Prices are unchanged. Shipments to London for the week ending Nov. 2 were 975,000 ounces.

Mexican dollars at New York: Oct. 31, 77½; Nov. 1, 77½; Nov. 2, 77½; Nov. 4, 77½; Nov. 5, —; Nov. 6, 77½.

Platinum—Unchanged.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 2—Blende, per ton, high, $78.46; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $50@52.50; Calamine, basis 40% zinc, $38@40. Average selling prices, blende, $54.84; calamine, $40; all zinc ores, $54.40.

Lead, high, $103.38; basis 80% lead, $100; average selling price, all grades of lead, $99.48 per ton.

Shipments the week: Blende, 9167; calamine, 297, lead, 1313 tons. Value, all ores the week, $645,400.

Only one smelting company's agent met the producers' agreement on the new schedule of zinc-ore prices, based on 60% zinc and the average price of spelter as quoted by the "Engineering and Mining Journal." Other purchasing agents cut prices $2.50 per ton below last week's price and the new schedule price.

Platteville, Wis., Nov. 2.—Blende, basis 60% zinc, highest settlement price reported, $73.25. Base price for premium grade, $75; base price for high-lead blende, $52 per ton. Lead ore, basis 80% lead, $100 per ton. Shipments reported for the week were 1728 tons blende, 116 tons galena, and 329 tons sulphur ore. For the year to date the totals are 107,551 tons blende, 6667 tons galena, and 38,105 tons sulphur ore. During the week 2580 tons was shipped to separating plants.

Other Ores

Antimony Ore—Although England is paying 7s. 6d., or about $1.75 per unit, and thus is obtaining the supplies from South America that used to come hither, the quotation in this market is only about $1 per unit, which is scarcely more than nominal. There are reported to be supplies of antimony ore in warehouses in New York, which have been unsalable for some time.

Chrome Ore—Unsalable, while stocks of ore shipped East on consignment seem to be accumulating.

Fluorspar—High-grade fluorspar, free from silica, is quoted at $30 to $35 per ton of 2000 lb.; for furnace use, less than 10% silica, $21@22 per ton f.o.b. Colorado points.

Manganese Ore—Supplies seem to be ample, and new selling contracts are difficult to effect.

Molybdenum Ore—No sales reported. Market lifeless.

Pyrites—Unchanged.

Tungsten—There is little or nothing doing in the tungsten market this week. Buyers are marking time. A few sales of high-grade wolframite were made at from $25@$26 per unit, and other prices are nominal.

Iron Trade Review

PITTSBURGH—Nov. 5

Reports thus far available from steel companies indicate that production of both pig-iron and steel ingots in October was at least at as heavy a rate as in September, actual output being more, on account of the extra day in the month. The influenza epidemic is, generally speaking, on the wane, but men are still succumbing, and few who have caught the disease have yet returned to work.

A general plan for the cancellation of war contracts has been drawn up at Washington, and submitted for examination and criticism by holders of large contracts. According to this scheme, which seems to meet general approval, all goods manufactured at the time of cancellation will be accepted and paid for. Work on all material in process will be discontinued. Material in process will be valued at cost plus pro rate of profit, and become the property of the Government at that valuation. The term will be construed liberally, to include material provided for the purpose of filling the contract, even if no work has been done on it. The Government will then have the alternative of selling it back to the original owner, or of selling it elsewhere, according to prices obtainable.

The steel trade hopes that Government control of prices and distribution of steel will continue after the cessation of hostilities, for the protection of the industry, but only for the shortest possible period.

Pig Iron—The market is absolutely flat. Current production is well taken up by deliveries on contracts and allocations, but consumers show no disposition to inquire for next year's deliveries. The familiar "waiting market" has succeeded the period in which furnaces refrained from quoting for next year's deliveries upon the hint of the War Industries Board that such transactions would not be favored. No offerings at cut prices are made, and the market is quotable at the set maximum limits: Bessemer, $35.20; basic, $33; No. 2 foundry, $34; malleable, $34.50; forge, $33, f.o.b. furnace, freight from the Valleys to Pittsburgh being $1.40, and from six detached furnaces somewhat less. W. P. Snyder & Co. report average prices realized on sales of Valley iron during October at $35.20 for bessemer and $33 for basic. The average quotation on No. 2 foundry in October was $34. Basic and foundry were advanced by the War Industries Board $1 a ton for deliveries after September 30.

Steel—The market is practically stagnant, as surplus production of unfinished steel of all mills is allocated to other mills. Middlemen under the regulations cannot act as merchants in unfinished steel, but may, it is understood, conduct brokerage operations, collecting commission from the seller. There is, however, no such business offered. When cancellations of war-steel contracts begin, there is likely to be a great deal of business in partly finished steel. The market remains quotable at the maximum limits: Billets $47.50; sheet bars and small billets $51; slabs, $50; rods, $57.

Ferro-Alloys—Ferromanganese is quiet, large consumers finding themselves covered fully as far ahead as they wish. Small consumers are occasionally in the market for small prompt lots. The market has not declined but it is fully expected the next change will be in that direction. We quote 70% ferromanganese at $250 delivered and 16% spiegeleisen at $75, furnace.

Coke—Influenza has seriously curtailed production of coke in the Connellsville region and shipments of raw coal have declined even more than those of coke. Byproduct operations are maintained only with difficulty but no important shortages of coke are reported by blast furnaces. The Fuel Administration continues its efforts to increase coke production and to bring about a further improvement in quality. With the easier coal situation now developing, it may be possible to meet more fully the requirements of byproduct plants as to the exact character of coal furnished. In a number of cases it has been impossible to give byproduct plants the coal best suited to their requirements.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	101.125	32.361	44.324	49.500
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(*a*)	207.443	318.875
April	55.910	(*a*)	220.171	329.905
May	63.173	(*a*)	245.114	364.217
June	62.053	(*a*)	242.083	331.925
July	62.570	(*a*)	242.181	360.347
August	62.681	(*a*)	243.978	380.900
September	61.542	(*a*)	244.038	343.905
October	61.851	(*a*)	247.467	335.543
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(*a*) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	8.050	6.650	7.750	30.500	29.50
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	43.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.[illegible]73	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	......	33.95	......	33.95	......
December	37.25	......	33.95	......	33.95	......
Year	$43.57	......	$39.62	......	$40.83	......

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 4
Alaska Gold M.	5
Alaska Juneau	2¾
Am.Sm.&Ref.,com.	88⅛
Am. Sm. & Ref., pf.	110
Am. Sm. Sec., pf., A.	92
Am. Zinc	14¾
Am. Zinc, pf.	50
Anaconda	70⅝
Batopilas Min.	1⅞
Bethlehem Steel	62¼
Butte & Superior	24
Butte Cop. & Zinc	10¾
Cerro de Pasco	36¾
Chile Cop.	22¼
Chino	42
Colo.Fuel & Iron	39
Crucible Steel	55½
Crucible Steel, pf.	89½
Dome Mines	14⅝
Federal M. & S.	13½
Federal M. & S., pf.	41
Great Nor., ore ctf.	31⅛
Greene Cananea	55⅛
Gulf States Steel	66
Homestake	86
Inspiration Con.	54⅛
International Nickel	33¾
Kennecott	39⅜
Lackawanna Steel	71½
Mexican Petrol	102¼
Miami Copper	27⅝
Nat'l Lead, com	61
National Lead, pf.	105¼
Nev. Consol.	20⅛
Ontario Min.	7⅜
Ray Con.	24¾
Republic I.&S.,com.	79⅞
Republic I. & S., pf.	99¾
Sloss-Sheffield	50½
Tennessee C. & C.	16⅛
U. S. Steel, com.	101¼
U. S. Steel, pf.	11[illegible]
Utah Copper	88½
Va. Iron C. & C.	69

BOSTON CURB*	Nov. 4
Alaska Mines Corp.	‡.12
Boston Ely	.90
Boston & Mont.	.45
Butte & Lon'n Dev.	.14
Calaveras	1¾
Chief Con.	3½
Contact	‡.15
Corbin	.10
Cortez	.17
Crown Reserve	.18
Crystal Cop.	.29
Eagle & Blue Bell	2¼
First Nat. Cop.	1⅞
Houghton Copper	.35
Intermountain	.05
Iron Blossom	.38
Iron Cap	18¼
Mexican Metals	.30
Mines of America	1⅛
Mojave Tungsten	.08
Nat. Zinc & Lead	.08
Nevada-Douglas	.35
New Baltic	.75
New Cornelia	17½
Oneco	.20
Pacific Mines	‡.35
Rex Cons.	.06
Yukon Gold	.95

SAN FRAN.*	Nov. 4
Alta	.03
Andes	.04
Best & Belcher	.01
Caledonia	.01
Challenge Con.	.03
Confidence	.10
Con. Virginia	.14
Gould & Curry	‡.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.02
Mexican	.10
Occidental	.40
Ophir	.03
Overman	.01
Savage	‡.02
Sierra Nevada	.01
Union Con.	06
Utah Con.	.01
Belmont	2.50
Jim Butler	47
MacNamara	.21
Midway	.07
Mont.-Tonopah	.09
North Star	.06
Rescue Eula	.08
West End Con.	1.07½
Atlanta	.03
Booth	.02
Comb. Frac.	‡.02
Florence	.10
Jumbo Extension	.08
Kewanas	.03
Nevada Hills	.02
Nevada Packard	.23
Round Mountain	.16
Silver Pick	.02
White Caps	11
United Eastern	4.00

COLO. SPRINGS*	Nov. 4
Cresson Con.	5.00
Doctor Jack Pot	.03½
Elkton Con.	.05
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.75½
Granite	.19
Isabella	.05½
Mary McKinney	.07
Portland	1.00
United Gold M.	.12
Vindicator	.30

BOSTON EXCH.†	Nov.
Adventure	‡.60
Ahmeek	79½
Algomah	.25
Allouez	‡48½
Ariz. Com., ctfs.	15[illegible]
Arnold	‡.20
Bingham Mines	‡ 10
Bonanza	‡.16
Butte-Balaklava	.30
Calumet & Ariz.	70½
Calumet & Hecla	455
Centennial	‡11[illegible]
Copper Range	48[illegible]
Daly West	‡2[illegible]
Davis-Daly	5¼
East Butte	11
Franklin	3[illegible]
Granby	‡79
Hancock	7½
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	25½
Keweenaw	1
Lake	‡5¼
La Salle	3
Mason Valley	‡3[illegible]
Mass	‡4[illegible]
Mayflower	4
Michigan	‡4[illegible]
Mohawk	57
New Arcadian	1[illegible]
New Idria	‡13
North Butte	14
North Lake	‡.40
Ojibway	.75
Old Dominion	‡42½
Osceola	55
Quincy	68
St. Mary's M. L.	‡49
Santa Fe	.60
Seneca	14[illegible]
Shannon	4
Shattuck-Ariz.	‡14
So. Lake	1½
So. Utah	‡.12
Superior	6[illegible]
Superior & Bost.	4[illegible]
Trinity	3[illegible]
Tuolumne	.94
U. S. Smelting	47½
U. S. Smelt'g, pf.	47
Utah Apex	2[illegible]
Utah Con.	9[illegible]
Utah Metal	2
Victoria	‡2½
Winona	‡1[illegible]
Wolverine	‡21½
Wyandot	‡.50

N. Y. CURB†	Nov. 4
Big Ledge	[illegible]
Butte & N. Y.	‡.75
Butte Detroit	‡.05
Caledonia	.47
Calumet & Jerome	[illegible]
Can. Cop. Corpn.	1[illegible]
Carlisle	‡2
Cashboy	.04
Con. Ariz. Sm.	‡1[illegible]
Con. Coppermines	5¼
Emma Con.	‡.03½
Goldfield Con.	.17
Goldfield Merger	.01
Greenmonster	‡[illegible]
Hecla Min.	5[illegible]
Howe Sound	4
Jerome Verde	50
Louisiana	‡[illegible]
Magma	32
Majestic	.22
Marsh	.03½
McKinley-Dar-Sa.	‡.40
Milford	‡.75
Mother Lode	.39
Nixon Nevada	.35
Ohio Cop.	.75
Rawley	‡2½
Ray Hercules	4
Richmond	‡.56
Rochester Mines	.34
St. Joseph Lead	15
Standard S. L.	[illegible]
Stewart	.10
Success	.09
Tonopah	‡2½
Tonopah Ex.	1[illegible]
Tribullion	[illegible]
Troy Arizona	.09
United Verde Ext.	37
United Zinc	[illegible]
Utica Mines	‡.08

TORONTO*	Oct. 29
Adanac	‡.08
Bailey	.03
Beaver Con.	.28
Chambers Ferland	‡.09
Coniagas	4.50
Hargraves	.03
Kerr Lake	6.00
La Rose	.37½
Min. Corp. of Can.	2.00
Nipissing	8.37
Peterson Lake	.09
Temiskaming	.29
Wettlaufer-Lor.	.02
Davidson	.25½
Dome Exten.	.23
Dome Lake	.10
Hollinger	5.00
McIntyre	1.50
Newray	.13
Porcu. Crown	.16
Teck-Hughes	.20
Vipond	.18
West Dome	.10

* Bid prices. † Closing prices. ‡ Last quotations

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	4.25	5.52	5.52	6.55	5.52	9.50
No. 12	4.30	5.57	5.57	6.60	5.57	9.55
No. 14	4.35	5.62	5.62	6.70	5.62	9.60
Black						
Nos. 18 and 20	4.80	6.32	6.32	7.30	6.32	9.80
Nos. 22 and 24	4.85	6.37	6.37	7.35	6.37	9.85
No. 26	4.90	6.42	6.43	7.40	6.42	9.90
No. 28	5.00	6.52	6.52	7.50	6.62	10.00
Galvanized:						
No. 10	5.25	6.97	6.97	....	6.87	.....
No. 12	5.35	6.97	6.97	7.85	6.82	
No. 14	5.35	6.97	6.97	8.00	6.97	...
Nos. 18 and 20	5.65	7.17	7.17	8.15	7.27	11.40
Nos. 22 and 24	5.80	7.32	7.32	8.30	7.32	11.55
No. 26	5.95	7.47	7.47	8.45	7.47	11.70
No. 28	6.25	7.77	7.77	8.75	7.77	12.00

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$55.00	$38.00	$65.00	$38.00
Standard openhearth rails	57.00	40.00	67.00	40.00
Light rails, 8 to 10 lb	3.13½*	83.00	3.13½*	68.00
Light rails, 12 to 14 lb	3.09*	82.00	3.09*	67.00
Light rails, 25 to 45 lb	3.00*	75.00	3.00*	65.00

* Government price per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, 9/16-in. and larger	$3.90	$5.00	$4.50	$5,30	$6.70
Track bolts	4.90	6.25	5.50	Premium	8.00
Standard section angle bars	3.25	3.65	4.45	Premium	5.15

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$4.27	$5.25	$4.27	$4.27	$5.25	$5.05
Channels, 3 to 15 in.	3.00	4.27	5.25	4.27	4.27	5.25	5.05
Angles, 3 to 6 in. ¼ in. thick	3.00	4.27	5.25	4.27	4.27	5.25	5.05
Tees, 3 in. and larger	3.00	4.27	5.30	4.27	4.27	2.55	5.05
Plates	3.25	4.52	10.00	4.52	4.52	5.50	5.28

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4–5	$4.50

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL	Mill Pittsburgh	Warehouse: New York Current	Warehouse: New York One Year Ago	Warehouse: Chicago	Warehouse: St. Louis	Warehouse: San Francisco	Warehouse: Dallas
¾-in. and larger	$4.65	$5.675	$7.00	$5.57	$5.55	$6.70	$7.00
CONE HEAD BOILER							
¾ in. and larger	4.75	5.775	7.10	5.67	5.65	6.80	7.10
⅝ and 11/16	4.90	5.925	7.25	5.82	5.80	6.95	7.25
½ and 9/16	5.25	6.275	7.60	6.17	6.05	7.30	7.60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+17½%
Galvanized cast steel rigging	2½%
Bright plow steel	30%
Bright cast steel	17½%
Bright iron and iron tiller	List

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$5.75	$7.75	$6.50	$6.25	$8.00	$7.25
Assorted	5.90	7.75	6.50	6.40	8.25	7.50

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh

Iron bars	3.5c.	Steel bars	2.90c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
$0.12	$0.16½	$0.18	$0.19	$0.18½	0.16½

DRILL STEEL—Warehouse price per pound

	New York	St. Louis	Birmingham	Denver
Solid	16c.	14c.	15c.	16c
Hollow	24c.	25c.	.	28c

PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Butt Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	44%	17%	¾ to 1½	33%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

Lap Weld

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

Butt Weld. Extra Strong Plain Ends

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

Lap Weld. Extra Strong Plain Heads

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
¾ to 3 in. butt welded	40%	43%	41.9%
3½ to 6 in. lap welded	36%	39%	37.7%

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
¾ to 3 in. butt welded	28%	28%	26.9%
3½ to 6 in. lap welded	25%	25%	23.9%

Malleable fittings, Class B and C, from New York stock sell at list plus 15%. Cast iron, standard sizes, 5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$2.50*	List	$1.25	$1.65	$0.98	$2.00
Hot pressed hexagon	2.50*	List	1.05	1.50	.78	2.00
Cold punched square	2.50*	List	.75	1.25	1.00	1.50
Cold punched hexagon	2.50*	List	.75	1.25	1.00	1.50

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	50–10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	30%	40–10%	37%
Larger and longer up to 1 in. by 30 in.	15%	20–5%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York	$2.50	Cleveland	List	Chicago	$2.50

For cast-iron washers the base price per 100 lb. is as follows:

New York	$5.00	Cleveland	$4.25	Chicago	$4.50

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tarfelt (14 lb. per square of 100 sq. ft.)	$64	$65
Tar pitch (in 400-lb. bbl.)	21	22
Asphalt pitch (in barrels)	40	45.50
Asphalt felt	72.50	77.20

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.45	$1.70	$1.85	$2.10	$2.25	$2.50
No. 2 grade	1.30	1.55	1.65	1.90	2.00	2.25

Asbestos asphalt-saturated felt (14 lb. per square) costs $5.35 per 100 lb

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.40 per roll in carload lots and $2.65 for smaller quantities.

Shingles, red and green slate finish, cost $5.75 per square in carloads, $6.00 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
[illegible]	$.055	$0.11	$0.162
Cincinnati	.07275	.1361	.1834
Kansas City	.0786	.15	.205
[illegible]	.09	.17½	.30
Los Angeles	.0668	.12	.20
New Orleans	.125	.195	.29

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under Y. P.	Fir	Hemlock	Spruce	12 x 12-In. 20 Ft. and Under Y.P.	Fir
Cincinnati	$39.00	....	$38.00		$43.00	$42.00
Kansas City	38.00	40.50	$40.50	$38.50	43.00	42.50
Seattle	24.50	24.50	24.50	24.50	24.50	24.50
St. Paul		52.00	48.00	48.00	......	60.00
Denver	43.00	35.50	......	......	......	40.00

	1-In. Rough, 10 In. x 16 Ft. and Under Y.P.	Fir	Hemlock	2-In. T. and G. 10 In. x 16 Ft. Y.P.	Fir
Cincinnati	$45.00	....	$41.00	$44.00	$40.00
Kansas City	45.50	$54.75	54.75	52.25	60.00
Seattle	24.50	24.50	24.50	24.50	24.50
St. Paul	62.50	45.00	43.00	......	48.50
Denver	43.25	34.50	34.50	35.00	33.00

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.50	$4.37	$4.75	$4.32	$5.35
Cut	4.00	6.50	....	4.47	6.75

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Current	One Month Ago	One Year Ago
New York	$4.00	$3.35	$2.22
Jersey City	3.64	2.99	2.16
Boston	3.67	3.59	2.37
Chicago	2.45	2.45	2.21
Pittsburgh	2.55	2.55	2.31
Cleveland	2.72	2.72	2.44
Denver	3.67	3.67	3.20

LIME—Warehouse prices:

	Hydrated per Ton Finished	Common	Lump per 300-Lb. Barrel Finished	Common
New York	$16.50	$13.50	$2.70	$2.45
Kansas City	22.00	.....	2.35*	2.20*
Chicago	18.00	17.50	1.80*	1.10*
St. Louis	22.00	16.00	.....	1.75
Boston	22.00	18.00	3.45	3.15
Dallas	16.50	......	.....	....
San Francisco	20.00	......	.....	2.15
St. Paul	25.00	19.00	1.60*	1.50*
New Orleans	......	16.45	1.97	1.93
Cincinnati	14.20	......	.....	11.95‡
Denver	26.25	13.20	...	2.40*
Los Angeles	22.00	......	18.00‡	14.50‡
Seattle	25.00	......	.....	2.50†

* 200-lb. barrels. † Per 180-lb. barrel. ‡ Per ton.

Note—Refund of 10c. per cloth bag, amounting to $2 per ton.

LINSEED OIL—These prices are per gallon:

	New York Current	One Year Ago	Cleveland Current	One Year Ago	Chicago Current	One Year Ago
Raw per barrel	$1.61	$1.23	$1.75	$1.30	$1.65	$1.27
5-gal. cans	1.76	1.33	2.90	1.40	1.85	1.37

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound:

	Red Current Dry	In Oil	1 Year Ago Dry	In Oil	White Current Dry and In Oil	1 Yr. Ago Dry and In Oil
100-lb. keg	14.00	14.50	13.25	13.50	14.00	13.00
25- and 50-lb. kegs	14.25	14.75	13.50	13.75	14.25	13.25
12½-lb. keg	14.50	15.00	13.75	14.00	14.50	13.50
5-lb. cans	.....	.....	15.25	15.50	16.00	15.50
1-lb. cans	.....	.....	.....	.....	17.00	.....

MINING AND MILLING SUPPLIES

HOSE—

Fire

	50-Ft. Lengths
Underwriters' 2½-in	85c. per ft.
Common, 2½-in	40⅓%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.60	$0.35	$0.30

Steam—Discounts from List

First grade 25% Second grade 30% Third grade 40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	40+5%	35%
Chicago	45%	40+5%
Birmingham	35%	35%
Denver	40%	30%
Cincinnati	40—10%	40%

RAWHIDE LACING—40—5% off list.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft., ¾-in., 6; ⅞-in., 4½; 1-in., 3⅓; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.34½	Denver	$0.35½
New York	.34	Kansas City	.34
Cincinnati	.34¼	San Francisco	.32
Chicago	.33	Seattle	.34
St. Paul	.34	St. Louis	.34

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Chrome brick	net ton	$175.00
Chrome cement	net ton	75.00
Clay brick, 1st quality fireclay	per 1000	50.00—$55.00
Clay brick, 2nd quality	per 1000	35.00— 40.00
Magnesite, raw	ton	30.00— 35.00
Magnesite, calcined	ton	32.00— 35.00
Magnesite, dead burned	net ton	32.00— 35.00
Magnesite brick, 9 x 4½ x 2½ in.	net ton	110.00—125.00
Silica brick	per 1000	50.00— 60.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade, $55; St. Louis grade, $40.

Birmingham—Fire clay, $50; silica, $50; magnesite, $110; chrome, $165.

Chicago—Second quality, $25 per ton.

Denver—Silica, $35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	1.48	1.37
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2.70	1.92

Prices per tie at Missour mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Red Oak Treated A Grade 6x8x8	
No. 1	$0.59	No. 1	$0.36
No. 2	.77	No. 2	.53
No. 3	.90	No. 3	.72

7x9x8 treated white oak	1.05
7x9x8 treated red oak	.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago In Bbl.	Car	Denver In Bbl. Lots	In Carload Lots
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	$0.60	$0.70	$0.65	$0.76	$0.62
Pure destructively distilled pine oil	.60	.60	.57	.55	.....
Pine tar oil, sp. gr. 1.02 = 1.035	.35	.40	.38	.65	.....
Crude turpentine	.45	.70	.65	.60	.....
*Hardwood creosote, sp. gr. 0.96-0.99	.23	.40	.38	.42	.....

* F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	$52.00	$58.00
Chicago	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	60%	80%	Black Powder*
New York	......	$0.31½	$0.38½	....	$2.50
Boston	$0.25¼	.28¼	.35¼	.42¼	2.50
Cincinnati	.19¾	.23¾	.29¾	....	2.45
Kansas City	.21½	.27¾	.34¾	.44¼	2.55
Seattle	......	.25½	.32½	....	.....
Chicago	.19¾	.23¾	.34	.44	2.45
St. Paul	.20	.27¾	.34¾	....	2.45
St. Louis	.20	.27½	.34½	.44½	....
Denver	.18¼	.26	.33	.43	2.55
Dallas	.26	.33¼	.40¼	.50¼	....
Los Angeles	.22	.29	.37	....	3.05

CHEMICALS

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 44c.; Chicago, .31½c.; St. Louis, 35c.

SODIUM SULPHIDE—In New York the price per pound is 8½c. for concentrated, 4½c. for crystals. The St. Louis price is 9½c. for concentrated, 20c. for fused; the Chicago price is 7½c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb.; Chicago, 16c.; Denver, 14c. f.o.b. Pueblo; St. Louis, 16c.

ALUMINUM DUST—Chicago price is $1.65 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drums Per Drum
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo	124.00	119.00	1.74
West Coast	129.00	124.00	1.81

Engineering and Mining Journal

November 16, 1918

Volume 106

Number 20

GOLDEN EAGLE MINE SHAFT AND HOIST HOUSE, WITH MILL IN BACKGROUND

Reopening the Golden Eagle Shaft

BY F. DEAN BRADLEY*

The shaft at the Golden Eagle mine at Haydenhill, Calif., was reopened early in 1917 after being neglected since 1912. Caving had occurred throughout the greater part of its depth, and the old timber was practically worthless. Retimbering was done with few mishaps and at low cost.

AFTER several years of idleness, the Golden Eagle mine at Haydenhill, Calif., was reopened[1] in 1917. Up to 1915, repair work had been done on he levels to keep them open, but the shaft had been neglected except for such work as was imperatively needed. The mine was under water to about the 600 evel. The sump was a little below the 800 level. The workings were open during the summer of 1916 to a point below the 300 level, but had been closed for a ear or more between the fourth and fifth levels, to what extent it was not known.

The exceedingly wet winter and spring of 1916 and 917 created serious difficulties underground, as well as on the surface. When the reopening of the mine was undertaken, in the late spring of 1917, it was found that further caving had taken place around the 100 level, although the shaft was still open. Bulkheads had been built across the manway compartment on all levels, and in both compartments on the 400 level, before the mine closed down. Other than these few facts, little was known of the real condition of the shaft.

The old timbers near the surface were badly out of line, but an average was established with a plumb line, and the new collar and headframe were set to that. The collar was about 16 ft. above the natural slope of the ground, so that removal and replacement of the superstructure were comparatively easy. Examination of available sets gave evidence that most of the timber above the water level would have to be renewed, and, as it would be necessary to use green timbers throughout, it was decided to make them as light as possible by cutting the size to 8 x 8 in. whenever an entirely new set was placed, instead of the 8 x 10 in. formerly used.

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*With National Metals and Chemical Co., San Francisco, Calif.

[1] The mine has been closed since this article was written.

The old sets[2] were framed with a dovetail, the wall plates extending about six inches beyond the end plate, forming a joint like that commonly used for the divider in the ordinary method of framing. The post daps were only ½ in. deep, which was found unsatisfactory as work proceeded. Many of the old posts had slipped out of their pockets because of the shallowness of the latter. Framing of the new sets was started in the same way, with the idea of economizing on material by using all the old timber which was sound. This plan was soon abondoned. Aside from the fact that most of the sets removed were decayed beyond all usefulness, it was found that the method of framing proposed made much extra work in the shaft. When the sets were hung, it always took two men to set the end plates in place and block them, as there was nothing to keep them from falling out until they were firmly blocked together.

METHOD OF TIMBERING MODIFIED

The regular shaft set,[3] having a horn on each end of all four plates, which enabled them to be supported by the hanging rods until blocked, was adopted and thereafter the work moved more rapidly. The post daps were cut one inch deep, and, behind the lagging, keyboards of 2 x 8-in. timber were used. It was thought that this would give the same strength in timber as the sets of 8 x 10-in. stuff, except that the lagging stood in two inches nearer the shaft on all four sides and saved a great deal of unnecessary trimming, where the ground had squeezed in or the new line crowded the wall.

In all cases where the ground had caved, the old timbers were utilized for filling, so that no pressure came against the lagging. This was found to be a serious defect in the old timbering. Sawed 2-in. lumber was substituted for the split lagging formerly used; the latter was about six inches wide and of variable thickness, blocks or wedges being required for each piece, and could not be used after adopting the key board. There were several thousand of these cut during former operations, and it caused much regret at first that they could not be used, but they subsequently became valuable, as will be shown.

DELICATE PROBLEM ENCOUNTERED NEAR 100 LEVEL

Most of the timber, though badly decayed, stood firmly in place, and, in the beginning, the working platform was put on the set below that which the men were removing. All went well until near the 100-level station. A reconnaissance had been made of this section, a bulkhead placed on both sides of the shaft, and other measures taken to prevent serious accident, should more caving occur. The inspection showed two sets out above the level and 10 or 12 tons of rock on the bulkhead in the manway. The station timbers were sound and the station was open.

The problem was considered delicate but not impossible. The only way it could be safely approached was by proceeding from the top. There was no way to dispose of the waste in the manway, and any disturbance of it there might start a run from above. The station was only half the width of the shaft, the other side being bulkheaded and filled. The fallen timbers had lodged crosswise in the shaft, so that the mass appeared substantial and not likely to fall out unless disturbed. Safety ropes were provided for the men in case any movement took place.

About 4:30 o'clock in the afternoon of the day when the top of the cave was reached, the platform, on which two men were standing, suddenly settled and dropped them about two feet onto the muck. At the same time, the set they were removing pushed in, and the soft loose material filled around them, so that help was required to get them out. Neither was injured, and, after the first scare, they returned to work. This was the only warning that was given of what soon followed.

There was no further movement, and everything stood well until after the men were extricated. The debris had been cleaned down, the bulk of the old timber removed and the new secured by the hanging rods, when about 10 o'clock in the evening, as suddenly as before, the whole mass of rock, timbers and supports beneath the men went down, leaving the shaft open for over 100 ft. below. One man was standing on a wall plate and the other grasped a safety rope when he felt the platform moving, but no one was injured. This was the nearest approach to a serious accident that occurred during the entire progress of the shaft work.

An examination of the damage showed the shaft to be stripped clean of timber to within about 30 ft. of the 220 level, where the fallen material had lodged. The station at the 100 level remained open, although all the timber in the shaft at this point was gone. A large hole had opened on the west end of the shaft, where the cave had started, but probably not over 30 tons of rock had come out. The weight of this on the bulkhead, however, had been sufficient to break the old timbers supporting it, and those below, being half rotten, could not stand the impact when they fell. None of the new timber had been disturbed.

SHAFT CAVED FROM 500 TO 300 LEVEL

A swinging platform was then suspended from the solid sets above, a few more sets of hanging rods were installed, and work proceeded as before. From this point to the 220 level a set was placed every shift. It was necessary to crib from the 220-level station to about 20 ft. above it, as the station supports were gone. This landing was caught up and reopened, and work was resumed in the shaft on the somewhat perilous footing offered by the caved material. Every precaution was taken to safeguard the men in case the material should break through into the open shaft. The miners relaxed their tension, however, as the work proceeded on down past the 300, to 400, and, at last, the 530 level before any sign of timber in place appeared. It subsequently developed that the caving had started at the fifth level and had continued upward, a section at a time, until it was well above the 300 level. This was determined by the occurrence of the caved material in layers of timber, large boulders and fine rock, in their respective orders, followed by succeeding series lying in the same way.

After passing the 220 level, the whole north side of the shaft became loose, so that blocking would not hold. Until the 300 level was reached, the old timber mixed with the rock served to hold it in place long enough to permit placing stulls between the solid ends to block against. There was enough solid ground at the 300 level to hold bearers, and the timber was well anchored there. From that point, however, the ground grew heavier and contained less old timber to bind it. About eight sets below, the cave opened out to include both ends, leaving only one solid wall on the south side. Here was encountered the first real difficulty.

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[2] This type of set, shown in Storms' "Timbering," being used at the Argonaut shaft.

[3] See Storms' "Timbering," p. 79.

GROUND TOO HEAVY FOR SHAFT SETS USED

Six sets of hanging rods had been in use from the 100 level down. As is the usual practice, the top one was removed as each new timber set was swung. New material was ordered, but was delayed in reaching the mine. Every bolt or scrap that could be welded to make a rod of sufficient length was used to make hanging rods. Forepoling had been resorted to as soon as the loose material would no longer stand, and the angle taken by the spiling into the caved rock apparently allowed enough surface to be exposed to downward pressure to throw a heavy vertical strain on the stulls, which, in turn, communicated their forces through the blocking to the timber sets. These were taking weight to such extent that the washers on the top rods were cutting deeply into the wall plates. It was apparent that no more rods could be moved. On the other hand, there was no place an ordinary bearing timber could be set. To stop work and wait for material for hanging rods would cause the loss of most of the crew, which had been secured with considerable difficulty. The situation called for emergency treatment.

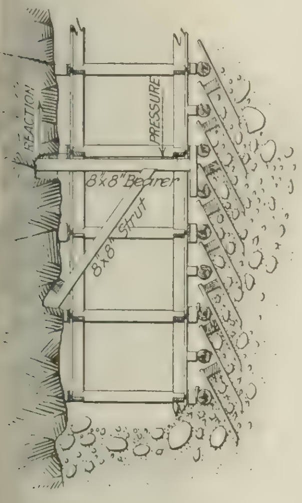

FIG. 1

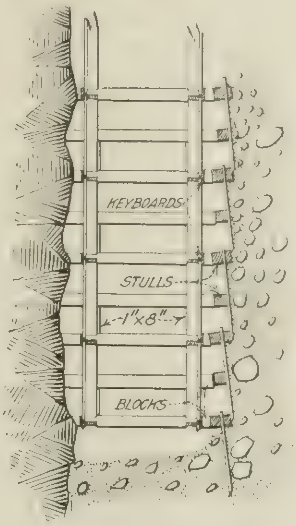

FIG. 2

CANTILEVER BEARER SET REMEDIES TROUBLE

In former years I had had experience in bridge work, and believed that a cantilever could be employed in this case. The rock of the south wall, as stated above, was solid and stood almost vertically. In this two hitches were cut, the lower to take an angular strut from above; the upper in the form of a niche with top and bottom bearing (Fig. 1). A horizontal bearer was inserted in the latter, the strut meeting it about 12 in. inside the north wall plate so as to form an overhang and transmit the pressure from the north side in such a manner that the south end reaction would be upward against the top of the rock niche. The north end of the bearer was then blocked to the stulls, whose side pressure naturally prevented its revolution about the inclined strut.

As it was necessary to go several feet above the lowest set to find solid bearings, it was not possible to line these braces with the timbers, so two of them were placed inside the end plate and divider in the manway compartment. The braces in no way interfered with the operation of sinking, and, when solid bearings were at last secured on both sides of the shaft, they were removed so as not to obstruct the passage for air pipe or other equipment. The settling on the north side stopped immediately after these braces were blocked, and it was possible to take out the hanging rods for the sets below. The arrival of the iron later obviated the necessity for resorting to this treatment again.

From the 400 level, where the last bearing timbers were placed, to the 530 level there was little solid rock. In places, all four sides of the shaft were loose and had to be spiled all around. Where this was necessary the outside lagging was reinforced half way by an additional stull, or bridge, which, in turn, had to be supported by the shaft sets. To overcome undue pressure on the sides of the posts at these points, additional reinforcement was jumped in between the end plates of the two sets (Fig. 2).

In order that the supply of dry split lagging, which was adopted for spiling, might not be exhausted, the spiling was driven with two- or three-inch spacing, except where the rock was too fine. This, of course, necessitated lagging the shaft timbers to secure the shaft against falling rocks, so a modification of the ordinary method of bridging was made. This is shown in Fig. 2, where it appears that the spiling bear against an outer bridge instead of against the wall plate, as would be the case if they had been placed tightly together. The saving in spiling as compared with Fig. 1 is noteworthy.

FEW ACCIDENTS MAR WORK'S PROGRESS

No stoping had been done below the 530 level, and the ledge was far enough from the shaft to cause no damage from sloughing, so from here to the water level, a distance of 565 ft., the work became more or less of a routine order. Timber in place was found one set above the water, where a mass of loose timber was lodged, forming a perfect mat for the caved material. The débris penetrated to about 10 ft. below the water surface. Beneath the surface of the water the old timbers were sound, although considerably out of alignment. It was unnecessary to replace them, so it was easy to bail water and repair from here on.

About 40 ft. from the sump, the material which had escaped the self-constructed bulkhead was encountered and had to be shoveled out. The shaft was very wet after its several years of soaking, but, aside from being uncomfortably warm, the work during the last few shifts was not troublesome. The entire job was completed with only minor injuries to four or five employees, nearly all of which could have been avoided with proper care on the part of the men. In connecting the new with the first few sets of old timbers, the plumb lines showed a difference of ¼ in. at the ends and 1½ in. at the sides, which was somewhat remarkable considering the approximate starting point for the collar.

Not the least interesting feature in connection with his work was the cost. Though it is hardly to be claimed that the job would have been undertaken had the facts been known, the following figures are the best proof of the results obtained as compared with the cost of sinking a new shaft: Direct shaft costs, including foreman, timber, fuel, and necessary materials, $14,497.87; general overhead expense for seven and one-half months, $3,781.17; total cost, $18,279.04. Total shaft recovered, 810 ft.; direct cost per foot, $17.89; total cost per foot, $22.57.

The Golden Eagle shaft has one manway and one hoisting compartment, each 4 ft. 8 in. by 5 ft. 8 in. in the clear. The sets are 5 ft. 2 in. between centers and are fully lagged. It is believed that to have sunk a new shaft of the same dimensions and as well timbered, with the present prices for labor and supplies, would have cost well over $30 per foot.

Molybdenite Near Falcon Lake, Manitoba

The report of the Canadian Geological Survey for 1917 contains a paper by C. L. Bruce on the region near Falcon Lake, Manitoba, near the Ontario bondary, where occurrences of molybdenite have been found and claims have recently been staked. Falcon Lake drains into Shoal Lake, and thence flows south into the Lake of the Woods. During the summer Falcon Lake may be reached from Ingolf, on the Canadian Pacific Ry., by canoe through Long Pine and West Hawk Lakes, and also by way of the Falcon River from Shoal Lake. Through the winter months connection may be made with the railway by road.

The country shows the typical, broken, lake-dotted character of the pre-Cambrian period, and has somewhat greater relief than most areas having similar rocks. The oldest rocks consist of a volcanic complex of schists and ellipsoidal-weathering greenstones, involved in which are certain areas of sedimentary rocks, which have not yet been separately mapped. The volcanics, and probably the sediments as well, are intruded by a fresh, reddish to gray granite-gneiss, which forms the country rock to the northwest and southeast of the narrow belt of basic rocks between West Hawk Lake and Falcon Lake. West of Finnel Lake, which lies just north of Falcon Lake, there are many areas of ellipsoidal-weathering greenstone.

On the northwest side of the basic belt, near the Keewatin-Laurentian contact, a large number of pegmatite dikes of all sizes cut the older formation. Most of these are entirely within the schist and greenstone, but the largest one visible may be the pegmatitic edge of the main body of gneiss. The pegmatites occur in a belt lying parallel to the approximate line of contact between the two formations, and, though not continuous, form a zone about two miles long north of Falcon Lake. It is along this zone that claims have been staked for molybdenite. The pegmatites consist principally of a pink weathering feldspar and quartz, some of the rocks being almost entirely feldspar, though others appear to grade into typical quartz veins. Muscovite is a common constituent of the pegmatites, and beryl is found, although rarely. Some molybdenite occurs in most of the pegmatite dikes, and one sampl showed native bismuth associated with the molybdenite The molybdenite is found with the following physica characters: (1) As a constituent of typical pegmatit dikes; (2) in equigranular granitic dikes, and (3) i quartz veins.

In the typical pegmatite dikes, the molybdenite occurs as crystals, varying from a fraction of an inch u to two inches in diameter. The size of the larger individuals seems to vary according to the distance o the dike from the parent granite mass, the larger crystals being found in the dikes close to the edge o the main granite area. In these dikes, however, the tota amount of molybdenite present is not greater, an possibly is even less, than in those further from the intrusive. In the equigranular dikes the molybdenit crystals are much smaller, occurring in small hexagona plates. In quartz veins molybdenite flakes are foun in veinlets traversing the quartz. The molybdenite bearing quartz veins are not large and contain to little of the mineral to make them workable, even if the were of sufficient size. The equigranular dikes carr more molybdenite than the other types, but all thos seen were too small to be important.

In the pegmatites it is difficult to obtain an idea o the proportion of molybdenite. The crystals are scattered irregularly through the quartz and feldspar, s that a face showing no crystals may show several whe a thin layer has been broken off. Ordinary samplin under such conditions is worse than useless. The onl method of forming an accurate estimate of the conten of a vein is to remove and mill a large quantity. Judging from dike material broken from the face of a sma open cut, the molybdenite content is less than 0.25% At this place the dike is from 2½ to 3 ft. wide and ha been open cut for 20 ft. to a depth of 3 ft. The pegmatitic material breaks easily, and a small quantity o almost pure molybdenite could no doubt be produce by cobbing such material, but it is doubtful whether thi could be done economically with a product of such lo grade as this seems to be. However, the accessibilit of the district, the large number of well-exposed dike varying from 2 to 12 ft. in width, and the ease wit which a considerable quantity of the material could b taken out, without expensive mining machinery, mak it possible that this prospect might be commerciall worked at this time.

The molybdenite content will probably continue constant, but the depths to which the dikes extend canno be foretold. As they undoubtedly join the parent mas of granite below, the depth from the surface to whic they reach depends upon the altitude of the granite, t be ascertained only by drilling or underground wor

Wolfram in Bohemia

Tungsten ores are now being mined successfull from old mines in Zinnwald, Bohemia, that had formerly been abandoned, according to a German periodic quoted in *Commerce Reports*. The production o wolfram ore in Austria prior to the war was negligibl but the old mines in the Zinnwald district alone hav since 1914 yielded 93,000 metric tons of wolfram or Nearly all the ore is shipped across the border to Saxon to be smelted.

Standardization of Mining Methods
II—Standard Machine-Drill Rounds*

By CHARLES A. MITKE†

The purpose of the article is not to deduce a new principle but to present an outline of a course of procedure followed by a mine organization in the development and adoption of a standard machine-drill round, which, with slight variation, would be suitable for all classes of ground. Results obtained from old types of drill rounds were considered, and, by careful experimentation, a design was evolved which accomplishes a maximum advance for the amount of drilling done and the explosive consumed.

Though different operations connected with the driving of drifts and raises are important, in that they have a bearing on the cost, they are, nevertheless subordinate to the actual drilling. Success in drilling depends largely on the type of machine-drill round which is used, and involves a number of important questions, such as the "depth of round to be pulled" (advance), "placing of the cut," and "direction and number of holes necessary."

Too Little Consideration Given to Cost of Breaking Ground

The character of machine rounds is of the greatest importance as well as being a determining factor in the cost of breaking ground when drifting and raising, but it is, in a great measure, left to the individual judgment of the miner, who follows the old-time method employed in hand drilling and places his round according to the slips, fractures, or crevices which appear in the face of the rock. This he believes to be of the utmost importance, the only other worthy consideration being the number of holes to be drilled. If the ground does not break satisfactorily, more holes are considered necessary, and the prevailing idea, not only among the miners but among many shift bosses and foremen, is that the principal factor governing the breaking of ground is the number of holes drilled, without special regard to the direction in which they are driven, except that their position is determined by the faults and slips occurring in the face. In fact, it is a common practice, in cases where a drill round does not break, for the foremen and bosses to order the miner to "put in more holes," without making mention of the direction or depth they should be driven.

An estimate of the average advance per round in ordinary ground would be from 3½ to 4½ ft., with 5 ft. considered good work. At present, practically all rounds are drilled from 6 to 18 in. deeper than the actual advance made. Many miners drill 5 ft. per round, but the total footage made at the end of the month will average only 3 ft. per round. This is due almost entirely to the character of the round.

In rounds where the advance is far less than the ground drilled, the fault in nearly every case lies in the position of the cut holes, as the round will usually break no deeper than the depth of the cut holes, regardless of what depth the other holes are drilled. Consequently, on the position and depth of the cut holes depends the distance of advance of the round.

Earlier Types of Piston Drills Responsible for Lower Position of Cut Holes

The old type of piston drill, with which many miners gained their first experience in machine drilling, is responsible for the placing of the cut holes in the bottom of the drift, as it was necessary to point the holes downward, although this is a difficult position from which to break the ground when the round is blasted. Experience has proved to the miners that it is possible to break the ground with this type of round; therefore it is hard for them to believe that a round having the cut holes placed in some other position may give not only equally good results, but even better, and do more toward removing all the ground drilled than was possible with the old type of round. No round is advanced more than the depth of the holes drilled, but the purpose in working out a standard round is to determine upon the type which, under average conditions, will break all of the ground drilled, in both short and deep rounds. By accomplishing this, the average footage per man per shift would be considerably increased, and this would necessarily result in a decrease in cost.

Standard Round Customary in Tunnel Work

The realization of the advantage of evolving a standard round, though comparatively novel in mining, is not new in tunnel work, in the performance of which rounds are usually driven on contract, and it is to the interest of the contractor to develop a round that will remove the most ground with the least drilling and a minimum amount of powder. Remarkable results have been obtained in tunnel driving, as, for example, in the work at the Mount Royal tunnel, in which a record of 810 ft. per month was established; in operations by the Arizona Copper Co., showing 799 ft. per month, and by the Laramie-Poudre, 653 ft. per month; and at the present time a tunnel is being driven in the Southwest that averages 20 ft. per day, or 10 ft. per shift. Though the advance secured by the use of deep rounds in tunnel work cannot be attained in small mining drifts, nevertheless a type of round may be used which will show a material average increase in the footage over records made with the old type of rounds.

Development of the Standard Round

Some time ago, in an effort to secure a type of round which would break practically all of the ground drilled and which might be considered as a standard for average conditions, a number of experiments were made at the Copper Queen mine. These were carried on in all kinds of ground and under varying conditions, so as to establish a basis for a round which could be adopted as standard.

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*The second of a series of articles which began in the Nov. 9 issue.

†Mining engineer, Bisbee, Arizona.

One of the difficulties encountered in conducting these experiments was the opposition of the older men who had been mining from 15 to 25 years. "I have been mining for 20 years, and none of these young fellows 'round here can tell me how to put in a round"; "These blueprint rounds can only be drilled in the office on paper, but not in the mine underground," and similar expressions reflect the opposition that the proposition encountered. However, when it was properly explained to the men that the company would assume all responsibility in regard to breaking the ground, and that if the round failed there would be no discredit to the miner, they did their best with the particular round in question and afterward frequently presented other types of rounds with which they desired to experiment. Another obstacle which had to be overcome was the objection of the men to the use of one type of round in all classes of ground, regardless of fractures, water courses, faults and other irregularities encountered. In their opinion these variable conditions required special types of rounds, the position and number of holes varying according to the situation of the fractures and faults in the face, all of which should be taken into account.

EXPERIMENTAL TYPES USED IN DEVELOPMENT OF STANDARD ROUND

Some of the experimental types of rounds which have been tried out should prove of interest. Fig. 1 represents the old type of 12-hole round, with the cut holes placed at the lower part of the drift face. The machine column and arm, upon which a No. 18 Leyner was mounted, is diagrammed at the right. The height of the arm above the bottom of the drift was 7½ ft. when the back hole was drilled. It was lowered 1 ft. for the three breast holes, then lowered to 6 ft. in height for the next six holes, and finally the machine was lowered as far as possible for the two lifters. This round was drilled in average ground. Fig. 1A is a side view of the same round, and shows where the holes bottomed when the round was drilled 6 ft. in depth. However, when the shots were fired, the actual advance at the drift was only 4 feet.

Another drift was begun in somewhat harder ground, and the round shown in Fig. 2 was tried out. The lay-out is almost identical with that shown in Fig. 1, although the miner who did the drilling claimed he was using an absolutely new design of round. The results obtained were similar to those secured in the round shown in Fig. 1.

Fig. 3 shows a round used in softer ground, and consequently a fewer number of holes were required. The round was drilled to a depth of 5 ft. The actual advance was only 4½ feet.

A 13-hole round drilled in hard ground, with the depth to which each hole was drilled, is shown in Fig. 4. In blasting, a 50-lb. box of 40% gelatin was used, and 3½ ft. of ground was broken, leaving the face well squared up.

The nine-hole round shown in Fig. 5 was drilled in uniformly soft porphyry. In one drift 4.4 ft. of advance was made during each of 10 consecutive days, 5½ ft. being the average depth of each round. Sixty sticks of 30% gelatin per round were used in this instance.

Fig. 6 shows the plan followed in a 13-hole round that was used in a number of drifts driven in good average ground, the arrows in the face showing where the holes bottomed. One drift showed an advance of 5½ ft. for 13 consecutive days. This type of round represented something new for the miners, and they first ridiculed it by calling it a "blueprint round." However, when the men discovered the footage which they could make by this arrangement of holes, they did not hesitate to use it in their work.

Fig. 7 shows a 14-hole round, which was used in hard ground. The rounds described in Figs. 2 and 4 were tried in this exceptional ground, but as a rule the advance was equivalent to half what it should have been for the ground drilled. In the round shown in Fig. 7 the advance was nearly always equal to the total ground drilled.

Fig. 8 shows a 13-hole round used in a number of drifts in average ground. In one drift 8-ft. steel was used, and the drift was advanced 7½ ft. for a period of 15 consecutive days. The cut holes usually met in the center. On one occasion after the holes were drilled the angles were measured and plotted, as shown in the drawing. When this round was fired it was advanced 7¾ feet.

STANDARD MACHINE-DRILL ROUND FOR DRIFTS

Figs. 9 and 9A show the types of rounds which were finally adopted as standard, and both represent slight modifications of Fig. 8, with which the best results were obtained. The cut holes are situated in the center, and the burden is properly distributed on the different holes. The drift is arched so that it may be used for motor haulage, or, if it is to be timbered, three back holes are used. The numbers at the collars of the holes represent the order in which the shots are to be fired, and the two center holes, numbered "1," are drilled to meet and fired simultaneously. This round was drilled through ground which contained many slips, watercourses and fractures, and compared favorably with another drift in similar ground where the miner used a variable type of round to suit the constant changes in the ground. This latter round advanced only about two-thirds of the footage made by the standard round.

Fig. 9 is a 13-hole round for average ground, and Fig. 9A is a 16-hole round for hard ground, though in softer ground from 5 to 13 holes are frequently found to be sufficient. In these cases the center cut is put in and the same principle carried out as in the harder ground, but the number of holes around the sides and bottom of the drift is reduced.

DEVELOPMENT OF A STANDARD ROUND FOR RAISES

The method of procedure followed in the development of a standard round for drifts was also adopted in working out a standard round for raises, and from the many designs presented and tried out those shown in Figs. 10 and 11 were selected as the most efficient. Fig. 10 is an example of the end cut in a 4 x 6-ft. raise and was a popular cut with the miners, although Figs. 11 and 11A represent the standard type of round adopted for raises. Fig 11 is used in a small raise 4 x 6 ft., whereas Fig. 11A is intended for a 4 x 8 ft. raise. In both cases the

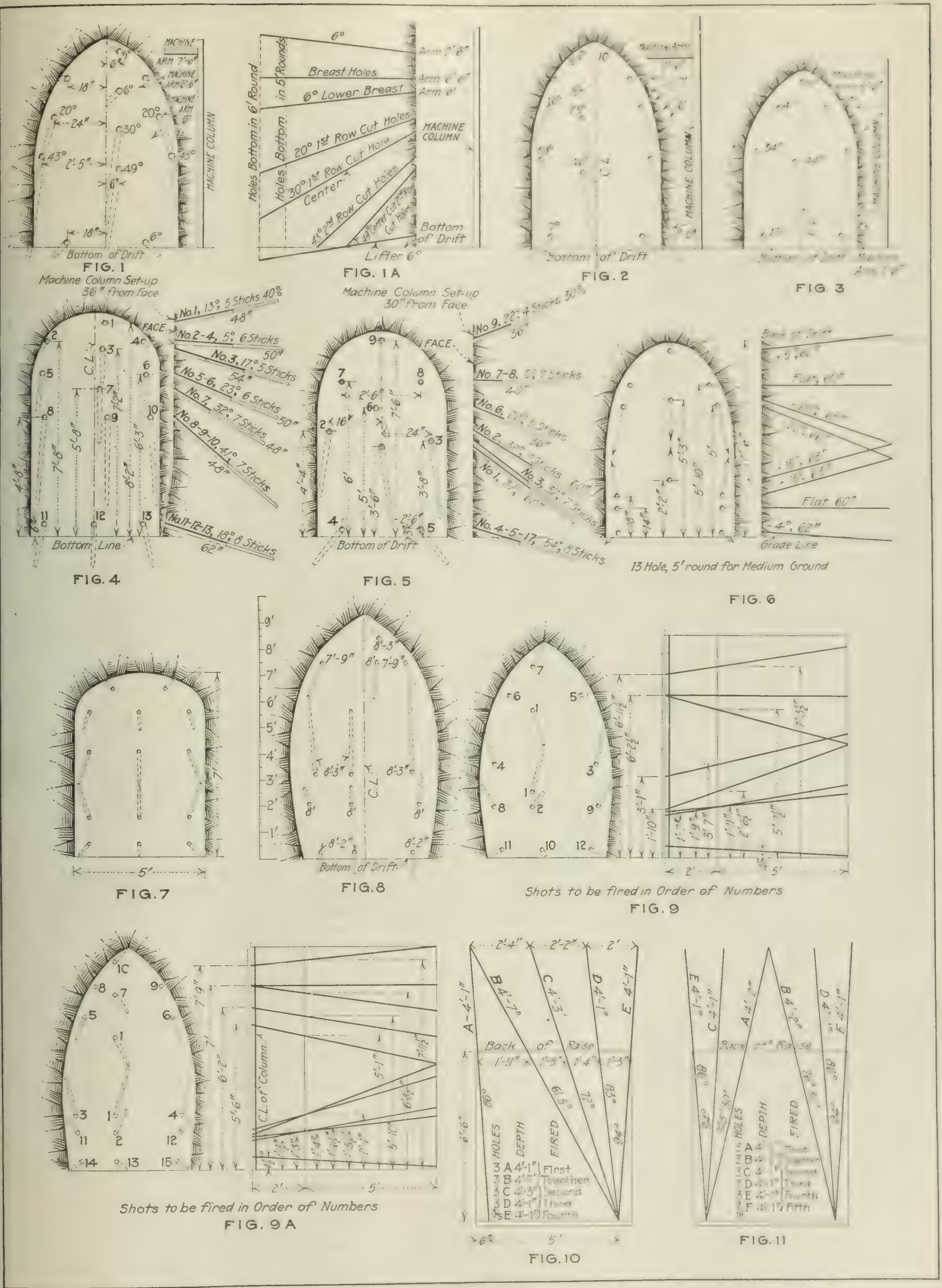

FIG. 1
Machine Column Set-up 36" from Face

FIG. 1 A

FIG. 2

FIG. 3

FIG. 4

Machine Column Set-up 30" from Face

FIG. 5

13 Hole, 5' round for Medium Ground

FIG. 6

FIG. 7

FIG. 8

Shots to be fired in Order of Numbers

FIG. 9

Shots to be fired in Order of Numbers

FIG. 9 A

FIG. 10

FIG. 11

EXPERIMENTAL TYPES OF ROUNDS USED IN DRIFTS, AND STANDARD MACHINE-DRILL ROUNDS FOR DRIFTS AND RAISES

Fig. 9—Standard 13-hole round for drifts. Fig. 9A—Standard 16-hole round for drifts. Correction—In Fig. 5 the depths of holes No. 9, 7-8, 6, 4-5, should be 54 inches.

center cut is used. In the comparative tests between results of the methods shown in Figs. 10 and 11, it was found that Figs. 11 and 11A showed a better footage per man shift than could be obtained with Fig. 10.

STANDARD ROUND FOR TOP-SLICE STOPES

It is impracticable to devise a standard round that will be suitable for all methods of stoping. For example, in cut-and-fill one or two holes properly situated may break as much ore as a round of holes in a square-set stope. However, in horizontal top-slicing there is considerable uniformity in opening up lead sets, so in this special case the same principle which is practised in the standard round in drifts has been applied to this method of stoping, with satisfactory results, and is shown in Fig. 12.

When standard rounds were adopted, orders were given to the foremen to have blueprints made and posted in all the mine offices, so that the bosses might become familiar with them, and instructions were issued to use the standard rounds in all prospect and development work. Wooden models with wires showing the drill holes were then made and placed in the mine offices and later transferred to the miners' change room, so as to give the men an opportunity to familiarize themselves with the standard round. Drill instructors were appointed from among the miners who had made the best footage with the standard rounds, and they were sent to train all the machine men.

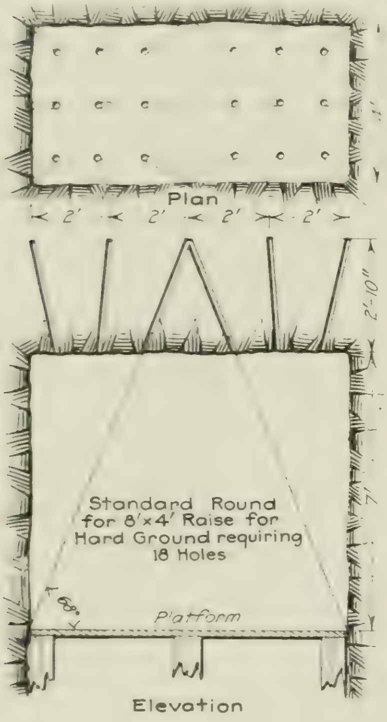
Plan
2'
2'
2'
2'
2'-10"
7'
Standard Round for 8'x4' Raise for Hard Ground requiring 18 Holes
Platform
Elevation

FIG. 11A

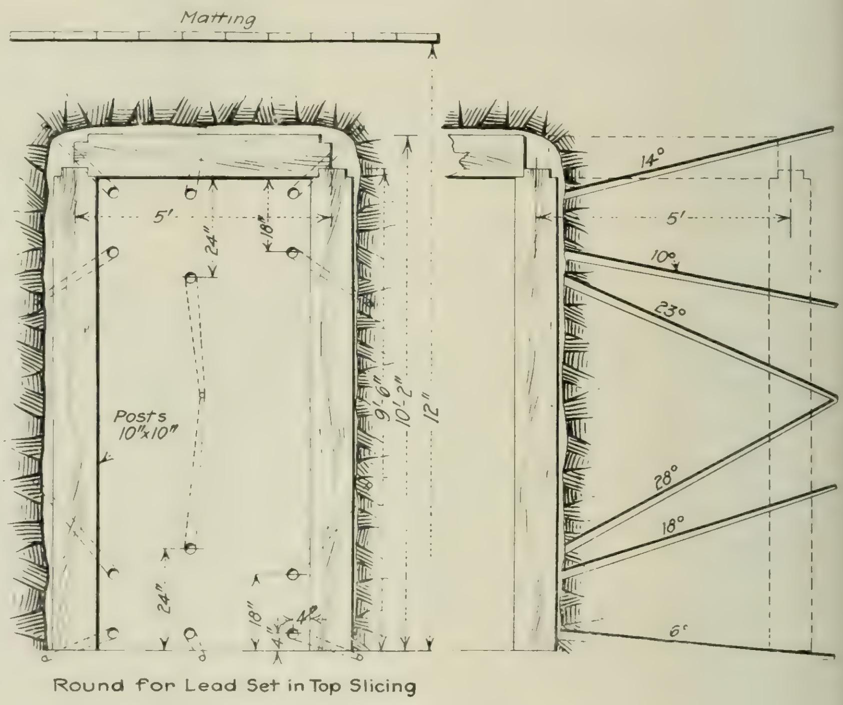

FIG. 12

STANDARD ROUNDS ADOPTED FOR USE IN RAISES AND TOP SLICING

It is advisable that the drill instructor should be a man who has had experience in drilling different types of machine rounds in other camps for different classes of ground. Unless he has had a wide experience of this nature, the men whom he is supposed to instruct, and who have been in other camps themselves, are in a position to argue with him and tell him of the success of certain other rounds in these camps. If he is not in a position to prove to them that such a round is not efficient in the class of ground in which they are at present working, his efforts as an instructor will be unsuccessful. It is therefore necessary for him to have drilled other types of rounds besides the standard, so that he may be able to draw comparisons and prove its worth to the individual miners.

The instructor starts with one miner at a time, instructing him how to drill the new type of round, and stays with him until the miner becomes proficient and is convinced that he can secure further advance with the standard than he could with the other types. After one miner has mastered the standard, the instructor spends several days with another, and so on until all the machine men have become accustomed to the new methods.

In some cases the duty of instructing the men may be performed by a development boss, who acts both as instructor and supervisor of all development work. In others a machine foreman has been employed for this purpose, and his duties are similar to those of the drill instructors and development bosses. The question as to whether instructions should be given by a drill instructor, development boss or machine foreman should be decided according to conditions at the particular mine.

RESULTS ATTENDING ADOPTION OF STANDARD ROUND HAVE JUSTIFIED EXPERIMENTATION

Adoption of the standard round has led to a material increase in the footage per man shift. The amount of ground drilled is usually removed in the blast, as the holes bottom in a vertical plane which leaves a square face for the next set-up. Since the introduction of the standard round, the size and shape of drifts are more uniform, and the men are careful not to drill wild holes and break a lot of unnecessary ground in the back or sides, as they formerly did.

It has been satisfactorily proved that a machine-drill round need not necessarily be drilled according to the slips and breaks in the ground, as the footage advanced by the standard round has far surpassed that obtained with a variable round put down according to the fractures and faults in the face.

In drifts where the bonus system has been instituted, the miners have repeatedly tried and failed to make the bonus when using the old type of round, and have found that it is possible to make the required footage only when the standard round is used.

Abnormal labor conditions and the loss to the mines of large numbers of trained miners who have joined the Army, have, during the last year, detracted from the results formerly obtained from the use of the standard type of round. However, when normal conditions are restored, results as good as if not better than those formerly achieved may be confidently expected.

The Pollution of Streams

By Chesla C. Sherlock*

An old rule of the common law, still in force, is to the effect that streams are common property, and that, whereas an owner of land alongside of which there is a stream may use the water for his own benefit as it passes his land, he must not pollute the water or render it unfit for subsequent use. This rule has resulted in a great deal of litigation, especially in instances in which mining companies have used the water in mining operations, afterward turning it back into its original channel.

It is permissible for a riparian owner, as defined in legal phraseology, to use all the water he desires, but he must not cut off the supply entirely or diminish it to an extent that makes it impossible for owners of other property to use it subsequently. It is permissible to take water freely from streams, which, however, must not be drained, or withheld from others who have equal rights in this connection. Inasmuch as it is often impossible for mining companies to use water without polluting it, or to avoid an actual loss before returning it to the natural stream, thus causing a considerable shrinkage in the normal supply, it can readily be seen that mine owners and operators are liable to be placed between the crossfire of two time-honored legal principles. The mine operator can use the stream, but he will be liable to the lower riparian owners, if they care to bring action for damages.

In a Washington case (Packwood *vs.* Mendota Co., *146 Pac. 163*), the court decided this specific point, holding that a mine operator who took water, for the purpose of washing his ore, which was then turned back into the stream and polluted it, is liable for damages to the lower riparian owners.

In a Pennsylvania case (Eckman *vs.* Lehigh & W. B. Co., *50 Penn. Sup. Ct. 427*), the court expressed the rule clearly, when it said: "The proprietor of a mining operation has no right to discharge culm and other refuse matter of the mine into a stream, or to leave it where it will be carried by ordinary floods onto the land of other persons. If he does so dispose of it, he renders himself liable for any damages resulting therefrom to such owner. Where the material is unlawfully put into the stream, the fact that an extraordinary flood was the contributing cause in carrying it onto the plaintiff's land does not relieve the wrongdoer from responsibility for his act."

In a Federal case (Arizona Copper Co. *vs.* Gillespie, *230 U. S. 46*), the Federal Supreme Court held that a statute declaring all streams to be public, and giving the right to use them for mining purposes, does not concede permission to send waste material or débris down the stream to the destruction or substantial injury of the riparian rights of subsequent users of water. The court further held that a person suffering such damage was entitled to injunctive relief from a continuance of the wrongful act, even though the injury might constitute a public wrong and be one for which a public prosecution might be maintained.

A West Virginia case (State *vs.* Southern Coal and Transportation Co., *71 W. Va. 470*), which involved a coal mine, illustrates a principle of law which is applicable to all mines and mining operations. The court held that, under a statute making it unlawful to throw into or allow to enter a stream any deleterious matter injurious to the propagation of fish, an operator of a coal mine has no right to cause such damage by polluting the stream with sulphurous or foul mine water. This verdict holds even though such water is a product of nature and the operator is under the legal duty to drain it from his mine, and though the stream in question is the natural receptacle of such drainage, and there is no reasonable or practicable way to eliminate the sulphur and other objectionable ingredients in such water before discharging it from the mine and letting it enter the stream.

A Kentucky case, however (*145 Ky. 137*), resulted in a decision that a riparian owner who changes the course of a stream and runs the water over his land, when he knows that it is contaminated with mineral matter, cannot hold the owner of a mine, who caused the contaminated material to enter the stream, in action for damages for the injury done to the land and to the vegetation thereon.

These cases illustrate clearly, I think, the duty and obligations of those responsible for mining or metallurgical operations which may lead to pollution or interference with streams, even when an express statutory license has been granted for their use. A mine operator may use a stream and the water therein, under his right as a riparian owner, irrespective of an express right of statute; but in either case, he must return the water, or a reasonable amount of it, to the stream, free from poisonous substances, uncontaminated and unpolluted. Not only that, but he must prevent poisonous mineral substances from entering the stream, even though they may do so by natural drainage, for he is still bound to consider the lower riparian owner, even if not using the water in the stream himself.

The right of an injured person to recover for damage caused seems to depend upon whether or not he knew and realized that the water was contaminated. If he knew this and took no action, he cannot recover in any subsequent claim.

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Coöperation in Mine Promotion and Management

By PAUL T. BRUHL*

A paper which emphasises the permanent value of honest coöperation between financial houses and their clients, between mining corporations and their staffs. Wealth from mining ventures is unfairly shared, according to the author, and greater facilities should be created to permit more complete participation in benefits on the part of the small stockholder.

THE example of the successful mining magnate in America has not conduced to the general prosperity of the mining world. His career may be dazzling, and may stimulate emulation; but there should be less concern for the ambitions of individuals and more for the general prosperity of the industry. The interests of the majority are not served when the prizes are immense and occasional.

Mining investment in the United States may be considered as a monopoly for a few and a snare for the vast majority of the investing public, and the point is often overlooked that, with the reputable mining company, all the cards should be on the table. There should be ample facilities for shareholders and intending shareholders to inform themselves of the progress and grade of ore in every drive and stope, day by day, week by week, and year by year. In England it is illegal to issue shares at a discount; consequently, long lists of mining stocks are at a premium. A page or even two pages of a daily newspaper are required to publish the transactions that occur during a session of the exchange. Numbers are interested, and critically so. A fierce light of public opinion beats down on the mining financier; and his career is short if he betrays his trust. In America, the mining news is relegated to an obscure corner of the daily paper, and little information is given to the public until after it has been utilized on the inside.

Mining Directors Have Moral Obligations

A Western Australian mine, with shares held mostly in London, was on the down grade. A director met one of the shareholders in the street and asked him if he still held his shares (he had acquired them at the instigation of that director; hence the responsibility). The shareholder inquired the reason for the question, and was informed that the property was turning out badly. Fortunately he had previously sold his shares at a big premium, but he was nevertheless interested, so he asked the director if he had sold *his* holding. What was the reply? "Certainly not. I am a director, and in honor bound to stand by the ship to the last. It is my duty to inform those who were influenced by me to invest; but I cannot take personal advantage of inside information coming to me in a fiduciary capacity." That director retained his entire holding until the mine was liquidated. He lost his money, but he made a name for honesty, and had no difficulty, subsequently, in finding investors for his properties.

Mining investors are always willing to take a chance. They are fully aware that such ventures have a gambling element, but they look for a square deal; and, even when they lose, they will follow the man who stood by them, and will take another chance with him. The lesson has not yet been learned in America that it is easier to market undercapitalized stock at a premium than overcapitalized stock at a discount.

Many of the leading British financial houses have won the confidence of the public by President Wilson's policy of laying the cards on the table—by open diplomacy. All the facts are available; the vendor's share is distinctly shown; the terms are clear on which the public is invited to subscribe. The promoters acquire a large profit, but there is no secrecy as to the amount, and the public can see for itself that the terms are equitable. It knows that, so far as human knowledge can go, facts are exactly as set forth, and realizes that the promoters are taking a proportionate risk. The endorsement of an undertaking by a reliable firm is sufficient to insure oversubscription immediately, and a substantial premium on the shares is almost a certainty.

Financial Houses Should Be Respected by Clients

Compare the methods of business that I have just described, with the peddling of dollar shares for a few cents, laboriously undertaken by the petty satellites of questionable promoters, who often, with good reason, conceal all the particulars that a European mining investor may learn through the daily press. There are hundreds of thousands of investors in many countries who look upon reliable financial houses as a chicken looks upon the mother hen. The old bird selects a warm place for herself, that is, at the same time, the best for the brood, which prospers simultaneously with the parent. No envy is occasioned by the accumulation of fortunes by the directing financiers, when these have been made by coöperative work and ability, instead of by fleecing the junior partners in the common enterprise.

American mining financiers seem to favor the policy of skinning the lamb from the beginning. Neither the property nor the investors are considered. It is a case of "after us the deluge"; and, as a result, there is a constant deluge. What is needed in America, with its enormous resources, is steady development and ever-increasing output—not a few great concerns of fabulous success, and a host of wrecked mines and disappointed shareholders. The aim should be the prosperity of the industry as a whole, not that of a few individuals who wander off with the proceeds to spend them in Paris and in other places, where the outlay does not benefit the country which is the source of the spenders' affluence. Necessarily, there must be a few who gain more than others, but their prosperity should arise from the fact of their having held the larger share—upon coöperation and mutual profit, not on the destruction of the smaller investors.

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The plan of undercapitalizing some prosperous undertaking should be tried, affording the public an opportunity of participating in a shareholding that will inevitably net a large premium. The financial house that secures the reputation for such business will have no difficulty in attracting all the money it requires, and attracting it from the better and saner class of conservative investors. If the suggested tactics are pursued, it will have a far longer, happier, and, ultimately, a more prosperous existence.

The business of a mining finance house is to provide the means for thoroughly investigating properties and honestly calculating their possibilities. Having done this, let it conceal nothing with regard to the preliminary work and expense, and then invite the public to subscribe on a basis that indicates an obvious premium on the shares. The public, under such circumstances, will not grudge the relatively large proportion allotted to the promoters.

Coöperation Desirable in Mine Operation

A similar policy will succeed in the management of the individual undertaking. In many countries millmen and miners look upon their work as a profession. In this country there is a tendency to regard any man, irrespective of age or training, as good enough material. The result is that labor is frequently inefficient, migratory, and little interested in the company's welfare. Just as the financial house should make friends of its shareholders, and practically constitute them a permanent body of partners who can always be relied upon to reinvest the profits of one undertaking in another proposition under the same auspices, so the individual company should make friends with its staff, and enlist the interest of the men in the welfare of the mine. A contented workman swears by his mine, and is proud of it. The miner should be brought to interest himself in the output of a mine, in the same way that a fireman interests himself in the speed trial of his ship. An increase of a dollar a ton in recovery should be an occasion for rejoicing—it should give the workers the exhilarating feeling of having backed a winner.

The popular fallacy that the interests of employers and employees are antagonistic is in no industry more untrue than in mining. If the owners of a mine would see that the worker has reason to boast of his condition and prosperity, they would soon have occasion to boast of their own prosperity.

The shareholder comes into the financial undertaking when the greater risks have been overcome. The mine worker often receives his regular wage during periods when the output does not justify the operation of the mine at all. In both cases those who have borne the risk are entitled to a profit that is large in proportion to the general results. The shareholder receives an approximately even and regular dividend; the worker has an approximately even and regular wage. But when, in either case, luck accrues to the entire undertaking, all should benefit. The recognition that those who take the greater risk are entitled to a larger share should be reciprocated, when unexpected prosperity arrives, by considering the claims of those who have coöperated.

Compressed Air on the Rand

The Victoria Falls, on the Zambesi River, Rhodesia, Central South Africa, are situated at so great a distance from important enterprises that, to date, the vast power available has not been tapped in any way. Its ultimate utilization is, however, inevitable. The Victoria Falls Transvaal Power Co., Ltd., operates a steam-electric plant in the Transvaal. It is the largest undertaking of this kind in the British Empire, says the *Compressed Air Magazine*. Approximately 837,000,000 units (kilowatt hours), or 1,120,000,000 hp. hours, were sent out of the generating stations during the year 1917. This involved burning more than 1,000,000 tons of coal, a large proportion of which consists of "duff," and is a byproduct from the collieries. The year's operations involved the heating and evaporating into steam of about 6,500,000 tons of water, and this quantity was passed through the turbines and condensed in the surface condensers, which required the circulation of approximately 78,000,000,000 gal. of water. The total number of units sold for lighting, power, and tramways by the public utility companies and municipalities of greater London for the year 1916 was approximately 450,000,000 units, or about 40% less than the units sold by the Victoria Falls Transvaal Power Co., Ltd., to the mining industry on the Witwatersrand.

The compressed-air supply is much the largest in the world. During the year 1917 no less than 2,000,000 tons of air passed through the main pipe network from the two compressor stations to the mines for use in driving rock drills, and other purposes. At the time of maximum load each day, air is delivered at the rate of about nine tons per minute.

If

By Berton Braley

(With apologies to Kipling)

If you will bear your part without complaining
In all the toil and struggle of this war;
If you will give your all to help in gaining
The peace of justice that we battle for;
If you will save by thrift and self-denial
That our brave fighters may have what they need:
If you at home will stand up to the trial
As they who battle for true freedom's creed;

If you give your uttermost of labor,
Your finest effort, to your work each day,
Putting no extra burden on your neighbor,
Keeping yourself from slackness or delay;
If you will strain each fiber, nerve and sinew
In smelter, drift, refinery or shaft;
If you will give whatever strength is in you
In full devotion to your trade or craft;

If you will look on loafing as a treason
To those who fight and to your nation's weal;
If you will strive with all your skill and reason
Until we crush the Prussian under heel;
If you will back, with money and endeavor,
The splendid boys who battle "over there,"
You will help to bring a peace that lasts forever
And you can know and say, "I did my share!"

Mining Men in the Service

MAJ. C. L. BERRIAN

MAJ. JOHN SEWARD

CAPT HALLET R ROBBINS

CAPT. E. O. DAUE

The Porphyry Coppers
II—Mining Methods*

By L. H. GOODWIN†

THE contention has often been advanced that many of the supposed advantages of steam-shovel over underground operations have been nullified by the extensive improvements in large-scale underground work; and the statement has been made that even the Utah Copper Co., if it had its mine to open again, would favor an underground mining system. It will be interesting, therefore, to review the results of the steam-shovel work at that mine, as published in its annual reports, and to compare the indicated cost of extracting its orebody by that method with deduced data as to the results that might have been obtained by underground methods. The Utah Copper Co.'s mine presents the best example for such a discussion, even if the fact that the other steam-shovel porphyries have not published sufficient data did not limit consideration of the problem to that property.

The final analysis of the advantage and utility of the respective methods must include a comparison of the entire cost of extracting the orebody by shovel operations with the corresponding cost if done by underground methods. It is manifestly impossible to reach entirely satisfactory and dependable conclusions when initial calculations must be based upon the incomplete data of a mine as yet in only the first stages of its life. When comparison is made, however, between a result obtained by the use of such incomplete data and that achieved by a method in which data from mines of different character had been used, there is slight difference.

INDICATED COSTS OF STRIPPING

The indicated costs of mining the Utah Copper orebody by shovels is best considered under the two heads of stripping and mining, respectively. The report for the year 1917 states that, to the end of that year, 43,978,733 cu.yd. of capping had been removed by stripping operations. This figure does not check exactly with that obtained by adding the respective items covering this operation that are recorded in the annual reports for the several years from the time stripping was started, in 1906, to date. The discrepancy is probably due to some change in the basis of calculation; but this fact does not affect the accuracy of the total net cost of the operation, which appears to have been $16,251,252, or 36.97c. per cu.yd. In the 1914 report, the figure of 115 ft. is obtained by calculation from drill-hole records as the average depth of capping over the whole deposit, and this involves 185,533 cu.yd. of stripping per acre. Applying this figure to the total capping removed to the end of 1917, the amount is equivalent to completely stripping 237 acres. The ore reserves developed are reported to underlie 226 acres; and, as the equivalent of 237 acres has already been stripped, it appears that operations to date have stripped the orebody completely, and a small additional area (the estimate including vertical side slopes only).

The ratio of capping to ore, considering vertical boundaries, is given in the 1913 report as 1 to 4, as against a probable ratio of 1 to 3 when allowance is made for side slopes. To obtain an indicated cost of stripping the entire orebody, it becomes necessary to increase the amount already spent for stripping by 1⅓, or a total of $21,700,000. But it may be assumed that the ratio of 1 to 3 is not sufficiently conservative, and 1 to 2 may be considered a safer ratio of capping to ore. The indicated cost of stripping the entire orebody then becomes twice what it would be if vertical side slopes held, or $32,500,000.

MINING COSTS HIGHER THAN STRIPPING COSTS

At the end of 1917 a developed ore tonnage of 371,752,000 was indicated as remaining under the area to be stripped, and 67,220,700 tons had already been mined from it, making a total of 438,972,700 tons to be considered. The actual operation of mining the ore is exactly the same as that of stripping the overburden, but the cost per unit cannot be assumed to be the same in the two operations. As a matter of fact, it appears that the cost of mining is usually higher than the cost of stripping. In the early stages of operation this will be true for the following and other reasons: Operations in ore are hampered by lack of space because of the limited areas of ore pits; the operations of the ore shovels are more intermittent than those of the waste shovels because the concentrating mill is not as flexible a unit in taking its supply as is the waste dump, and because more trouble is to be expected in supplying cars to the ore shovels; the waste need not be broken to as small sizes as the ore; and probably the capping is somewhat more easily broken than the underlying ore.

Thus, the cost of 36.97c. per cu.yd. indicated in the foregoing for stripping overburden corresponds to about 18.5c. per ton, as one cubic yard in place apparently represents approximately two tons of material. For purposes of comparison, the cost of ore mined by steam shovel during the year 1911 to 1916 inclusive has been computed, and the indicated average is 20.96c. per ton. During the year 1915 this cost was reduced to 16.61c. per ton, which is considerably lower than the indicated average cost of stripping, and in 1916 it was only 20.24c. It is likely that during the middle stages of a mine's existence its mining costs per ton might be as low as its stripping costs. In the latest stages, however, although the difficulties enumerated above will be largely eliminated, they will probably be offset by the increasing depth of operations below the surface, with possibly occasional slides of waste from the sides and similar operating difficulties.

Recognizing the impossibility of obtaining an accurate figure for the average cost of mining the whole orebody, it will perhaps be well to assume that the average cost of shovel mining to the end of 1915, including the low cost obtained during that year, will be as representative as any that could be used. The figures available are for the years 1911 to 1915 inclusive, and indicate that over 29,000,000 tons had been mined, at an average cost of 21.25c. per ton, which is the actual mining cost alone and includes no charges for diamond-drill development and no proportion of prepaid stripping expense, but does include the proper proportion of general and administrative charges. On this basis the indicated cost of mining the whole orebody becomes 438,972,700 × $0.2125 = $93,281,699, and when to this is added the previously obtained indicated cost of stripping it, the total cost of extracting the orebody becomes nearly $126,000,000. To compare with this assumed cost, then, an underground method, in order to compete successfully with the shovel method, must show a total cost, including underground development, of not more than $126,000,000 divided by 438,972,700 tons, or 28.7c. per ton.

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*Part I of this series appeared in the Nov. 2 issue.

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The mine now under consideration used an underground method for a time, and cost figures for most of the work are available. To what extent they are representative of a system that might have been employed to mine the whole orebody, is, of course, unknown, as various external factors may have exerted an influence. That this work was to be but an incident in the mining of the whole deposit was known from the first, and therefore it received comparatively little attention, which tended, of course, toward high costs. A factor which probably worked in the opposite direction was that no attention had to be paid to future operations and that cheap ore could be obtained by sacrificing the usefulness of underground openings. Most of the underground production was secured during the years 1910 to 1913, inclusive, and cost figures were published for the three later years of operation. A résumé shows that more than 3,000,000 tons was mined, at a cost of 52.14c. for direct mining and 16.09c. for development, or a total of 68.23c per ton, which includes the proper proportion of general expense.

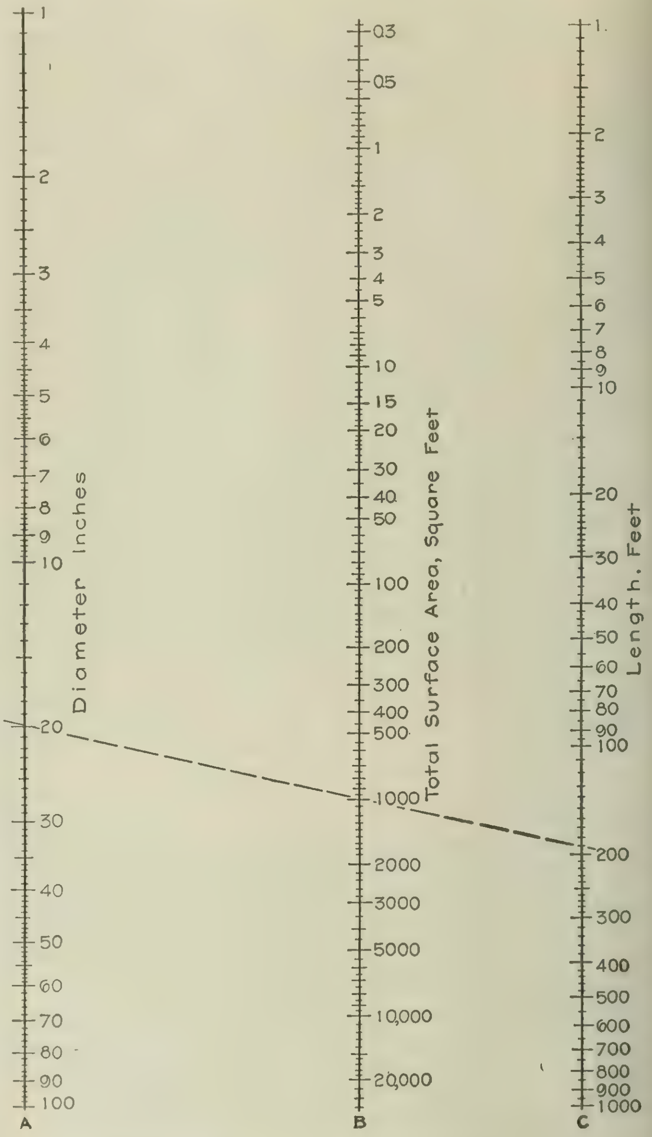
The performance of other mines in underground work conforms, in general, to this result. The new mining plant of the Inspiration is widely regarded as a good example of underground efficiency, and its total unit mining cost, as published for the year 1915, is almost exactly the same as that indicated above for Utah in three previous years, or 68.11c. per ton. This includes a prorated charge of 20.00c. for development expense. In 1916, Inspiration's cost was 60.6c. per ton, including the same prorated development charge. At the Ray Consolidated property the average cost of mining, including a charge for development for 9,889,359 tons milled during the five years ending with 1915, was 80.84c. per ton.

A comparison of the most favorable results secured by underground operation with the deduced figure for shovel operation shows a large saving by the latter method. Though many of the figures presented may perhaps be regarded as not applicable to the Utah orebody, the indicated saving is thought to be large enough to cover all possible contingencies. The consideration of contingencies may be grouped under three heads, namely, the possibility of higher costs by steam-shovel operations than are indicated, that of lower costs by underground operations, and the comparative merits of the two systems as regards efficiency in extracting the ore, with reference, particularly, to admixture of waste with ore.

Chart for Determining Pipe Areas

By W. F. Schaphorst*

The accompanying chart will be found convenient for determining the radiating surface of all kinds and sizes of pipe; the heating surface of boiler tubes, superheater flues, condenser tubes; the square feet of surface of refrigerating coils; the square feet of metal needed for circular ventilating and heating ducts; and for like purposes; in fact, wherever it is desired to find the area of a cylinder.



A CONVENIENT CHART FOR DETERMINING PIPE AREAS

As will be noticed, the chart's range is wide—from 1 to 100 in diametral measurement and from 1 to 1000 ft. lineal measurement. The dotted line drawn across the chart, for example, shows that where the diameter is 20 in. and the length 191 ft., the total area is 1000 sq.ft. The chart may also be used "backward" to advantage. For example, if any figure in column *C* is known, and the total radiating area in column *B* is known, a straight line through the two points will give the current diameter in column *A*.

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Effective Tube-Mill Liners

By A. W. ALLEN

WHEN inadequately protected, the head castings of tube mills are likely to wear and fracture, causing serious accidents and delays. The fundamental requirement for effective protection of a nonrenewable surface is that the liner should be in direct contact with the material to be shielded. The danger of scouring is always increased when a space intervenes between the two; and the life of the liner is, moreover, lessened. Stamp-mill operators maintain that, after a mortar-box liner has worn through so that the casting behind it is badly cupped, the life of any new liner which is placed over the worn part will be comparatively short. This may be due to the fact that absolute rigidity cannot be maintained, as is the case when the liner is bolted to an even, unworn surface.

Makers of crushing and grinding machines often ship a tube mill which has dished end-castings. Liners accompanying it are sometimes well designed for the purpose, sometimes totally inadequate. Fig. 1 shows an example of the latter type. Mills of this class were installed in one instance within my recollection, and it was apparently taken for granted that the liners were suitable. After a few months of operation the sharp edges of the end- and trunnion-liner plates wore away, thus permitting access to the space between liner and shell. Gravel, sand, and, later, pebbles found their way there, and rapidly scoured the surface. This evidently passed unheeded for several months; or if noticed, the amount of damage done was not realized. In due course the metal was worn to such an extent that the shell fractured at its weakest spot—the junction between trunnion and head—and the mill collapsed, resulting in expense and interruption of operations.

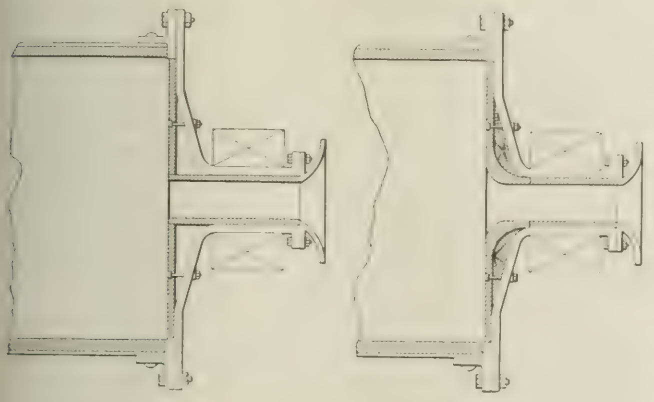


Fig. 1 Fig. 2

TUBE-MILL HEAD LINERS

Attention was then directed to the design of the liners originally purchased with the mill, and a radical alteration was contemplated, Fig. 2 showing the style adopted. The liners were cast locally from scrap metal in convenient sections, were held in position by means of bolts in the usual way, and supported, as were their inefficient predecessors, by radial ribs which formed a part of the original head casting. The space between liner and shell was taken up with carefully fitted wooden blocks, which doubtless swelled when the mill was in operation with wet pulp, and this helped to insure an absolute rigidity of the various component parts of the end of the mill. As indicated in the cut, the liners were designed so that there was ample metal where abrasion was greatest. The result was entirely satisfactory, and no further trouble was experienced in this connection.

Wear on the cylindrical portions of the tube-mill shell seldom occurs, because the majority of liners in use are bolted directly to the surface, and can be made of simple design, to conform exactly to the contour of the interior. When such liners are nearing the end of their life, they become so thin that fracture invariably develops, usually in the neighborhood of a bolt hole, and the escaping pulp acts as a danger signal and a warning that the shell is exposed. This is the great advantage which results from the use of liners bolted to the shell, and it usually outweighs the benefits claimed for other types, some of which can loosen from the shell and so permit damage.

A point to be taken into consideration when a certain type of liner is to be adopted is whether it will form an absolute safeguard against shell wear, or only so if certain contingencies do not arise. Some classes of tube-mill liners may break, wear through in parts, or collapse, and so expose the shell to abrasion of pebbles and ore. This may be noticed in time and promptly repaired; it may pass unheeded; or the accident may be realized and a chance taken that material damage will not result before it may be practicable to shut down.

Mill superintendents are usually anxious to maintain their output, and are often impressed with the necessity for keeping up the tonnage to the maximum; and an accident to mill liners toward the end of the month may lead to a delay in repairing. A proportion of the responsibility, where material damage results, should be borne by those who advocated the particular liner in the first instance.

Silex or similar stone lining, which is held in place by magnesite or cement mortar, often proves a menace, because imperfectly finished blocks are difficult to install satisfactorily. Short pieces of drill steel are sometimes driven between the blocks before the cement is set, to assist in maintaining rigidity of the whole lining, but a piece of stone occasionally falls out, and the accident may pass undetected unless the millman's hearing is exceptionally acute. Damage to the shell invariably results.

In cases where liners cannot be made to conform to the contour of the surface to be protected, or where, in such a contingency, an unnecessary waste of metal would be involved, the advantages assumed to result from the adoption of that particular construction should be questioned. Tube mills with ends cast at right angles to the axis of rotation furnish flat interior surfaces on which simple and effective head liners can be bolted. Additional stability, when necessary, can be insured by external strengthening ribs. Damage to unrenewable parts is then unlikely to happen without obvious neglect.

Capacity of Belt Magnetic Separators

By GEO. J. YOUNG

THE capacity of a commercial separator of the Wetherill type is expressed in pounds of feed per hour. The main factors controlling capacity are the width and speed of the feed belt, the thickness of the feed material on the belt, the specific gravity of the feed material, and the proportion of magnetic material. The width of the feed belt is fixed according to the design of the machine. Commercial sizes of the Wetherill are 6 and 18 in. The speed of the feed belt also varies with different classes of apparatus; usually several speeds are available. The minimum speed is 30 ft. per min., and there is no advantage in adopting a lower rate. The maximum speed of the Wetherill is 110 ft. per min., but this is too high for material finer than 30 or 40 mesh, as dusting results at this speed. For material of this size, 60 to 80 ft. per min. is the highest speed advisable. Within these limits the capacity of the separator will be determined by the thickness of the feed bed. The ideal condition would be a thickness of a single mineral grain of maximum size, but this would greatly limit capacity. Conversely a bed three or four grains thick would be likely to give a contaminated product. Selection must be made between the extremes, and the thickness determined according to the nature of the product desired. With minerals requiring maximum field intensity, a thin bed on the feed belt is only permissible, though minerals of high magnetic permeability can be separated from a thicker bed.

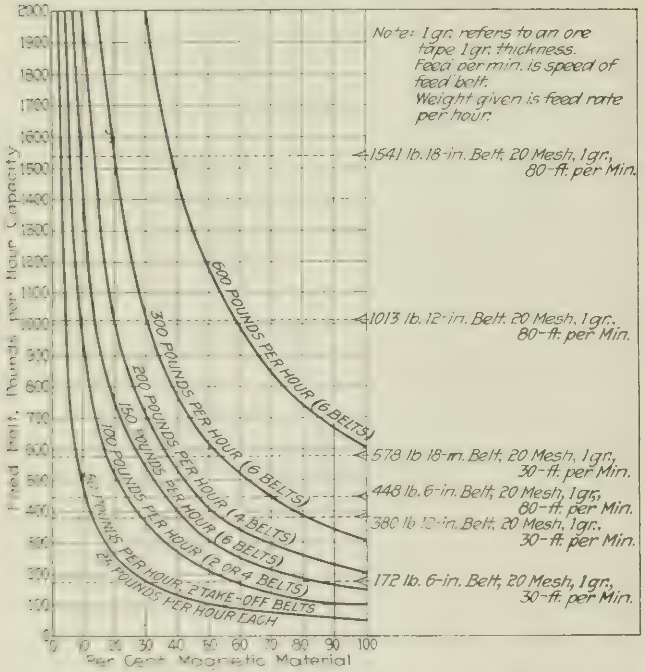


CHART SHOWING CAPACITY OF MAGNETIC SEPARATORS

Two or more take-off belts (depending upon the number of magnets) are used on the Wetherill separator. Take-off belts are limited in their discharge capacity, and, under normal conditions, are operated at a maximum speed of 300 ft. per min. The highest take-off rate that I measured was 200 lb. per hour for one belt. I am of the opinion that 50 to 100 lb. per hour is the upper limit of the take-off rate for clean separation, although I have had no opportunity of using a machine larger than the 6-in. Wetherill. If a maximum rate is decided, then the total for a given machine will be the product of the number of belts and this rate. Under proper working conditions the burden of magnetic material should be evenly distributed among the take-off belts. This is not always feasible, because, in some cases, the greater part may be of pronounced magnetic permeability, and will naturally be caught and discharged by the first pair of take-off belts. Thus the capacity of a two- or three-magnet machine is no greater, under such circumstances, than that of one with a single pair of magnets. In a number of experiments with pyritic material that had been given a magnetizing roast, I found that, by careful adjustment of pole distances and amperages, I could secure a moderately good division among the take-off belts. The second magnet removed a magnetized product of lower permeability than the first; and in the case of each take-off belt, the second belt of each magnet did likewise.

VOLUME IN CUBIC FEET PER HOUR DISCHARGED BY FEEDER

		Feed Belt Speed					
		30 Feet Per Minute		60 Feet Per Minute		80 Feet Per Minute	
		Volume Per Hour in Cubic Feet					
Mesh	Grains Thick	6-In. Belt	18-In. Belt	6-In. Belt	18-In. Belt	6-In. Belt	18-In. Belt
6	1	8.52	28.50	17.04	57.00	22.10	75.92
	2	17.03	56.90	34.06	113.80	44.20	151.84
	3	25.40	75.40	50.80	150.80	66.30	227.76
10	1	4.30	14.20	8.60	28.40	11.03	37.96
	2	8.60	28.40	17.20	56.80	22.06	75.92
	3	12.90	42.60	25.80	85.20	33.09	113.88
20	1	2.16	7.22	4.32	14.44	5.60	19.27
	2	4.32	14.44	8.64	28.88	11.20	38.54
	3	6.48	21.66	12.96	43.32	16.80	57.81
48	1	0.76	2.46	1.52	4.92	1.97	6.77
	2	1.52	4.92	3.04	9.84	3.94	13.54
	3	2.28	7.38	4.56	14.76	5.91	20.31

(1) Feed-belt speed.

It is evident that, under certain conditions, the feed rate will be limited by the take-off capacity of the separator; and if it is assumed that this is, in turn, limited by the number of belts (a reasonable assumption), then the smaller separator, the 6-in. size, has a relatively greater take-off capacity than the larger, 18-in. feed belt.

The density factor can be readily determined by filling a 1000 c.c. dry graduate with the proposed feed, and weighing the content. Multiplying the weight by 28.45 will give the weight in pounds per cubic foot. This factor will be found useful in reducing volume measurment to weight.

The proportion of magnetic material is an important factor. A feed containing 80%, as compared with one containing 10%, would bring eight times the amount of magnetic material to the take-off belts in the same time. For a product containing a large proportion of magnetic material, the capacity of the separator is determined by the take-off capacity; and for material containing a small proportion, by the feed belt. The interrelation between feed-belt and take-off capacity is shown in the chart. The table gives the theoretical volume of feed per hour at different speeds and for different grain sizes.

The method of using the chart is best illustrated by an example. Assume that it is desired to treat 1000 lb. per hour of product containing 60% of removable magnetic material. This would require a machine with a take-off capacity of 600 lb. per hour, and a three-magnet separator would be required. For handling a product containing only 10% of removable magnetic material, a take-off capacity of 100 lb. per hour would be required, and this would be furnished by one magnet. A feed rate of 1000 lb. per hour would equal 12 cu.ft. per hour. Referring to the table, for a 20-mesh feed one grain high, a 6-in. separator would have a feed-belt capacity of 5.6 cu.ft. per hour; a tape two grains high would constitute a feed rate of 11.2 cu.ft. per hour at a feed-belt speed of 80 ft. per min. Thus a 6-in. two-magnet machine would answer for 1000 lb. of product containing a high proportion of magnetic material; and a single-magnet separator for the product containing a low proportion of magnetic material.

In selecting a separator, the proportion of removable magnetic material is a factor in determining the width of feed belt. It is evident that an 18-in. feed belt would bring an oversupply of product to the take-off belts in the case of a feed containing a large proportion of removable magnetic material, as shown in the chart. An 18-in. feed belt would bring 1541 lb. per hour of 20-mesh material, one grain high, (80-ft. per min. feed-belt speed). Only a product containing 39% of magnetic material could be handled. Thus the 18-in. belt would be unsuitable for anything containing more than 39%, because the feed stream would have to be greatly diminished below the receiving capacity of the belt. On the other hand, a product containing a low percentage of removable magnetic material, 5 to 15%, could be advantageously handled on the 18-in. belt machine.

Where capacity is of secondary importance, the 6-in. feed belt, with magnet-field strengths suitable for the separations desired, will answer all practical requirements. In designing a large separatory plant, experiments for capacity determinations should be made on separators not smaller than the 6-in. size.

Diamond Drilling in Cornwall

In Cornwall the use of the diamond drill in coal-boring operations has long been an established institution, but until recently its value as a prospecting tool in the metalliferous mines had not been proved, says the *Iron and Coal Trades Review*. Some years ago attempts were made to use the diamond drill in the Cornish mines, with unsatisfactory results. Trials were made with two machines, one of pseudo German-English manufacture and the second of Swedish origin. The first, working for a short time, ran up a bill of £1000 for 100 ft. drilled, and the second was even a more dismal failure, as three weeks' work in granite showed an advance of only three feet. It is, therefore, not surprising to find the Cornish miners prejudiced in the matter of diamond drilling, and if it were not for the enterprise of Bewick, Moreing & Co., of London, a well-known firm of mining engineers, it is doubtful if the diamond drill would ever have had a second trial as a prospecting apparatus. When the firm named took over the general management of the East Pool and Agar Mines it was decided to adopt the diamond drill, and the results have more than justified the company's enterprising action in this direction while establishing the successful use of the drill in lode prospecting in this locality.

Oliver Wethered, of the Geevor Tin Mines, Ltd., and Dolcoath mine, made an agreement with the Sullivan Machinery Co., of London, for drilling at an agreed price per foot, and under this and other contracts nearly 5000 ft. of diamond drilling has been done to date in Cornwall, besides the 1500 ft. by East Pool. All this drilling is underground, the holes being put in horizontally, and the deepest one has penetrated to a total depth of 971 ft. in the Dolcoath mine. This was begun on April 4 and completed on June 22 of this year, and shows a progress of over 100 ft. per week. During this time, double shifts were worked five days a week and one shift was worked on Saturday, and the total cost for carbons amounted to approximately 3.5s. per ft., a moderate figure.

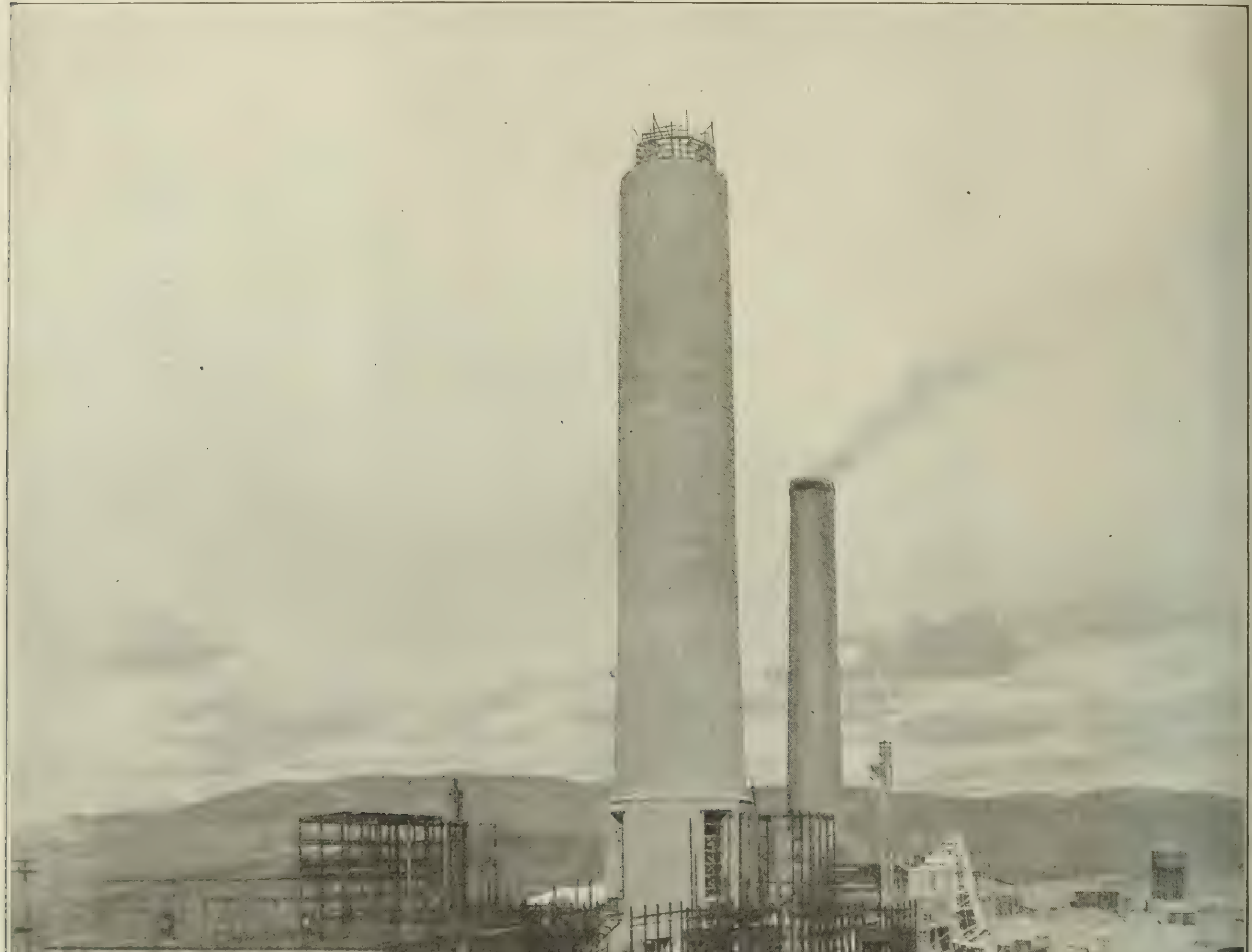
There is still a certain amount of prejudice against the use of the diamond drill, but this, for the most part, is due to lack of familiarity with this method of prospecting. It may be interesting to consider the objections and how far they are borne out by facts. Perhaps the greatest objection to the drill lies in the fact that where there is a possibility of lenticular or pocket formations the drill may pass by the orebody, although perhaps close to it, without indicating its existence. The same objection holds against an exploratory crosscut, as it also proves no ground beyond its walls, and it must be borne in mind that the cost of a 7 x 6-ft. crosscut in Cornwall—approximately 50s. per ft.—compares with the drill hole at 18s. per ft., and the rate of advance in crosscutting through the granites is not more than 2 ft. in 24 hours, as compared with 20 ft. progress with the diamond drill.

Another objection is the small size of the core extracted by the diamond drill, which it is claimed is unsuited to accurate sampling of the body passed through. If there is anything in this argument it is offset by the low comparative cost of drilling compared with crosscutting, although it is not easy to see how anything can be fairer or more accurate than the drill core. A further objection is the tendency of the drill hole to deflect from the line of projected bore. In some cases such deflection certainly does take place, but, except in deep holes, it is at best a negligible quantity, and when drilling in granites may be said to be non-existent.

From the results already obtained from diamond drilling in Cornwall, it is clear that this form of prospecting is a valuable addition to the development methods already practiced in that field. It has been shown that ten times the rate of progress can be secured at one-third of the cost, and that the management is afforded an accurate knowledge of the formation penetrated, thus being able to determine rapidly which areas are profitable, as against those not worth further development.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Photographs From the Field



NEW STACK AT THE WASHOE REDUCTION WORKS, ANACONDA, MONT., SHOWN 440 FT. ABOVE THE FOUNDATION. WHEN COMPLETED THE TOTAL HEIGHT OF THE BRICKWORK ABOVE THE FOUNDATION WILL BE 550 FEET

SACKING MAGNESITE FOR SHIPMENT AT ATLIN, BRITISH COLUMBIA

GENERAL VIEW OF HYDRO-MAGNESITE DEPOSIT AT ATLIN, BRITISH COLUMBIA

The deposit covers about 80 acres, and the amount of material which is available in the bed is estimated at half a million tons. Up to the present, little development has been done, chiefly because of the distance from commercial centres, as Atlin is one of the most northerly points of British Columbia, and operations make it necessary to ship by water from Atlin to the White Pass & Yukon Ry. Co. terminal on Atlin Lake, thence to the North Pacific Coast, and from there south by steamer to Victoria, Vancouver, or Seattle. A few tons have been taken out for experimental purposes recently, and the results are said to have been satisfactory. Chemical analysis shows from 96 to 99% magnesium oxide after calcination. It is thought likely, because of the evident high grade of the material, the fact that it is in a finely divided condition and lies on the surface of the ground, and because the demand is growing in Canada, Western America, Australasia, and Japan, that some effort will be made which will result in the mining of the deposit.

Manganese Deposits Near Lake Creek, Oregon

AN EXAMINATION of several manganiferous deposits in Oregon, including a reconnaissance of 150 square miles near Lake Creek, was made in July, 1918, by J. T. Pardee, a geologist of the U. S. Geological Survey, in company with Henry M. Parks, Director of the Oregon Bureau of Mines and Geology. Messrs. Parks and Pardee are jointly responsible for the estimates and conclusions here given.

So far as known, the manganiferous deposits of the Lake Creek district are confined within an area of about 150 square miles in the central part of Jackson County, Ore. The area is rather sparsely settled, and farming is the principal industry. The nearest large town is Medford, which is 15 miles directly southwest of the deposits but nearly twice that distance by the available roads. Eagle Point, a town on the Pacific & Eastern Ry., is the most convenient shipping point. The surface of the region is hilly and in places mountainous, but moderately rugged. Streams are numerous, and the climate is mild.

VOLCANIC ROCKS UNDERLIE DISTRICT

The area is underlain by igneous rocks that appear to be chiefly basaltic and andesitic flows and tuffs. The sequence of the rocks in part in the Lake Creek district comprises, beginning with the lowest flow, a platy basalt, 500 ft. or more thick; a red basalt tuff, commonly manganiferous, 100 to 300 ft. or more thick; a platy basalt, a few feet to 100 feet thick or more; dark gray to buff, locally manganiferous, andesitic tuffs and breccias, a few feet to 500 ft. thick; vesicular to compact massive dark gray and purplish gray andesitic flows and tuffs, about 500 ft. thick; and dense black basalt that weathers light gray on the surface, a few feet to more than 100 ft. thick.

Only insignificant amounts of manganese were observed in rocks other than the tuffs. All the layers dip 8° to 10° ENE, and apparently have been broken by faults with downthrow prevailingly on the west. At the Tywell mine the red tuff is cut by an andesite dike that appears to lead to an overlying andesitic flow. The rocks of the district resemble those of part of the middle or later Tertiary volcanic series of central Oregon, and may be of the same age or series.

Manganese oxides are locally plentiful in the gray tuff on the Gus Nichols and Vestal claims, but are confined chiefly to the upper part of the red tuff. Most of the outcrops of this rock show considerably more manganese than the other rocks. Pits or other workings show that at the depth of a few feet the rather soft oxides seen at the surface generally give place to hard, compact material containing abundant manganite. In several places bodies of hard oxides have filled cracks and vesicles and have replaced some of the rock. The exposed parts of these bodies appear to be free from foreign matter and sharply distinct from the barren parts of the tuff. The results obtained at a small plant operated by the Manganese Metals Co. appear to show that material rich enough to be called ore should contain not less than 10% Mn, but most of the manganiferous material seems to be so easily workable that even such as contains only 7 or 8% Mn might be mined and milled profitably if worked on a larger scale.

At the Tywell mine, a face of ore estimated to average 20% Mn is exposed for a length of 150 ft. and a height of 10 ft. It extends further horizontally in two directions for unknown distances—possibly for 1000 ft.—and at some places it may be considerably thicker than it is at the exposure. The information afforded by drill holes and open cuts, and the inferences drawn from the distribution of float, indicate that this body probably extends through four acres or more and contains about 10% Mn. Though practically no ore has been prospected or mined elsewhere in the district, the red tuff in several places at the surface shows a mineralization comparable with that at the Tywell mine, and the areas of tuff that bear manganese stains include several hundred acres.

In the most promising areas the tuff is either uncovered or lies beneath only a few feet of overburden. At the Tywell mine part of the tuff area is overlain by lava that ranges in thickness from a few inches to 100 ft. or more. In the principal working, a large open cut, the ore has been followed back into the hill to a point where the overlying lava is 15 ft. thick. It appears reasonable to assume that the ore extends at least a few feet further under the lava, but practically no evidence of its extent could be obtained. As most of the deposits of manganese oxide in the Northwest are superficial, the Lake Creek deposits probably do not extend far beneath the lava, and the lava-covered areas have therefore been left out in making the estimates of known and probable ore reserves here presented.

The manganese oxides were clearly formed later than the tuff, and in at least one or two places they were evidently deposited by descending solutions. No minerals which suggest that the ore is of deep-seated origin were found, and it is doubtless residual. The oxides have apparently been partly leached out of the weathered tuff. At the Tywell mine, 5 to 10 ft. from the surface, there are many cavities that appear to have been filled with manganese oxides but that are now nearly empty, and most of the oxides remaining in other places are soft. Apparently the manganite in the unweathered parts of the deposit was changed by weathering to pyrolusite, part of the manganese being dissolved and carried away.

In addition to the manganese oxides and silicate minerals, the crude ore contains some hematite and limonite and a little gypsum and zeolite. The concentrate is reported to contain a little barite. Data given by the Manganese Metals Co. show that the ore so far mined has averaged about 20% Mn. Car samples of two shipments of concentrate ran 47.5 and 48.5% Mn, and assays of other samples of concentrates are reported as follows:

ANALYSES OF CONCENTRATES OF LAKE CREEK MANGANESE ORE

	Gold Oz. Per Ton	Silver Oz. Per Ton	Iron %	Manganese %	Phosphorus %
Sample 1	0.08	11.1	1.2	52.5	0.09
Sample 2	0.08	14.5	1.4	46.5	0.207
Sample 3	0.16	11.15	0.9	52.8	0.174

About 1500 tons of ore, containing at least 15% Mn, is in sight. In addition, incomplete prospecting by drilling and open cutting indicates that at least four acres are probably underlain by 10 ft. of ore (about 120,000 tons) containing probably 10% Mn. The surface indications in other parts of the district warrant an estimate that they may yield 130,000 tons more of material carrying at least 10% Mn, so that the probable reserves of ore of this grade total at least 250,000 tons.

Development of District Begun Last Year

Manganese mining is a new industry in the Lake Creek district, actual development work having been begun late in 1917. Since October of that year the Manganese Metals Co. has explored, by open cuts and drill holes, three or four acres on the Tywell ranch, about five miles southwest of Lake Creek postoffice, and has erected a mill capable of treating 20 tons of crude ore in 24 hours. This mill has been in operation intermittently since Mar. 15, 1918, and has produced concentrates that contained an average of about 45% Mn, four tons of crude ore yielding one ton of concentrates. Since this company began work, the known limits of the manganiferous area have been considerably extended by prospectors, and many claims have been located.

The cost of hauling concentrates by teams from the Manganese Metals Co.'s mill to the railroad at Eagle Point is now $4 a ton. At a moderate expense the roads could be made usable for heavy trucks throughout the dry season, from April to November. Water for working many of the deposits can be obtained almost throughout the year without great expense, and timber for mine and mill construction is within easy reach of most of the mines. Wages are $5 or more a day, and mining supplies are about as expensive as they are elsewhere in the Northwest. Electric power is available from a transmission line passing through Eagle Point.

Options Taken by Victor Rakowsky

Options on several claims, including the larger part of the holdings of the Manganese Metals Co., have recently been obtained by Victor Rakowsky, of Joplin, Mo. Mr. Rakowsky has arranged to begin developing the deposit on the Tywell ranch by churn drilling, and has taken steps to obtain water and machinery sufficient to extract, on a large scale, such orebodies as he may find. He will probably have demonstrated the value of his property and of his other options within a few months, and his plans include the erection of at least one mill, having a daily capacity of 500 tons of crude ore, which is to be in operation before the end of 1918. Unless some unforeseen contingencies arise, the mill of the Manganese Metals Co. will no doubt continue production at its present capacity.

The results so far obtained by Mr. Rakowsky on a test shipment and by the Manganese Metals Co. show that high-grade manganese concentrates can be made profitably from the ore at the Tywell mine and presumably from that at the other Lake Creek deposits. In fact, the richness or purity of the manganese oxides in this region, and the sharp line of demarcation from the waste, make these deposits workable, and distinguish them from others of low grade, such as those which are associated with quartz lodes. Though the extent of the workable bodies has not yet been demonstrated, there is evidently sufficient ore in this district to warrant extensive operations.

Frozen Organic Klondike Deposits

In a paper recently read before the Royal Society of Canada, J. B. Tyrrell describes the deposits of frozen material which overlie the gravel in the bottom of the valleys in the Klondike, and which, it is assumed, occur only in Arctic or sub-Arctic regions. The material is locally known as "muck," and the deposits, which are of vegetable character, may have a thickness of 10, 20, 30, or even as much as 100 ft. The plane of separation between the gravel and the vegetable matter is usually sharp and well defined, though occasionally little layers of the latter may be found included in the upper beds of the gravel.

The deposit is composed in part of mosses, such as *sphagnum* and *hypnum*, and also of sticks and limbs of trees, leaves, and of all similar kinds of débris. It also contains a large quantity of water in the form of ice. Here and there are layers of clear ice which have been formed by spring water rising from beneath, and freezing before it reached the surface. In one instance which was examined the water derived from this ice was found to be quite hard from the presence of salts of lime. Some gritty material may also be present in the deposit, and occasionally, toward the bottom, there may be a few thin layers of sand.

In color, the frozen vegetable matter is usually dark bluish gray or brown, much like the bottom turf in the Irish bogs, though it becomes lighter with the presence of sand. On the undrained parts of alluvial flats it is now generally covered with mossy swamp, and near the channels of streams it supports a lusty growth of white spruce forest.

The "muck" deposit and the gravel and rock which are found underlying it are permanently frozen to depths of about 200 ft. below the surface. In mining operations, shafts can readily be sunk through it with pick and shovel, for an experienced man can pick it off in layers without difficulty. The deposit was formed while the rocks and soil of the country were permanently frozen, and while the supply of ordinary alluvial material was cut off. The process of its formation started in a period of great cold in early glacial times, and has gone on continuously and uninterruptedly down to the present.

If the cold period when the beds began to be formed was at the beginning of the first glacial period, then the gravels of the alluvial bottom lands, which underlie the "muck," would be pre-glacial in age. From this it would be necessary to conclude that the valleys holding these gravels were excavated before the glacial or Pleistocene epoch, and that these valleys are therefore of Pliocene age. When the cold period began, the country appears to have been fairly thickly populated with mammoth, mastodon, bison, elk, moose, horses, bears, and other animals of that era, for bones are found in large numbers in the underlying gravels and in the bottom of the deposit, but there is reason to believe that the climate soon become too severe for them, and their remains are scarce in the higher portions of the deposit, and finally disappear from it altogether.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

Development of the Ferromanganese Industry*

By Theodore Swann.

Prior to 1914, the United States produced less than one-half of its ferromanganese requirements, and in 1914 only 54% out of a total 183,728 tons, produced and imported. In 1917 this amount was increased to 331,381 tons, of which 286,000 tons, or 86%, was produced in the United States. In 1918 home production will be not less than 90%. Under pre-war conditions the world's supply of manganese ore came mainly from Brazil, India, and Russia. The shortage of shipping brought about by the war, made it imperative that the United States should develop its own resources.

Domestic Production of Manganese.

The domestic production of manganese ore in 1914 was 2635 tons—insufficient to make one-half of 1% of the ferromanganese required. In 1915 this was increased to 9709 tons, or enough to meet about 2% of requirements. During 1916 the domestic production more than trebled that of the previous year, and amounted to 26,997 tons, or enough to make less than 3% of America's increased ferromanganese requirements. In 1917 the production of high-grade domestic ore quadrupled that of the previous year, and 113,734 tons was produced—enough to make more than 10% of the ferromanganese required.

The domestic ore production of 1917 only supplemented the foreign supply, the shipment of which was rapidly becoming difficult. In the first six months of 1918 the high-grade domestic manganese ore production was greater than that of the entire year of 1917, with prospects for a decided increase in the second half over that of the first half.

During July, 1918, a total of 30,370 tons of ferromanganese was produced, containing 20,226 tons of metallic manganese, and 23,021 tons of spiegeleisen, containing 4698 tons, making a total of 24,924 tons of metallic manganese in the total ferromanganese and spiegeleisen produced. The percentage of metallic manganese derived from domestic ores in the tonnage reported for July, 1918, was 47.9.

Manganese Requirements.

It has been estimated, from the consumption to date this year, that the iron and steel industry will require, during the remainder of this year and the first half of next year, 31,000 tons per month of metallic manganese in the form of ferromanganese; and, assuming that the average grade will be 65%, the monthly requirements of ferromanganese will be 32,300 tons. In addition, 3000 tons per month of metallic manganese, in the form of spiegeleisen, will be needed. Assuming the average grade to be 18%, the monthly requirements will be 16,500 tons.

The total metallic manganese requirements for the year ending June, 1919, for both ferromanganese and spiegeleisen, are therefore assumed to be 288,000 tons. From the best information available, the United States will produce ores that will contain at least 50% of the manganese content required to make this tonnage of ferromanganese and spiegeleisen.

Conservation of Manganese

At the May meeting of the American Iron and Steel Institute, C. R. Ellicott presented a complete and instructive paper, entitled, "The Conservation of Manganese." In addition to acknowledging the facts so ably presented therein, one may well pay tribute to the many producers of domestic manganese ore who are rapidly making the United States less dependent upon other countries. It is the patriotic duty of both the producers and users to encourage the production of domestic ores, and to break away from the prejudice against the use of low-grade alloys.

It has been suggested that the steel industry could further aid in the conservation of shipping by using, when possible (in many instances to their direct advantage), silicomanganese, which could be made from high-silica domestic ores. Prominent American metallurgists consider the advantages of silicon alloyed with manganese to be:

1. The silicon reduces the carbon content, giving the desired low-carbon alloy for the steel addition.
2. The combined selective action of silicon and manganese will be more active than either element alone.
3. The resultant combined oxides, forming manganese silicate, will, owing to greater fluidity, be eliminated from the metal more readily than the oxides of either alone.

Deposits of Silicomanganese Ore

There are numerous deposits of manganese ore too high in silica to be used in making ferromanganese. These however, are available for making silicomanganese. It is possible to make silicomanganese from high slags carrying from 10% and up of manganese, and also from manganese ores carrying as low as 18% manganese and as high as 40% silica. This source of supply has been proved to be available by one electric-furnace operator, who made, from slags running 10 to 17% manganese, several carloads analyzing about 64% manganese, 12% iron, 23% silicon, and 0.60% carbon. The average slags produced with the above metal contain under 4% manganese.

The manufacture of ferromanganese in the electric furnace is one of the important developments in connection with the utilization of domestic manganese ores, especially when the plants are near the mines. Perhaps the greatest value today of the electric furnace, in connection with the production of ferromanganese, is the conservation of coke. In July, 1918, over 7½% of the entire production was made in electric furnaces. It is estimated that by the end of this year such appliances will be making about 15% of the total ferromanganese produced in the United States.

The slag and volatilization losses in the smelting of ferromanganese constitute problems for the metallurgists of the country. It is believed possible to increase the recovery by 10%. If such increase could be made, a saving of about 30,000 tons of metallic manganese would be effected, thus releasing more than 75,000 tons of shipping.

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*Abstract of paper presented at the Fourth National Exposition of Chemical Industries, New York, Sept., 1918.

The Russian Industrial Nightmare

HUGO KLEIN, a steel metallurgist who is a member of the German Military Commission now at Kieff, in the Ukraine, has written an article, appearing in *Stahl und Eisen*, dealing with the troubles of the South Russian industry since the outbreak of the revolution, which we reproduce from the *Ironmonger*. He recalls that in April, 1917, the preliminary government of Prince Lvoff, which preceded that of Kerensky and the destructive anarchism of the Bolshevists, issued an order for the formation of workmen's committees in all industrial undertakings, whether owned by the government or by private proprietors. This order was, no doubt, due to the pressure of the Petrograd workmen's council, and was probably agreed to by Prince Lvoff and his Moderates, because they thought that, by setting up such committees, they would at least reduce the number of mass meetings of workmen, which in Russia invariably degenerate into political wrangles. The committees were in practice to frame their own rules and themselves define the nature of their activities, rights, and duties. The participation of the directors of the works was limited to the provision that the draft rules were to be discussed at a joint meeting of the committee and of the directors, and settled by mutual agreement. In most plants, however, these joint meetings were never held, but the decisions of the workmen's meetings were set up as law, and the directors had to content themselves with silent opposition.

MASS MEETINGS FREQUENT

If the Ministry thought that by this order the workmen's agitation would be diverted into less violent channels, they soon discovered their mistake. Several meetings were held weekly, either in the yards or within the factories, and while they were in progress, generally from one to one and a half hours, all the plant, even furnaces, remained unattended. The managers were not notified of the meetings, nor was their permission asked. "The Present Political Situation" was a favorite theme of discussion, and the "expert advisers," which under the order might be added to the workmen's committees from outside the factory employees, usually turned out to be itinerant professional orators, students, lawyers, or others. They "instructed" the illiterate workmen in the aims and objects of the Petrograd workmen's and soldiers' councils, and a net of orders emanating from these councils was drawn over the whole country. The same system of deliberate disorganization by which the army was wrecked was applied to the factories.

MINIMUM WAGES FIXED FOR METAL WORKERS

In May, 1917, at the invitation of the president of the iron distributing office, which had been created by the government during the war, joint meetings of the manufacturers' and workmen's delegates were held, at which for the first time minimum wages applicable to all classes of workers in metals were to be fixed. The workmen's delegates rejected the increases offered by the manufacturers, and left the meetings, but gradually the new scale was agreed to by the workmen and put into force. In the course of the summer the workmen seized sole control of the various funds for the purchase of food and other necessities for the workers and of the welfare institutions which had been organized in many factories, and large sums of money were stolen or squandered.

Managers, engineers and other members of the staff were gradually deprived of all authority and influence. Any one of these who had made himself disliked was forced out of his position, and managers were constantly dismissed by their workmen for "anti-revolutionary sympathies." Their successors had to be approved by the workmen's committee before they took up their appointment. The most trivial incidents in the day's work were discussed at interminable length, and judgment was pronounced upon them at the workmen's councils. With the installation of the Bolshevist government in November, 1917, the democratization of works proceeded apace. Lenine ordered the formation of supervising committees consisting only of workmen, who examined all the works' reports, controlled all purchases and sales and demanded the right of countersigning every letter that left the works. But the most embittered fights were for the control of the cash-box.

"HAND OVER," THE REVOLUTIONISTS' WATCHWORD

The progress of the Russian revolution showed no trace of the inspiration of any elevated thought, of any respect for human rights. Its sole watchword was "Hand over!" Hand over the land to the peasant; hand over the factory to the laborer. No thought was given to the new duties which must accompany the new-claimed rights. The land was left unplowed; the factories stood idle. Piece-work was abolished, and there were no bounds to the waste of time. While the creation of wealth grew less and less, new paper money was printed in ever-growing masses, and as no one produced anything useful, the purchasing power of money sank and famine prices ensued.

The monthly output of coal in the Donetz district, which averaged 2,000,000 tons in peace time, and was still 1,358,000 tons in September, 1917, sank to 491,000 tons in January, 1918, and has since ranged from 325,000 to 500,000 tons. The monthly output of pig iron in South Russia, which amounted on an average to 260,000 tons before the war and in 1916 was still 237,000 tons, fell in November, 1917, to 106,000 tons, in December to 93,000 tons, and in January, 1918, to 82,000 tons. Since that time no returns have been published. In April and May of the present year, all the blast furnaces were idle with the exception of two near the coal mines, but their output was very small.

FACTORIES CLOSE BUT WAGES CONTINUE

At the end of 1917, the production in the mines had decreased to such an extent that the factories were obliged to suspend work, but by order of the Workmen's Committee the men continued to draw their full wages, and if there was not enough money in hand of the works' funds, the wages were paid out of government money.

Then came the last chapter: the nationalization of the works. The Bolshevist government called upon the workmen themselves to assume the management of the factories. In most of the factories, however, no men could be found who were able to carry out this request. In some plants the supervising committee exercised its powers side by side with the directors who really did the work proper, and in others workmen were elected to the board, but failed to exercise any real influence. The only factories in which the order of nationalization was actually carried out were those to which the Petrograd government had sent special delegates. The parting present of the Bolshevist government was the "Mutual Contract," which was signed on Mar. 16, 1918, after long negotiations between the All-Russian Trade Union of Metalworkers and the Manufacturers' Syndicate, under pressure of the Bolshevist government.

UNIONS ONLY COULD HIRE AND DISCHARGE

Under this contract all workmen could be engaged or dismissed only by their respective trade unions. The workmen were divided into groups, and the wages were fixed on the same basis, although not at the same figure all round, so that there was little difference between the pay of the skilled worker or the man in a responsible position and that of the unskilled laborer. Previously, a leading roller and a skilled machinist had been paid four or five times as much as an ordinary day laborer, but the underlying idea of the Bolshevists was to make wages as nearly equal as possible. So the laborer's wages were put at one rouble per hour, whereas the highest wage of a skilled worker was fixed at 1.90 roubles. A large number of the men were dissatisfied with this arrangement, and also with the equal treatment of work in different groups.

When work was temporarily suspended, the men were to be paid two-thirds of their wages for the first 12 days and one-half for the remaining period of idleness. If during this time the workman demanded to be paid off, he was to be paid 12 days beyond the day of his leaving. If the works were permanently closed, the directors had to pay the dismissed workmen 24 days' wages, and as the rule entitling the men to 12 days' wages on dismissal was not repealed, when many of the works closed down the men demanded payment for 36 working days. The manufacturers had signed the "Mutual Contract" under duress, and on the understanding that the work performed should reach a good average standard and that the government would fix higher selling prices for the finished products, and when neither of these conditions was fulfilled, they declined to recognize it any longer.

CONDITIONS WORSE WHEN TEUTONS ARRIVE

When the German and Austrian troops marched into South Russia the difficulties of the industry became worse still. The available rolling stock had diminished with the retreat of the Bolshevists, the army authorities seized what was left, and the coal supplies were barely sufficient for the railways. Nothing could be spared for the iron works, and those which had still managed to keep going were now obliged to close down. After the resumption of railway traffic, the partial removal of the considerable stocks of half-finished and finished manufactures that had accumulated at the works, and the reopening of the banks, many of the factory owners put an end to their undertaking to pay wages during the suspension of work, by dismissing all the men. Even Lenine recognized in time that it was a mistake to abolish all piece-work and that the management of industrial undertakings can be carried out only by men whose training fits them for their positions. Hence he afterward issued another decree, in which piece-work was reëstablished and orders were given for the reinstatement of the technical and commercial managers "in order that further millions may not be lost by the nation"—a decree which is typical of the disorder into which the Bolshevists have thrown the world of labor. The latest device is to vest the management of every factory in a committee of eight, consisting of representatives of the government, the manufacturers, and the workmen.

WORK RESUMED IN SOME PLACES

Three of the "mixed" iron works in the Ukraine, the Société Dniéprovienne, Kramatorskaya, and Donetz-Yurievka, have lately resumed manufacturing on a small scale. Others, including the South Russian Tube Works, the Briansk and Taganrog Iron Works, and the iron works in the coal district (Hughesovska, Makeievka, and the Russo-Belge Co.), are preparing to restart at the end of August. At first only some of the openhearth furnaces and bar-iron and roofing-sheet mills will be set going, in order to work up the existing stocks of steel ingots, pig iron, and scrap, and to get as large a quantity of finished products as possible ready for the market with a minimum consumption of coal. The works in the coal district have enough materials at hand to be independent of supplies by rail for some months, but of the factories outside the district, only those which are assured of a coal supply, or which produce special products, such as black and galvanized roofing sheets, tubes, and tires, which are urgently required, will be able to do anything until after the harvest, when labor will return to the coal mines. With a resumption of the coal output, and in view of the accumulation of stocks of blast-furnace coke, it should be possible to blow in a number of blast furnaces in October.

Risk Not Assumed by Miner

BY A. L. H. STREET*

Upholding judgment in favor of the operator of a drilling machine in a mine, who was injured by a fall of loose rock, and who asserted negligence of his employer in assuring him that the stope at the particular place where the accident occurred was in safe condition, it was recently decided by the Utah Supreme Court, in the case of Urich *vs.* Utah Apex Mining Co., 169 *Pacific Reporter*, 263, that though plaintiff was required to inspect his place of work, he did not, on the theory that he was bound to make the place of work safe, assume the risk of injury from rock falling from the roof of the mine in a place other than his immediate place of work. It appeared that the accident did not occur where plaintiff had been engaged in operating a drill, but at a place he was passing in obedience to an order of the shift boss, who temporarily assigned him to other work.

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Mineral Industry in Burma*

Grains of gold are washed down by many streams in Burma, and the panning of gold dust from sand forms a precarious means of livelihood. The upper reaches of the Irrawaddy and the Sittang appear to be the most prolific. In the Irrawaddy above Myitkyina the Burma Gold Dredging Co. has carried on operations for some years, but has met with many difficulties. The largest yield in a year has been 8000 oz. of gold.

An attempt was made to extract gold from quartz at Kyaukpazat, in Katha District, and quarrying and crushing were started in 1895. The yield of gold was about 1200 oz. The gold-bearing quartz proved to be only small in amount and was soon exhausted. The washings in streams show that many parts of the province are rich in gold, but it has nowhere as yet been found near the surface in remunerative quantities. It may some day be mined profitably from lodes, but capital has not so far been applied to such a venture.

The Chinese at one time had silver workings at Bawdwin, in the Northern Shan States, now the scene of the industries of the Burma Corporation. That these workings must have been extensive is shown by the amount of slag that has been left on the surface and by the bareness of the adjacent hills from which firewood was cut. The mine is now worked chiefly for lead, and will be referred to later. The only other silver mine in Burma worked in recent years is at Bawzaing, in the Southern Shan States, where the chief of the state, assisted by a Chinese lessee, extracts silver in small quantities from argentiferous galena by primitive methods.

Tinstone has long been worked in Tavoy and Mergui districts. It is found in granite and also in alluvial deposits. The mine workers are mostly Chinese. The physical difficulties of the country, the high rate of wages and the absence of communications have impeded commercial undertakings, and the industry is carried on on a small scale. Tin undoubtedly exists in large quantities in these districts, and its working may become a commercial success when better means of communication and transport have been established.

The export figures for tin ore and tin, in tons, are: 1911-12, 279; 1912-13, 429; 1913-14, 395; 1914-15, 290; 1915-16, 330.

Broad tracts of ferruginous laterite are found in many parts of Burma. Some of these have been worked for iron, and the abandoned workings can still be seen.

The Burma Corporation's mine at Bawdwin, in the Northern Shan States, is the only important source of lead and silver in Burma. In 1915, 42,000 tons of ore and slag was smelted. The total production of hard lead was 13,522 tons, of which 6947 tons was refined and sold in Eastern markets, and 6575 tons, containing 248,875 oz. of silver, was shipped to England to be refined. The mine is connected by the company's light railway with the Mandalay-Lashio Ry. The roasting plant, which consists of three roasters in operation and two under construction, will, when completed, have a daily capacity of 150 to 200 tons of ore. In June, 1916, the daily production was at the rate of over 50 tons of lead, containing from 3000 to 4000 oz. of silver. Fine silver is not yet produced on the spot. No zinc concentrates were exported during the year. The Geological Department of the government of India considers that the question of the ultimate treatment of the Bawdwin concentrates is an important one for India, because if it were found possible to erect zinc smelteries in Burma, the resultant production of large quantities of cheap sulphuric acid should have a far-reaching effect on industrial development.

The figures for export of lead, in tons, are: 1911-12, 10,131; 1912-13, 7489; 1913-14, 3422; 1914-15, 6499; 1915-16, 10,846.

Of recent years a great demand arose for wolfram in the manufacture of high-speed steels, and attention was directed to the source of supply in Tavoy and Mergui districts. The whole of the supply went to Germany, from which country all tungsten used in England was obtained. Since the war began a greatly increased amount of tungsten steel has been required for the manufacture of munitions. Methods of working, which before the war amounted to little more than surface extraction, have been improved. The output, which was 2326 tons in 1914 and 2645 in 1915, rose to 3034 tons in 1916, and 4000 tons in 1917, and is rapidly increasing. The Tavoy field produces one-third of the world's output. All wolfram produced is earmarked for dispatch to the British government.

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*Excerpt from an article by Sir Harvey Adamson, in the bulletin of the Imperial Institute.

Mineral Exports From Bolivia in 1917

Minerals maintained a leading position in Bolivian exports in 1917, 86% of the shipments last year being credited to the mining industry, according to *Commerce Reports*. Tin held its place of honor, its shipments in 1917 amounting to 46,430 tons, against 35,000 tons in the preceding year. Though the increase in quantity was 10,000 tons, or 31%, the increase in price was 100%, the 1917 value amounting to $33,250,800, whereas in 1916 it was $16,634,280. Copper exports grew from 29,000 tons in 1916 to 37,000 tons in 1917. The mineral deposits are found in four central departments, Potosi leading and Oruro following, with La Paz third and Cochabamba fourth.

Carrying Katanga Copper

The *Ironmonger* in a recent issue describes the present situation of the Benguela Ry., which will run from Lobito Bay, in the Portuguese colony of Angola, on the west coast of Africa, to Benguela, on the east coast. So far, 325 miles have been opened, and earthworks have been completed for another 75 miles, but it has been necessary to suspend construction because of the impossibility of getting railway material at present. The gage of the line is 3 ft. 6 in. It will run along the watershed dividing the tributaries of the Congo River from those of the Zambesi, and will join the Capetown-Bukama line about 90 miles north of Elizabethville, in the Belgian Congo. When it is completed it will give an Atlantic outlet to the copper of the Katanga mines, which has now to be transported to Beira, on the east coast, for shipment to Europe. Thus not only will the overland route be shortened, but the ocean voyage will be reduced by 3000 miles.

Correspondence and Discussion

Safety Measures and Hoisting Efficiency

I quite agree with the spirit of an editorial which appeared in the *Journal* of June 15, entitled "Safety Measures of the Right Sort," and concur with the conclusion that safety regulations should be made effective by imposing prison sentence as well as monetary fine upon the person responsible for an avoidable accident.

Although I have never worked in Sudbury, I doubt that the guilty person was sent to jail. The hoisting practice of the district must be somewhat out of date if chairs are still used in the shafts, for these are relics of the days when hoisting engines' brakes were unreliable. The use of chairs has survived in some districts, but that does not make the practice proper and safe, and there are several reasons why they should not be used in a shaft. In the first place, they are likely to cause accidents similar to the one recorded at the Mond No. 1 mine, which was, fortunately, unattended with serious result.

Chairs are generally equipped with a pin to hold them out of the shaft, but usually the management demands such fast handling of the cars that dependence is placed entirely on the overbalancing of the lever arm to hold them in this position. Occasionally, because of accretions of one kind or another, they become balanced; and the jar from a passing cage, if the guides are at all rough, may throw the chairs back into the shaft. The cage, when it is lowered, then seats itself at the station, the cable coils up in the shaft (a considerable length of rope may be unwound before the hoisting engineer notices the lack of weight) and the up cage is pulled into the tangle, thus damaging the timbering, cutting up the cable, and, possibly, seriously injuring some one. It is probable that the cager at the Mond mine did throw the chairs out, and that they were jarred back into position again in the shaft. If he did so, the accident was not his fault, but the fault of the management; for it may be entirely attributed to questionable hoisting practice.

The liability of accident as a result of chairs being left in place or dropping into the shaft is not the only reason why they have been discarded in many mines. It is poor practice to use them, both because their adoption slows down the rate of hoisting, and because, by taking the weight off the cable and putting it on the chairs, a greater strain is thrown upon the hoisting rope in starting the loads. The life of the cable, which is an expensive article at the present time, is proportionately shortened. The engineer, when chairs are used, must "feel" for them every time he lowers a cage to the shaft level from which he is hoisting; and if he lowers on them too hard he will break something, and tie up the shaft. When chairs are not used, the engineer "drops" the cage to within an inch or two of its proper position, usually on an exact level with the floor.

The skill with which a good hoisting engineer will "spot" his cage without chairs, at a level 1200 to 2000 ft. below surface after "dropping" the cage at a high speed, is surprising. I have seen hoisting engineers at the Mountain Consolidated shaft, at Butte, "spot" a cage at a lower level 20 times in succession, in the ordinary course of hoisting, without once missing the station floor by as much as an inch. While the cage is dancing with the stretch of the rope, and before it has come to a real stop, the cagers, if they understand their work, will have the empty car off and the loaded one on, and will have rung for the engineer to "spot" the next deck, level with the station. If the deck should be stopped two inches high or three or four inches low, the cagers will handle the cars almost as quickly as if the deck had been "spotted" level with the station.

Salt Lake City, Oct. 1, 1918. C. T. R.

Uncertainties of Geological Evidence

The Plutonic school of geologists, who make up in enthusiasm what they lack in numbers, have assiduously hunted over the southeast, or disseminated-lead belt, of Missouri for conclusive evidence as to the deep-seated origin of the huge bodies of low-grade lead ore. Though trifling amounts of lead and zinc occur in the limestones of all ages in Missouri, from the coal measures down to the basal Archean granites, no important quantities of either metal, beyond the small, erratic production of "gopher" miners, have been produced except in the famous Joplin region in the southwestern corner of the state, which covers several counties, and the disseminated belt in southeastern Missouri. The latter district has been the premier lead producer of the United States for several years, and more than 90% of the output is obtained in one county (St. Francois). The explanation of this intense localization of the lead in southeastern Missouri has always been a difficult nut to crack, especially as the deposits are so large and persistent, with extensive though practically barren areas intervening between the different orebodies. Some of these exceed a mile in length, range from 10 to 100 ft. in thickness by 50 to 500 ft. in width, and generally follow two well-defined courses. Though there is no sharp boundary delimiting the sides of the orebodies, their great size, fairly uniform low-grade character, and their occurrence at the base of the lowest limestone found in Missouri, that sometimes rests on the granite, is in marked contrast to all the other Ozark lead and zinc deposits. The Joplin deposits occur in the sub-Carboniferous.

Geologists who have a bias toward the deep-seated origin of mineral deposits promptly grasped these salient differences from the other numerous Missouri lead deposits as indicating ascension from great depths, especially as they occur at or close to the Archean granites and porphyries of the Ozark uplift, whereas the latter are deeply buried throughout the other mineral districts of Missouri. Although the practical absence of silver in the disseminated lead (about an ounce per ton of lead) seems to preclude a fissure-vein type of origin of the lead, true quartz veins in the Missouri granite and porphyries sometimes carry galena that is rich in silver, though in other veins the silver is practically absent, amounting to only ½ to 2 oz. per ton. Hence the silver evidence is neutral, although some enthusiastic dissensionists have insisted that this one feature precludes acceptation of the theory of the deep-seated origin of the lead.

The invariable occurrence of the sulphides of nickel, cobalt, and copper in the disseminated ores, which increase in quantity the nearer the lead deposits occur in relation to the granite, as at Fredericktown and Mine LaMotte, further points to a deep-seated origin, especially as nickel and cobalt do not occur anywhere else in Missouri except at St. Louis. But in some of the close-grained, compact lithographic limestone beds in the St. Louis quarries (sub-Carboniferous), geodes are found that are lined with beautiful dolomite and calcite crystals on which rest tufts of millerite, or nickel sulphide, as delicate yellow hairs. Solid blocks, free from cracks or seams, on being broken, are found to contain the millerite bearing geodes, hence it is evident that in this instance the nickel was derived by lateral secretion and is in no way connected with a deep-seated origin.

The fact that the thin layers of shale that occur at the base of the disseminated lead bearing limestone (Bonne Terre) are more or less converted into chlorite, whereas the shale in upper horizons is unaltered, has also been construed as pointing to deep-seated thermal waters, but this metamorphism is of a local chemical nature and does not extend for more than 50 to 100 ft. above the base of the Bonne Terre limestone. Also, the fact that the freshly mined, bright, disseminated galena soon "sunburns," or tarnishes, on exposure, whereas elsewhere in Missouri the galena remains bright, is due to its containing a little iron, probably as carbonate. The enclosing limestone rapidly "sunburns" on exposure, changing from gray to brown, owing to associated iron carbonate—in fact it contains sufficient of that substance to be attracted by a powerful magnet.

The presence of much faulting in the disseminated belt has a neutral bearing, as most of the orebodies occur at a considerable distance from the important faults.

Two occurrences recently came to my notice that would have greatly encouraged the Plutonic geologists in their search for convincing evidence to confirm their views had the specimens to be described been forwarded to them with the mere statement as to where they were found. A sample of felsite—a genuine igneous rock—was found "outcropping" close to one of the largest mines in the Flat River district, and at Bonne Terre, near the St. Joe mine, a weather-beaten piece of fluorspar, containing lead, was found "outcropping" in a field. It was difficult to resist the temptation to send the specimens to a certain distinguished geologist of the Plutonic school, with the above meager information, as it might have started "another meeting on the Stanislaus," in which he would have had at least two powerful "weepons of offense." But some things are not what they seem, and investigation disclosed that the felsite was a solitary specimen that was found on the roadside, where it had been either hurled at a dog, or fell out of the rig of a fisherman who had returned from Iron Mountain Lake—in the midst of felsite and a favorite resort for the Lead Belt fisherman.

I identified the fluorspar as of true deep-seated origin, as it came from the fissure veins of Hardin County, in southern Illinois. The latter place formerly furnished flux for the Flintshire furnaces that the old Desloge Lead Co. operated at Bonne Terre about forty years ago. What small boy stole it from the fluorspar bin, and whether he used it to throw at rabbits or groundhogs, deponent sayeth not. H. A. WHEELER.

St. Louis, Mo., Oct. 22, 1918.

Co-operation Among Small Mines

Referring to the article by Geo. J. Young in your issue of Nov. 9, I am acquainted with the Rex Mill mentioned and with the Gold Circle district in which it stands, and Mr. Young is quite right when he suggests that coöperation might have resulted in more rapid and better development of the district as a whole, and would undoubtedly have been to the material advantage of several prospectors in the vicinity. Until human nature changes or until men learn that team work is as profitable for a few individuals as for larger organizations, the fact will remain that many cases of individual effort will fail where coöperation might have succeeded.

The Rex Mill was built for one property and was subsequently used as a custom mill, but in no sense as a coöperative proposition. Satisfactory recoveries were made, but the miners felt that it was being run for the benefit of its operators and not to their advantage, so that little use was made of it.

Later the Elko Prince Mining Co., operating under the management of the Dorr Co., built a substantial mill designed to take care of any custom ores that might be offered. The operators of this mill were a guarantee that customers would receive fair treatment, but only a limited tonnage was offered. The feeling still prevailed that the prospectors were to get the worst of it, or perhaps it was that they still hoped to make mines of their own that would equal or surpass the Prince.

Failing to get custom ores, the Elko Prince formed a leasing company with the object of developing the best claims in the vicinity. This has not yet been and probably will not be a success, as the most desirable ground is held at such terms as to render development impossible.

With all the elements present for successful coöperation, money for development and a mill for treatment, property owners do not see their way clear to fall in line. In a few years the Elko Prince will be worked out, its mill dismantled, and the prosperous little camp will become a dead mining town with possibilities still sleeping that might have kept it alive for years had owners only held that spirit of coöperation for which Mr. Young pleads. MINING ENGINEER.

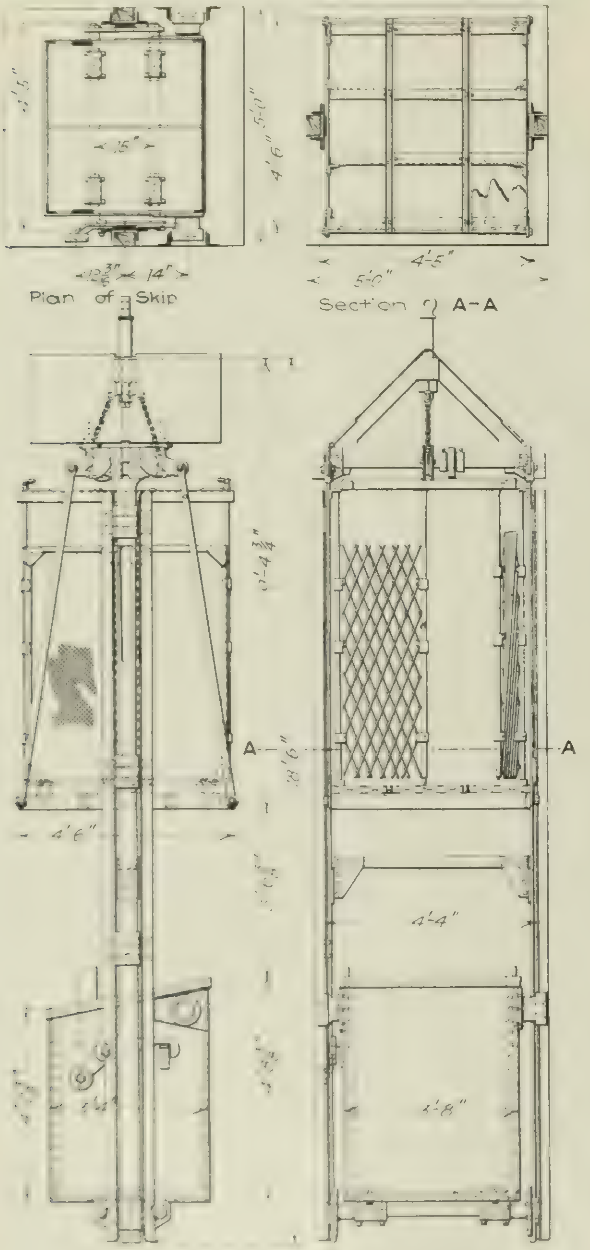
New York, Nov. 12, 1918.

Details of Practical Mining

United Eastern Mine Cage and Skip

By B. C. Staiger*

The design of a combination cage and two-ton skip, which has been in operation at the United Eastern mine for two years and continues to give excellent service, is illustrated herewith. The plans were designed by the firm of Otto Wartenweiler & Co. of Los Angeles, from preliminary sketches furnished by the local mine office.



COMBINED TWO-TON SKIP AND CAGE

The shaft has two 5 x 5-ft. hoist compartments, so that the hoisting equipment is operated in balance. The total weight of the combination cage and skip is approximately 4500 lb. Each cage accommodates 12 men. Drills and steel are handled in the skip, and timber that cannot be placed on the cage is swung by chain and clevis beneath the skip. The design allows less headroom than if the skip were placed above the cage, and for this reason Wellman-Seaver-Morgan hoisting-rope releases have been placed in the headframe as protection against overwinding.

SIZES AND MATERIALS OF MAIN MEMBERS OF COMBINATION CAGE AND SKIP USED AT UNITED EASTERN MINE

Member	Size, in inches	Material
Main bail	¾ x 5	Mild steel
Cage yoke	1½ x 4	Norway iron
Deck supports	½ x 2	Norway iron
Deck straps—cage	½ x 6	Mild steel
End straps—cage deck	1 x 4	Mild steel
Deck angles	3 x 4 x ⅜ L's	....
Cage gate guides	2½ x 2½ x ¼ L's	....
Cage gate guide supports	3 x 3 x ⅜ L's	....
Dog shafts	2 7/16	Cold rolled steel
Main guides	3 x 3 x ⅜ L's	....
Bonnet	⅜ in. plate	....
Draw bolt	2 in. square	Norway iron
Gate bars	⅝ x 3/16	Mild steel
Gate hinge posts	⅞	Standard pipe
Gate posts	1	Extra heavy pipe
Gate catch rod	¾	Cold rolled steel
Side screen	⅜	Double crimped wire, 1 in. mesh
Side screen frames	1½ x ½ x ⅛	Channels
Skip	1	Mild steel
Skip shafts	2½	Cold rolled steel
Bail brace	2½ x 2½ x ¼ L's	....
Wearing plates—side and bottom	3/16	....
Main bottom and side plates	¼	....
Tumbler horn	¾ x 5	....

The sloping top on the skip was an error in the design, but this has been corrected by building the back and sides up to a horizontal line, and this incidentally increased the capacity of the skip by 250 lb. The change was made necessary by the fact that the underground pockets have been placed on the same side of the shaft as the surface bins.

Each underground pocket is supplied with a two-ton measuring pocket for each hoisting compartment. Although this installation is entirely "home made," the success of its operation may be judged by the fact that the cage-tender sends up a skipload of ore every 63 seconds from a depth of 600 ft. though the hoist has a maximum rope speed of only 800 ft. per minute.

Simple Block Signal for Adits

Haulage along mine adits can easily be rendered safe for use by different trains from several branch drifts by simply running alongside the lighting wires an extra lighting circuit on which red lamps are placed at intervals of 200 ft. or so along the drift, depending on conditions. This auxiliary circuit is arranged in a series of blocks, according to circumstances. At each end of a block a simple lever switch is placed. Whenever a train enters the block, the driver or trainman throws the switch, thus lighting the red lamps along the block to tell others that it is occupied. When the train goes out of the block the switch at the other end is thrown, cutting out the red lights.

Such a block system is inexpensive and saves much time. Ordinary electric lamps dipped into red staining solution are effective. There is no chance of accident through lamps burning out or breaks in the circuit, for unless the red lamp at the switchboard lights when the switch is thrown, the train is not allowed to enter the block. The red lights along the drift also serve as a warning to any one in it that a train is coming.

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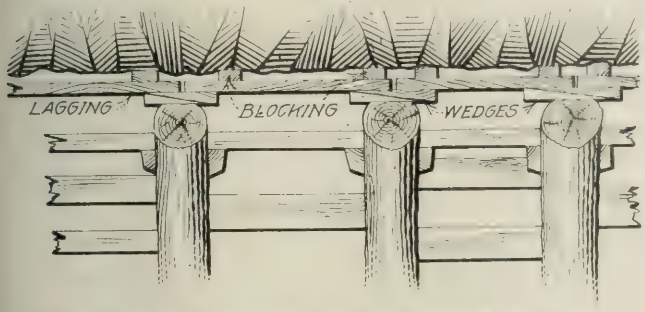
*Engineer, United Eastern Mining Co., Oatman, Arizona

Effective Method of Securing Lagging

A two-wedge method of securing lagging that can be used to excellent advantage in most cases along drifts or stopes, although some difficulty might be experienced in placing the wedges in the breast set, owing to the small amount of room usually allowed between the set and the breast, is shown in the illustration. General practice is to place the lagging directly on top of the cap. Above that the blocking is put in and so wedged as to come in contact with and help support the back.

The scheme of using two wedges not only insures a closer contact of the blocking with the back but offers a flat horizontal bearing surface to the weight, whereas, if only one wedge is used, a slanting bearing surface will be exposed, and any movement of the stope or drift might produce a slip or slide of the lagging and blocking. A wedge sharpened at one end and having the two bearing surfaces parallel would secure the same effect as the result obtained by using the two wedges, although the former could not be expected to give the same amount of pressure upward as is secured by the use of two wedges.



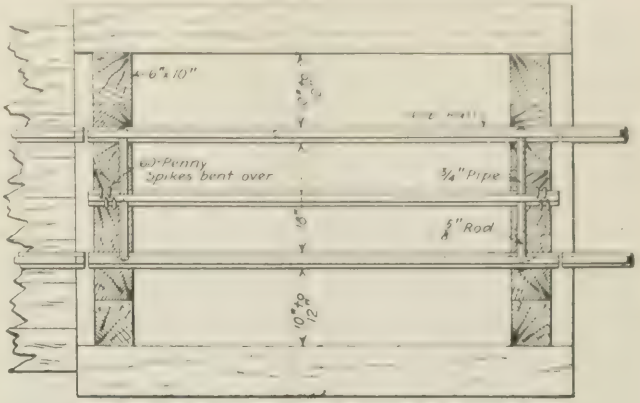
TWO-WEDGE METHOD OF SECURING LAGGING

Convenient Mine Grizzly

Best safety practices today demand that all chutes in stopes and along levels should be covered by grizzlies. A grizzly that is light, made to a standard size and type, and that permits cars and timber trucks to pass over it, is used at the Hecla mine, Burke, Idaho, and is shown in the accompanying drawing.

This grizzly is of simple construction, consisting merely of three pieces of rail cut long enough to bridge across the top of a chute and bolted together with pieces of pipe between the rails as distance pieces. These pieces of pipe are long enough so that the two outer rails are held to the gage of the track. The grizzly is nailed into position, flush with the rails of the track on either side of the chute, by driving 60-penny spikes on each side of the middle rail next the cross-bars and then clamping them down over the top of the rail. Thus the outside rails are kept free for the passage of cars, and yet the grizzly is secured in place in such a manner as to be easily taken up.

Usually the chute is wide enough so that a space 10 in. or a foot wide is left on each side of the outer rail, but when the chute is a little wider, the floor planks can be laid so as to narrow down the openings on the outside of the grizzly, and if the chute is much wider than the grizzly, two grizzlies can be put in side by side. Sixteen-pound rails have proved to be sufficiently strong for such grizzlies, as they need be only 5 ft. long, which is the distance of the stull-caps, center to center, along the vein.

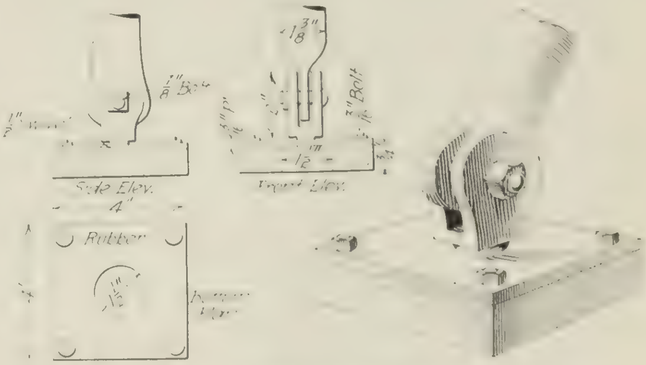


PORTABLE GRIZZLY

Safety Base for Ladders

By W. H. MacMahon*

A satisfactory safety base for a ladder that is to be used on cement or iron floors may be constructed from old and soft rubber pump valves or disks. These rubber disks are 5 in. in diameter and ¾ in. thick, with a ¾-in. circular hole in the center. In making the base, the hole is enlarged to 1½ in. and the disk fastened to a piece of iron plate by means of four small bolts whose heads are countersunk in the rubber. The plate, with its rubber face, is fastened to the ladder by means of a swivel joint. The accompanying sketch shows the details of construction. The rubber disk has been trimmed to 4 in. square to make a neater looking job, although the base works just as well when the full-sized disk is used. The swivel joint is made as tight as possible, so that the cavity in the rubber will act as a vacuum cup and will hold securely on wet floors.



DETAIL OF SAFETY BASE FOR LADDERS

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*Safety inspector, Republic Iron and Steel Co., Gilbert, Minn.

Events and Economics of the War

With an armistice signed by the German envoys at midnight on Nov. 10, the Kaiser fled to Holland, and Berlin and other cities in the hands of revolutionists, the end of the war was practically attained, though formalities remain to be concluded. Toward the last, the German retreat from France had become a flight, with the Allies in swift pursuit; Sedan was taken by the Americans and Mezières by the French.

In Austria, the occupation by Italian troops of territory to be held as guarantees was begun. Czech and Jugoslav republics are said to have been set up, the former at Prague and the latter at Agram.

In this country, the United War Work Campaign was opened on Nov. 11 to continue for seven days. Twenty-two alien concerns were listed on Nov. 9 for sale by the Alien Property Custodian.

A slackening of the restrictions on less essential industries was announced.

Reconstruction Bill Pending

In connection with the possibility of a reconstruction agency being established, opinion in Washington indicates that the members of the War Industries Board will probably be appointed to this work, if the Overman bill, providing for a commission of five to be named by the President, is passed by the present Congress. There is every expectation that the bill will go through. A similar measure has been proposed by Senator Weeks, which would have the commission made up of members of Congress.

Many in Washington believe that the War Industries Board is the only agency equipped with machinery and supplied with the information necessary to give suitable guidance to business for after-the-war work.

Tin Importers Protest

A protest was made to the War Industries Board on Nov. 6 by the newly organized Tin Importers' Association, over the ruling that the United States Steel Products Co. should have sole direction over the import of the metal into this country. The association informed George Armsby, chairman of the subcommittee on tin of the War Industries Board, that this would create a monopoly of the tin trade in the country for the benefit of the company named, which is a subsidiary of the U. S. Steel Corporation.

The Tin Importers' Association was formed soon after the War Industries Board announced its ruling. Among the members are: W. R. Grace & Co., Mitsui & Co., Nathan Trotter & Co., Lewis Lazarus & Co., Mitsubishi, Goshi Haisha, James W. Phyfe & Co., Frame, Leycraft & Co., and the Wah Chang Trading Co. Arthur E. Winter, of Winter, Son & Co., is president; I. J. Louis, of the Vernon Metal and Produce Co., is vice president, and E. W. Starke, of Caswell & Starke, is secretary and treasurer.

Anthracite Prices Raised

New prices for anthracite, revised to meet increased labor costs due to the higher wage scale just granted to anthracite workers, were announced on Nov. 7 by the U. S. Fuel Administrator. They are effective on coal mined on or after Nov. 1. At that time, approximately 60% of the estimated season's supply had been mined, and all of this will be sold at the old prices. The full power of penalty under the Lever law, Dr. Garfield said, will be exercised to prevent the adding of any allowance to coal shipped on or after Nov. 1 on which the increased wages were not paid.

Power Plants Save Fuel

Through the coöperation of industrial power plants, which have put into force the standard recommendations of the U. S. Fuel Administration for promoting efficiency in the use of fuel, a saving of three and a half million tons has been effected in the first six months following the announcement of the national program. At the same time, maximum production has been maintained in the factories. Some plants which have kept systematic records report a fuel saving as high as 25%, and the average is estimated between 10 and 15%. This large economy has been effected at practically no expense to the plant owner.

Steel Problems After the War

Among the peace problems with which the steel manufacturers of the country will have to cope, not least important are the probability of shrinkage in inventories and the necessity of reduction in wages. On this subject the executive head of one of the biggest independent steel companies is quoted by the *Boston News Bureau* as saying:

"One thing is probable, and that is the danger that many buyers of steel now having contracts with manufacturers at war prices, having bought heavily to over-anticipate requirements, will do everything in their power to abrogate such contracts. The manufacturer must, therefore, be the loser, as his inventory of raw materials, bought at war prices, was necessarily made to take care of these obligations, and cancellation of orders for the finished product must consequently entail a large inventory loss to the manufacturers through value shrinkages.

"The second result of an early cessation of war must be a readjustment of wages, as with declining orders and future close competition, manufacturers, to keep plants employed, will be compelled to produce their goods at lower costs. A protective tariff is the only means by which they can be protected.

"Following the cessation of war, therefore, there will certainly follow a lowering of costs of raw materials and a reduction in wages to meet these future conditions."

Nickel Matte From Australasia

As an exception to List of Restricted Imports No. 1, it was ruled by the War Trade Board on Nov. 1 that licenses may now be issued, when the application therefor is otherwise in order, for the importation of nickel matte from Australasia, provided that shipment be made as ballast in sailing vessels carrying wool; also provided that the maximum quantity of nickel matte to be loaded in any one ship be 15% of the deadweight capacity of such ship.

Potash From Blast-Furnace Dust

In June, 1917, according to a recent consular report, the British Ministry of Munitions opened a potash production branch to work out the results of valuable experiments made by Kenneth M. Chance, one of the directors of the British Cyanides Co., Ltd., and Lennox Leigh, of the North Lincolnshire Iron Co., in producing potash as a byproduct of the blast furnace, through the addition of salt to the charge.

In order to deal with the blast-furnace dust as a raw material for potash production, the British Potash Co. was formed. One-half of the shares in this company are held by the government and the other half by the British Cyanides Co., Ltd., the North Lincolnshire Iron Co., Ltd., and Messrs. John Lysaght, Ltd. Three directors represent the private interests and three the government interests. A factory erected at Oldbury, near Birmingham, equipped with a most modern plant and designed to turn out from 400 to 500 tons of potassium chloride per week, is in operation, and the period of scarcity has passed. It is part of the plan to erect a conversion factory, where the chloride not needed for agricultural purposes may be converted into other refined potash salts. Other factories in the neighborhood of blast-furnaces are contemplated, and there are hopes of obtaining especially large quantities of potash from the Cleveland iron district.

As blast-furnace dust has become such an important raw material, it was found that government control in handling it would be advisable. Therefore, in August, 1917, the blast-furnace dust-control order was published, followed in February, 1918, by the potassium-compounds control order. Thus orders control all dealings in potash salts, namely, chloride, carbonate, sulphate, and hydroxide. Transactions in blast-furnace dust are carried out under license from the potash-production branch of the Ministry of Munitions, through agents specially appointed by the food production department.

Further Tin Regulations Issued

Washington Correspondence

Regulations under which imports of tin will be distributed among private consumers, jobbers, and dealers, holding purchasing licenses issued by the War Industries Board, are as follows:

1. The revocation of outstanding licenses for the importation of pig tin, tin ore and concentrates, or any chemical extracted therefrom, as to ocean shipment after Oct. 20, 1918, shall remain in effect.

2. The Bureau of Imports is authorized hereafter to issue licenses for the importation of pig tin, where the applications therefor are otherwise in order, to cover shipments purchased prior to Oct. 1, 1918. For this purpose the date of purchase is to be determined by the American Iron and Steel Institute. Licenses so issued are to provide for the indorsement of the bill of lading to the American Iron and Steel Institute.

3. The Bureau of Imports is authorized to issue licenses for the importation of pig tin, where the applications therefor are otherwise in order, to the United States Steel Products Co., regardless of the date of purchase of said pig tin. Licenses so issued are to provide for the indorsement of the bill of lading to the American Iron and Steel Institute.

4. The Bureau of Imports is instructed to issue no licenses for the importation of pig tin except those described in paragraphs 2 and 3 above.

5. The Bureau of Imports is authorized to issue licenses for the importation of tin ore, tin concentrates, and chemicals extracted from tin ore, in accordance with its rules and regulations covering the licensing of the importation of these commodities in force on Oct. 4, 1918.

George Armsby, chief of the tin section of the War Industries Board, comments on the regulations thus:

On Aug. 28, 1918, the U. S. Government entered into an agreement with the governments of Great Britain, France, and Italy covering the purchase and distribution of their requirements of pig tin. Under the agreement an Inter-Allied Tin Executive was set up in London to control and direct all purchases of pig tin for the participating countries. The Inter-Allied Tin Executive has appointed its buying agents in the several principal producing countries, and this purchasing machinery has been in operation for some weeks. None of the countries participating in this international agreement will purchase tin except through the Inter-Allied Tin Executive, and will grant import license only for tin purchased by the Inter-Allied Tin Executive.

The War Industries Board requested the American Iron and Steel Institute to assume charge of the importation, financing, and distribution of the imports of pig tin under its supervision, and the United States Steel Products Co. will be the medium through which the American Iron and Steel Institute will operate in the carrying out of this work and will receive and pay for, at the source, the tin allocated to the United States under the international agreement above referred to, and will distribute this tin at cost to the consumers, jobbers, and dealers in the United States who hold purchasing licenses issued by the War Industries Board. Arrangements are now being made for the issuance of these licenses, and announcement will be made as soon as the licensing system is ready to be put into active operation.

No selling price has been announced on the tin that has been purchased by the Inter-Allied Tin Executive, and allocated to the United States, but this price will probably be announced between now and Dec. 31, 1918.

Consumers, jobbers, or dealers requiring spot tin can be assisted in locating available stocks by communicating with the subcommittee on pig tin of the American Iron and Steel Institute, Room 1811, 71 Broadway, New York City, as the American Iron and Steel Institute is well posted as to all surplus stocks of spot tin.

A report made to the War Industries Board, as of Oct. 1, indicates that there was a maximum stock of spot tin on hand in the United States at that date. Purchases of tin by the executive for shipment to the United States are progressing satisfactorily.

Import licenses will be granted covering contracts entered into prior to Oct. 1, 1918, where satisfactory evidence can be shown that the tin was actually purchased prior to that date.

Producers of quicksilver will meet with representatives of the War Industries Board on Nov. 20 to consider prices and other matters pertaining to their industry.

Mixed carloads of sulphuric, nitric, and muriatic acids are subject to the same rules and regulations, as regards the prices fixed by the Government, as though the carload were made of only one kind of acid.

Under a new agreement between the War Trade Board and the Swedish government, the Swedish Metal Import Association will handle such shipments as may be made from this country of mica, graphite and metals not worked, metal manufactures, lead, tin, tin plate and terne plates, graphite crucibles, aluminum, nickel, and similar commodities.

Twenty-seventh Still Needs Smokes

"Cease firing" it may be, but "cease smoking"—never. The comforts of life will be wanted by the men of the 27th Engineers, no matter what happens abroad. It can safely be said that months will elapse before the mining regiment returns after the "mopping up" is finished on the other side. So there will still be work for the Comfort Fund to do in brightening things up for the men.

The money that has been contributed to the Fund since it was established about a year ago has accomplished much good, and those from whom it came may be glad that they responded to the appeal. Everything that anyone has done in helping the cause along will be a source of satisfaction to him when the men actually start to return. It is then that the consciences of slackers will prick the hardest, and those who might have helped but did not will feel keen regret. For comparisons will be possible and it will be too late to alter the record.

There is still opportunity, however, for the mining man to put a little joy into life for those in the 27th Engineers. These are days of grace that should be utilized to the full in squaring oneself with his conscience

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johann	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hulst	20.00
Lawrence Addicks	20.00
R. R. Boyd	25.00
E. R. Varela	5.00
W. J. Walcott	25.00
Total	$18,823.27

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Acknowledgment is made only in the *Journal.*

Protection for Potash Companies

WASHINGTON CORRESPONDENCE

To meet a general desire that the potash industry be not allowed to retrograde to its pre-war status, the Government is being urged to take every step possible to protect the capital investment of those who have undertaken, or may undertake, the recovery of this mineral within the borders of the United States. Owing to the peculiar occurrence of potash, doubt is expressed as to whether adequate provision is made in the War Revenue Bill to exclude potash operations from heavy taxes before the investment is amortized. The following specific provision has therefore been suggested to the Senate Committee on Finance:

> In the case of buildings, machinery, equipment, or other facilities for the treatment of potash-bearing brines or other natural potash deposits, or for the recovery of potash from other sources, or as a byproduct in other operations, there may be allowed a reasonable deduction for the amortization of such part of the cost of such facilities as has been borne by the taxpayer; such reasonable allowances in all cases to be made according to the peculiar conditions in each case and under rules and regulations to be prescribed by the commissioner with the approval of the secretary.

World's Production of Aluminum*

The annual production of aluminum before the war was about 68,000 tons, which was distributed as follows: United States, 33%; Canada, 8½; Switzerland, Germany, Austria-Hungary, 17½; France, 26½; England, 11; Norway, 2¼; Italy, 1¼ per cent.

The important factories in the United States are the two at Niagara Falls, with a capacity of 50,000 hp., and one at Massena, of 100,000 hp. capacity. In Canada there is a factory at Shawinigan Falls, of 60,000 hp. capacity. These four factories all belong to the Aluminum Company of America.

In France there are factories with an aggregate capacity of about 100,000 hp., viz., Société Electrometallurgique Français, with factories at La Praz and at Gardannes; and Compagnie des Produits Chemiques d'Alais, with factories at Calypso, at Felex, and at St. Jean de Maurienne. The Swiss aluminum industry controls factories with an aggregate capacity of 100,000 hp., viz., one at Neuhausen, Switzerland, one at Rheinfelden, Germany, and one at Lend-Gastein, Austria, also Grippis Borgne. They are all owned by the Swiss Aluminum Industrie Aktiengesellschaft. In the United Kingdom, there are two works belonging to the British Aluminium Company and one owned by the Aluminium Corporation.

France and Switzerland have exported most aluminum. Prior to the war each exported 7000 tons to 8000 tons per annum. Germany has been the largest importer of aluminum, 16,000 tons in 1912 and 12,500 tons in 1913. It is difficult to obtain reliable information about the production of aluminum during the war. Prices have risen abnormally, and new factories have been started which have secured contracts extending over several years after the conclusion of peace. Their continued operation will be determined by post-war conditions.

If projected factories are built and come into operation, the production of aluminum after the war is likely to be about doubled. If the aluminum factories can double their output, an annual production of about 150,000 tons of aluminum may then be reckoned upon. Of this aggregate 50% is likely to be produced in the United States and Canada, and 13% in Switzerland, Germany, and Austria-Hungary. The production in Germany, Austria, and Hungary has of late been pushed ahead with much energy, on account of the war requirements, and several factories are planned and probably in course of construction in Bavaria (in which the Allegemeine Elektricitat Gesellschaft is interested), in Austria, and in Hungary. There will probably be a further production of 13% in France (26½% before the war), 8% in England (11% before the war), 11% in Norway (2¼% before the war), and 4½% in Italy (1¼% before the war).

Recent events have started the disintegration of the special war agencies of the Government. This is particularly noticeable in the U. S. Fuel Administration and in the War Industries Board. Men of experience and ability, who have been willing to work as volunteers or at a nominal salary during the emergency, now are anxious to resume their former activities.

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*Abstracted from the *Chemical Trade Journal* and from *Engineering*.

Draft Calls and Inductions Suspended

The Secretary of War has made the following announcement:

"I have suspended further calls under the draft and inductions, and there will be, for the present, no additional men brought in. As far as practicable we will turn back those who have been entrained and have not yet reached training camps."

What Is an Engineer?

The following definition has been promulgated by A. H. Krom, director of engineering, United States Employment Service, Chicago:

"An engineer is one who economically directs manpower. and, by scientific design, utilizes the forces and materials of nature for the benefit of mankind."

In view of the importance of the engineer in the present war. it is highly desirable that his status be properly defined.

October Pig-Iron Production

Pig-iron production during October was expected to show a new record, but the inroads of the influenza epidemic upon working forces brought the total below that of September, according to *Iron Age*. Production was 3,486,941 tons, and the daily average was 112,482 tons for 31 days.

Twelve furnaces were blown in and 12 blown out during the month, leaving the total unchanged at 365. Capacity active on Nov. 1 was 113,500 tons, against 114,570 tons on Oct. 1.

Reserves of War Minerals Justified

The War-Minerals Act will probably be administered almost entirely by the U. S. Bureau of Mines. The President has authorized the use of $100,000 to begin work under the new law. Legal opinion holds with practical unanimity that chrome, pyrites, manganese, and any other war mineral of which there may be temporary overproduction come under the act. Conditions are considered to warrant reserves of these minerals. Much importance is attached to this interpretation, as it will enable the Government to assist producers of chrome and other minerals who are now facing a difficult situation.

A rough survey of the situation, however, leads officials to believe that the amount which would be endangered by the immediate ending of the war does not exceed $10,000,000. This is divided as follows: Potash, $5,000,000; manganese, $3,000,000; pyrites, $1,000,000, and chrome, $1,000,000. Some think that the chrome situation is not as serious as represented, and that the interests of domestic producers will be protected if imports are restricted for another year.

Mahlon M. Garland, of Pennsylvania, has been suggested as chairman of the Committee on Mines and Mining in the next House. He has been a member of Congress since Dec. 6, 1915. Mr. Garland was long president of the Amalgamated Association of Iron, Steel and Tin Workers, and at one time was vice president of the American Federation of Labor.

Broken Hill Proprietary Co., Ltd.

The semi-annual report of the Broken Hill Proprietary Co., Ltd., which owns famous zinc-lead-silver mines in New South Wales, Australia, and iron mines at Iron Knob, South Australia, indicates a considerable expansion in output. The results of the operations of the ore-dressing mills and concentrating plants for the period under review—the six months ended May 31, 1918—indicate improved metallurgical extractions at lower working costs. The Broken Hill mills handled 70,843 tons of sulphide ore, and produced 11,958 tons of lead concentrate, assaying 60.55% lead, 29.14 oz. silver per ton, and 13,608 tons of slime. Tailings reground amounted to 117,133 tons, producing 2723 tons of concentrate, assaying 57.66% lead, 29.04 oz. silver per ton, and 14,714 tons of slime.

The zinc flotation plant dealt with 144,944 tons of tailings, as compared with 92,907 for the previous semester, and the production of zinc concentrate amounted to 36,630 tons. The current output of slime, with 43,674 tons from the dumps—a total of 73,991 tons, as compared with 50,248 tons during the previous half year—was treated in the Bradford-process flotation plant, which produced 8161 tons of lead concentrate, assaying 60.4% lead and 83.44 oz. silver per ton, and 19,203 tons of zinc concentrate, assaying 50% zinc.

The output from the company's iron mine in South Australia, at Iron Knob, was 164,780 tons. Of this, 135,847 tons was sent to the company's steel works at Newcastle, New South Wales. The rapid expansion of Australia's youngest industry, as reflected by these operations, is shown as follows:

OUTPUT FROM NEWCASTLE STEEL WORKS FOR YEAR ENDED MAY 31, 1918

	Half Year, Nov., 1917	Half Year, May, 1918
	Tons	Tons
Pig iron	41,351	67,803
Steel ingots	52,878	89,011
Coke	35,044	74,025
Sulphate of ammonia	598	1,120
Tar (gallons)	345,911	777,324

The net profits for the half year amounted to £359,706 4s. 8d., as compared with £290,881 3s. 2d. for the previous six months.

Broken Hill South Silver Mining Co.

The report for the half year ended June 30, 1918, of the Broken Hill South Silver Mining Co., of Broken Hill, N. S. W., Australia, shows that the amount of sulphide ore mined and raised during this period was 127,745 tons, as compared with 69,758 tons during the previous semester. The total tonnage treated in the mill was 128,400, as compared with 69,390 for the previous period, with an average content of 15% lead, 7.9 oz. silver per ton, and 14.6% zinc. The selective-flotation slime plant handled 19,136 tons of current slime and produced 2773 tons of concentrate, assaying 61% lead, 51.3 oz. silver per ton, and 7.7% zinc. Accumulated slimes to the extent of 15,916 tons were also treated in this plant, from which the yield was 2294 tons of concentrate, assaying 53.9% lead, 46.0 oz. silver per ton, and 13.7% zinc. The total yield of concentrates from all sources was 26,490 tons, as compared with 12,970 during the previous period, and the assay content 65.3% lead, 29.4 oz. silver per ton, and 8%

zinc. Owing to the war and the fact that timber from America is now unobtainable, local woods are being used for mine-support work

Working costs, including development and concentrating expenses, amounted to 29s. 11.7d. per ton, as compared with 31s. 5.4d. during the previous six months. The company still has on hand 794,789 tons of old mill tailing, and 442,932 tons of slime. The former contains 5.5% lead, 3.4 oz. silver per ton, and 16.0% zinc, and the latter carries 10.8% lead, 6.1 oz. silver per ton, and 14.2% zinc.

Kerr Lake Mines, Ltd.

The report of the Kerr Lake Mines, Ltd., for the year ended Aug. 31, 1918, shows that the gross production from all ores amounted to 2,582,992.82 oz. silver, 199,331.28 lb. cobalt, and 545.5 lb. mercury. These figures include 54,523 oz. silver on hand Aug. 31, 1918. Of the total, 2,004,737.91 oz. of silver, 199,331.28 lb. cobalt, and 525.5 lb. mercury was contained in ore shipped. The remainder was recovered from silver ores milled by the Dominion Reduction Co., at Cobalt.

Ore hoisted during the year amounted to 43,129 tons, of which 1017 tons was sacked for shipment. A bumping table eliminated 14,277 tons of waste from the remainder, leaving 27,835 tons of milling ore. Ore reserves, as at Sept. 1, 1918, were estimated at 34,730 tons, containing 1,637,300 oz. of silver.

New Westinghouse Research Building

High-grade experimental work cannot be carried on in the midst of the noise and confusion of production—quiet is the first essential for achievement in research where uninterrupted concentration is required. Delicate instruments and the costly mechanism of an experimental laboratory must be protected from the dust and vibration of the shops. The manufacture of electrical machinery and apparatus is one of the most intricate and complicated in industry, showing constant improvement and progress. The various departments in large works are frequently confronted with new problems that require special research work.

The Westinghouse Electric and Manufacturing Co.'s new research building at East Pittsburgh, Penn., erected to provide for the growing demand for advanced research, is situated about a mile from the works. Architecturally, the building is plain but substantial, of reinforced concrete and brick, trimmed with white terra cotta. The plumbing and wire services are arranged in such a way as to enable additions to be made in any particular laboratory when needed without disturbing any other part of the building. Provision is made in the new building to carry out a variety of experiments in many lines of work, including magnetic insulation, metallographic metallurgy, chemistry—both organic and inorganic—furnace combustion, wood-working, illumination, glass blowing, and other phases of industry.

The power house contains motor-generator sets for supplying single-phase, two-phase, and three-phase current at 220 volts, and direct current at 250 volts (three-wire circuit). A motor-driven air compressor supplies compressed air at 125 lb. pressure (8.75 kg. per sq.cm.), and a large motor-driven vacuum pump supplies the necessary house vacuum. A liquid-air machine, capable of supplying 1½ to 2 liters of liquid air per hour, is also installed in the main power house. The storage battery is in a separate room in the basement of the power house and consists of a total of 218 cells, so divided that various groupings and combinations may be obtained.

In one end of the basement is the furnace room, with a battery of electric furnaces of various types, together with the necessary control for melting, annealing and other metallurgical processes. Stacks are provided at each end of the building, with openings in the basement, for experimental furnaces using fuel, usually natural gas. The woodworking and metal-working shop and storeroom are also in the basement.

On the first and main floor are the main and private offices, the library, and the conference room. The remainder of this floor is assigned to physical, electrical, and magnetic research. The second floor will be given over to the same general class of work as the first floor. The third floor is devoted to chemical and electrochemical research, illuminating laboratories, and a glass-blowing room.

Though this new laboratory has been occupied for only a comparatively short time, the work already accomplished gives much promise for the future. It is, of course, intended that the fundamental and advance work shall be carried on by this section of the engineering department. Applications of new processes and products thus developed, however, are to be carried out by sections in more intimate contact with the production departments. As this special research section and all the others are under one management, men can readily be transferred from the more commercial sections to the laboratory, or vice versa, as the exigencies of the case demand. Thus a man working on some metallurgical problem can follow it up to the point of commercialization in the factory itself.

The history of the Westinghouse research organization is noteworthy. This division was founded in 1906 as one of the several divisions of the engineering department. It is now divided into seven laboratories. The extent of work covered by the whole division is broader than is ordinarily included in research work. For example, it has charge of the preparation of all specifications for the purchase of materials used by the company, together with the experimental and development work leading up to these specifications. It includes a process section, which has electrical control of all the various processes used by the company in the manufacture of its products. It has charge of the routine chemical and physical testing for all departments, including the inspection department. It has technical control of the various metallurgical processes, such as those involved in the brass foundry, copper mill, scrap recovery plant, and similar departments. Through the activity of its members on various standards and other committee work, it comes into contact with numerous organizations not strictly of research nature, both within and without the organization.

The seven laboratories are known as the chemical, physical testing, process, electrical, molded materials, ceramic, and research. The research laboratory, in the new building, is divided into sections, each with a section head reporting directly to the division engineer.

Editorials

End of the War

THE Great War came to an abrupt end on Nov. 11. The ending was sudden owing to the complete collapse of Germany, which was forced to sign an armistice of terms so harsh that it is deprived of any power to resume hostilities. Everybody also knows in a general way what the terms of peace will be. Thus there will be no prolonged negotiations and uncertainties. The victorious associated powers will meet to arrange the details. Then Germany will accept them, there being nothing else for her to do. There will be an adjustment of the evils that Germany has been propagating during two centuries. Subjugated peoples will be freed. Partitioned nations will be reconstituted. Even in Germany itself will the people now be at liberty to determine the kind of government that they want to have. These will be the major results of the Great War.

But not less than these is the solidarity that the struggle has created among free and enlightened nations. Forever will French, Belgians, British, Italians, Serbians, and Americans be friends. We bow especially to the French, who bore the brunt of the battle and under whose leadership victory was won. Not less do we admire the British, who, with the Australians, Canadians, and Indians, exhibited unparalleled sincerity, steadfastness, and sturdiness. The chivalry of the Italians and the gallantry of the Serbians likewise move our hearts. Nor do we forget the Russians, who sacrificed themselves, and in so doing gave the Allies of the West a chance to prepare, and thus ward off German victory during the first two years. As for ourselves, we may feel an everlasting pride that we joined those noble Allies and strengthened them just when help was most needed.

Reconstruction

THE great problem with which we are now to be confronted is reconstruction. For four years the civilized world has been engaged largely in making munitions and engines of war. Machine shops have been changed from the manufacture of articles for peaceful purposes to the production of shrapnel and shells. The automobile manufacturers who were making pleasure cars have been diverted to the making of lorries and tanks. The day has come when such things will no longer be needed, and the great problem is now to get the factories and their work people back to former lines.

The producers of the metals and other commodities will be affected just as much as the manufacturers who use them. We know how painful was the transition from a peaceful basis to a war basis. There is no reason to expect that the reversion will be less troublesome. On the contrary, it is more likely to be harder than easier. Scarcely any thought has yet been given to the great problems of this kind that confront us. In this we are greatly behind Great Britain and France, which long ago organized their reconstruction commissions.

We shall have considerable time in which to prepare for the demobilization of the army of two million men that is now in Europe, for they will undoubtedly have to remain there for some time, and their retransportation will necessarily be slow. Even the demobilization of the troops in cantonments in this country may be delayed for some months. But what will not be delayed is the cessation of making explosives, rifles, cannon, shells, tanks, aëroplanes, and other purely military munitions. Many hundreds of thousands of men and women who have been engaged in such production will be thrown out of employment, and in many cases will find themselves in mushroom munitions districts, wherein further employment is not to be expected and whence they will be obliged to migrate to the older industrial districts. This dislocation will inevitably create disquieting disturbances.

What is to be done to meet the situation? Manifestly there is need for intelligent thought and action by governmental commissions. Yet we think that private concerns must themselves do most of the thinking and acting. The manufacturer of automobiles, for example, who has been diverted from the building of pleasure cars to the construction of motor trucks, ought to be making preparations to get back to his normal business with the least possible delay. His plans ought to have been all ready, so that he would know just what moves to make upon termination of the war. Perhaps this is so.

There is, anyhow, going to be a radical readjustment, which will try the patience and test the resourcefulness of everybody. The difficulties will be minimized, however, if everybody approaches the new problems with a spirit of coöperation and if the right kind of thinking be done in advance.

Mexico After the War

NOW that the Great War is ended, and the achievement of making the larger part of the world a decent place in which to live has been consummated, there still remains what will doubtless appear as a trifling problem to solve. The great nations of the world, representing justice and the strength to enforce it, will be free, after having disposed of the more virulent pest, to attend to the elimination of minor irritants. Conditions in Mexico will demand attention; they must be improved from within or from without.

After having invited foreign capital to develop her resources, Mexico must see that the country is made safe for lawful enterprise. Neither the United States, Great Britain, nor France has any intention of writing off its investment there because of recent lawlessness. Nations have obligations toward their citizens just as the heads of enterprises are responsible to stockholders.

There is little justification for any further delay in the granting of the protection to life and property that civilized nations accord to those whose money, energy, and initiative they have welcomed.

The right to carry out industrial enterprise in Mexico is the unquestionable prerogative of those who have loyally obeyed the laws, respected the national institutions, and aided in the country's development. At the conclusion of the Great War an adjustment of the Mexican question will be demanded by those who have the right to do so. Our southern neighbor has everything to lose and nothing to gain by an adherence to the policy that has done such damage to her national credit and has halted all real progress in Mexico for years.

Getting Together

IT IS A PLEASURE to record that fewer strikes are now to be noted in mining districts. Strikes still occur, but they are not in mining. What does this lull mean? Is it patriotism on the part of labor or of the managements; or both? Or is it just simply getting together? We hope that it is due more or less to all three causes.

Under the strenuous calls for production that the country has had to meet it is a pleasant duty to set down the fact that many a laborer is getting to his work ahead of the clock and not quitting with his hammer in the air; that he is taking a bottle of coffee for lunch instead of going around the corner to get some beer to wash down his sandwiches; and it is just as pleasant to note that some of our gold-mine managements are straining every nerve to keep the plant in operation, for the benefit of their regular employees and their families, in spite of the ore being taken out at small profit or at no profit at all. Both are showing a desire to get together. Perhaps it is for patriotic reasons, perhaps it is just because it is right to do so; but, whatever the cause, the result is of deep significance, and its effect will remain with us. And there will probably come a day, if it is not with us already, when patience and toleration from both sides will be required as they have not been required before—when it will be harder and yet more necessary to get together than it is today. The man who has been getting $5 per day will not relish a cut to $4, or it may be to $2.50, no matter how the price of commodities falls. Nor will the man who has been paying the $5, robbing his mine and making no profit while taking out much-needed metal for the Government, relish a continuation of that procedure when peace has been declared.

There will be much reason, then, for each to consider the other's point of view, and not allow the selfish instinct to get too much the upper hand. It is time right now to begin thinking of what each of us can do, what each of us should do, in order that we may get together then as well as now.

It is pretty well agreed among economists that present high prices are due to a scarcity of sufficient labor to perform all the work that is required of it, and the bidding of employers, at a continuously increasing figure, for the labor needed in their plants, each hoping to outbid his neighbors.

In a country as free as the United States, this bidding for labor will continue as long as the excessive demands last, and for that length of time high wages will be with us. They may even keep on growing higher, with advantage to no one, employer or employee. A pair of shoes are worth about one day's work, and that is about what the worker will pay for them, whether conditions enable him to get $7.50 per day at his trade, or only $2.50.

We are almost upon the day when the world will be trying to catch up with those things that have been left undone—the time when we will be busy replacing what has been destroyed. The United States will have much of this to do, and there will be work for every man and woman who wants it. Before that period is upon us, there is danger of another one, when the employer must of necessity lower the cost of his production or quit altogether, and the employee must lower his demands or quit also. There will be hot-heads on both sides, and there will be some trouble, but we look forward with confidence to the attitude that will be taken by those who are working with their hands for a living and to those who are paying the wages. We feel confident that, having done it once, they will continue to get together.

This brings another thought. We are all human beings, whether we employ or are employed. When we are working for a corporation we sometimes visualize that corporation as an octopus, some great soulless monster, reaching out its tentacles to draw in our vitality to itself without a thought that we are men. But stop and think a moment. That corporation may be a single being as human as ourselves, or it perhaps is made up of a great many humans with the same desires, hopes, and ambitions as our own. Indeed, if we have been so fortunate as to accumulate $100 we are liable to be a part of that octopus ourselves.

It is not an easy matter to speak to a corporation and be on familiar terms with it; one has the feeling that it is not tangible, that he can get no nearer to it than the manager or superintendent, or it may be the shift boss, and that anything which he gets from the corporation is just so much pure gain. With this idea revolving in the back of his head, he feels much more like fighting for what he can get than going 50—50 with his employer. If we stop to think, however, that one of those bloated bondholders of which the corporation is made up, is old widow Jenkins with whom we board, it does seem to be a little more human. When Captain Tom was suffocated in trying to pull some boys out of the shaft fire, his widow received $1000 insurance, and she put it into the mine where he had always worked. But she is only one of a hundred who have done the same thing with their little pile, trusting that the boys would play fair when making their living by the use of that money. It is much easier to go 50—50 when you look at it from this point of view, and easier to get together with the management.

And you, Mr. Manager, you must remember that, though it is up to you to keep the wheels running, you are using humans to work for other humans; that they are not simply stulls to be thrown aside if they don't exactly fit the stope and have to be blocked at both ends. Whether they speak your language or some other, whether they see as you do or not, they are still human, and it is your function to work the two ends and the middle, and get them together, whether or no.

In our issue of Sept. 21, we reproduced several photographs of plants in South America under the caption of "Cottrell Precipitation in South America." In this designation we were partly in error, inasmuch as there is no Cottrell installation at either the Compañia Minera de Oruro or at the Borax Consolidated, Ltd. The work to which they pertain was of an experimental nature only, and the photographs were taken by one of the engineers of the Western Precipitation Co., and sent to the *Journal* as being of interest to its readers.

BY THE WAY

"Wot's thee want naow , Dicky, m'son?" "W'y, damme, Cap'n, I's got to 'ave 'nother wrench." "Gos along do; wot's tha matter with'n? 'Ere only foor days ago I did'st give thee one. Wot 'ast thee done with'n?" "Well, Cap'n, I tell 'e. I take'n down in tha bloody stope, an' firs' bloody thing I naws, w'en I gaws to look for 'e, w'y, damme, un was'nt theer; so some bloody beggar mus' 'a stollen she." "W'y, thee bloody gert fool, Dicky; w'y did'st thee not put a mark on she?" "So did I, Cap'n; so did I. An' dost naw, that all in spite of un, they stol' wrench, mark an' all?"

Several years ago, two "Cousin Jack" miners were spending a few days in the city before returning to work. Having spent the greater part of their lives in mining camps, the entire scene was new to them. While strolling along and taking in everything, they happened across the well-known Italian organ grinder, with his overdressed monkey, gallantly arrayed in a red flannel suit, resplendent in brass buttons and busily engaged in collecting pennies from the passers-by. After a few moments, the Italian swung the organ on his back and yanked at the chain; whereupon Jocko sprang on his master's shoulder. The Cornishmen, neither of whom had seen anything like this before, followed at a short distance. This seemed to interest Jocko greatly, and he amused himself by making grimaces at the pair. It was finally more than the "Cousin Jacks" could stand. "'Arry," says Dicky, "seems to me that there bloody beggar is makin' fun o' we." Harry was silent for a few minutes, and then, with an air of recollection said, "Damme, I naws thee. Thee's Jimmy Kevern's son from Redruth. Too bloody small to join tha h'army over in ole country; 'ad to come over 'ere to do h'it."

We read and study of why the little particles of metal should float and do float, writes Tom L. Gibson, of Grant, Colo., but nothing is said of why they don't float when they should float. Or why the same ore with the same gangue, with the same amount of oil and acid, floats and froths today, and tomorrow it does not. The office engineer will say that this is impossible—and as a field engineer I almost agree with him. However, I have ocular demonstrations every day of this condition. In smelting, the impossible happens once in a while, but in this float game it is a daily occurrence. With physical and chemical conditions the same, any one of a half-dozen things might occur. A heavy froth or no froth at all, a dirty froth or a clean one, a brittle froth or a tough one. The only person who can explain the reason is the man who has been in the mill only a couple of days. Then in a six-cell machine with the same connections, baffles all alike, impellors with same speed, why should the water level in the V boxes be so widely varied?—Why should the barite stick in the second V box at all times and never in the rest of the V boxes, when all are alike?—Why, when I put my oil in the ball mill and the pulp comes out a seething mass of black lead-laden froth, should it come out in my V boxes with a measly, dirty camouflage of a froth?—Why is it that the first two V boxes and the last two will have an excellent froth and the two center ones giving forth only a vacant stare?—Why is it that a man knows more about a float machine after he has been on it 24 hours than after he has been on it a month?—Why is it that No. 40 oil sometimes looks almost like turpentine and the next barrel has the viscosity and color of a heavy gravity pitch? Truly, "where the wind listeth" has nothing on the float machine.

The Cornish Miner

By D. E. Charlton

Oh, oo's that chap in diggin' clothes,
  Oo 'andles all tha h'ore;
An' oo's tha chap oo naws 'is groun',
  An' naws it all tha moor,
Tha longer that 'e works un?
  M'son, jus' listen 'ere,
E's no bloody h'engineer,
  But, tell e wot, e's on tha spot,
An' wot 'e naws, 'e naws e's got,
  An', dam-me, well e's learned un.

Oh, oo's tha chap that naws tha drill,
  O' any kin' or makin',
An' gawin' h'up or gawin' down,
  Can work 'er w'en she's shakin',
Jus' turn tha valve an' 'old un
  In shaf' or on tha sub,
Makes no dif'rence wot's tha rub?
'E naws tha feel of any steel,
I'll tell e wot 'e naws a deal
  That mus' be nawn in drillin'.

Oh, oo's tha chap that spits tha fuse,
  Oo naws wot shots e'll need,
An' places them to break jus' right?
  To tampin' 'e gives 'eed,
So not a bit is wasted.
  Now, dam-me, there's no doubt,
For I'm tellin' three straight h'out.
  'E naws jus' 'ow to raise a row,
An' jus' wot time 'e mus' allow
  Before tha beggar's pasted.

Oh, oo's tha chap o' girth an' brawn,
  Oo naws tha set that's needed—
Oo naws jus' 'ow a stull is put,
  An' wot groun' should be 'eeded
When caves do start a-workin'?
  M'son, jus' 'ark to me,
Min' I'm tellin' this to thee.
  Thee'd ought to see tha strength o' 'e,
Why, dam-me, makes no work o' she,
  W'en all tha res' are shirkin'.

'Is name is Tom, 'is name is Dick,
  Per'aps it may be 'Arry.
Thee'll fin' in this 'ere minin' work,
  That none o' they will tarry.
They're boun' to push tha job through.
  Thee asks, 'Oo is this 'ere?
For to thee it mus' h'appear,
  'E's a liner. An' none finer,
Dam-me, 'e's a Cornish miner,
  Min' you, 'e's some beauty, too.

NEW PUBLICATIONS

My Reminiscences. By Raphael Pumpelly. In two volumes. New York, 1918. Henry Holt & Co. Price, $7.50.

Raphael Pumpelly, distinguished geologist, who is now in his 82nd year, is so old a man, whose professional career dates so far back, that few of the present generation know of his early thrilling experiences in mining, thinking of him rather as a geologist and explorer. His long and useful career was full of exciting experiences and valuable achievements. It is well, therefore, that he has published his memoirs, which are lively and entertaining. They are written with such an ease of style and an exhibition of humor that they are quite unlike any dry records of the experiences of a distinguished man, but rather are the narration of a story-teller.

Pumpelly, who was born in 1837, entered Yale, but soon afterward was sent to Europe to acquire his education, however on no definite plan. While still a youth he set out upon his first adventure—a tour through the mountains of Corsica—during which his interest in nature, especially geology, was excited. Following this, pure chance led him to Freiberg, where he entered upon the study of geology, mining, and metallurgy. At Freiberg he met James D. Hague and Charles and Louis Janin, but Americans were not plentiful at Freiberg at that time (1856). Previous to that year the registry showed the names of only 12.

Pumpelly's account of his life and experiences at Freiberg, and of a summer vacation spent in a second tour of Corsica, is one of the most interesting parts of his memoirs. The "Moufflon Story" that he tells about himself surpasses in humor and style the stories of similar nature that we are wont to read as inventions in the magazines. We experienced a keen appreciation of the "Moufflon Story."

Returning to the United States, Pumpelly obtained his first professional engagement, which was to test a gold mine in Virginia, which he promptly found to be too poor, but while there he tried the chlorination process then invented by Plattner, and this was, not unlikely, the first application of gold chlorination in the United States. In 1860 he went out to the Santa Rita mines, south of Tucson, in Arizona. This was the heroic age in Arizona, when a few bold adventurers were trying to exploit mines in the region then just acquired by the Gadsden Purchase, always in imminent danger of Apache raids. Pumpelly's superior was killed in one of these, and he himself narrowly escaped with his life, but he remained stoutly at his post in order to smelt enough ore to obtain silver wherewith to pay off the Mexican miners of the company. A reading of these experiences is commended to young graduates of the present time.

Accomplishing his purpose, Pumpelly abandoned the mines and escaped over the desert to California, during which he had more thrilling experiences. Arrived at San Francisco he found that he, together with W. P. Blake, had been engaged as geologists by the Japanese government, and he proceeded to Japan. While there he had interesting experiences, but practically did not accomplish much, the Japanese really not yet being ready for foreign assistance. However, he created a native staff, whom he taught, and he showed native miners, for the first time, how to break rock by blasting.

From Japan Pumpelly went to China, where he studied economic conditions, geology, coal resources, etc., and fulfilled some official commissions. In 1865 he started home, traveling overland from Peking through Mongolia and Siberia, and arriving in New York in 1866.

In the United States he soon became engaged in active professional work, especially in the exploration of the iron ranges of the Lake Superior region, in the development of which he played an important part during many years. In the early '80s he organized and conducted the northern transcontinental geological survey for the Northern Pacific Ry. Following that his life was spent largely in travel and miscellaneous professional and scientific work, which culminated in explorations in Turkestan in 1903 and 1904.

As a publication of reminiscences, Pumpelly's is extraordinarily interesting, not only for what he has to tell but also for how he tells it. Especially is this so with what relates to the earlier part of his life. Everybody who is interested in mining in southern Arizona, in explorations in the California desert, and mining on the Gogebic range will find much entertainment in this account of early times by a pioneer who played his part in things.

The Diesel Engine, Its Fuels and Its Uses. By Herbert Haas. Pp. 133, illus. Bull. 156, U. S. Bureau of Mines, Washington, D. C.

The pamphlet was issued for the primary purpose of disseminating information with regard to the characteristic features of oil engines in general and the Diesel engine in particular. The result desired is the greater utilization of heavy fuels, and the economizing of oils which are needed for other purposes. In the matter of the conservation of light oils, the Diesel engine is destined to play an important part, because of its ability to utilize crude oils which are unsuitable for all other types of engines.

The mechanical and structural features of the engine are considered with commendable detail, and descriptions are given of the different types manufactured in the United States. The advantages of the Diesel engine are summarized under the heads of (1) cheapness of fuel required, (2) the fact that the plant is self-contained, (3) the small space required for fuel storage, (4) the speed with which full power can be attained after starting up, (5) the general reliability, and (6) high efficiency.

The Diesel type of engine has been, and is being, widely adopted by our South American neighbors, particularly in connection with mining and nitrate enterprises. It is also being used extensively in other industrial work, there being a large number of Diesel engines in operation in the city of Buenos Aires. The pamphlet under review will serve a useful purpose if it draws more attention to the fact that the Diesel engine is, under a wide variety of conditions, an efficient and economical power producer.

Annual Chemical Directory of the United States, Second Edition, 1918. Consulting Editor, B. D. Lovelace; Managing Editor, Charles C. Thomas. 6 x 9, pp. 534; $5. Williams & Wilkins Co., Baltimore, Md.

A well-arranged compilation of chemical products used for scientific, technical, and industrial purposes; names of manufacturers and dealers; lists of apparatus and equipment; directories of chemists, engineers, laboratories, and technical societies; and publications on the respective subjects during the year.

The work involved in the classification of the numerous products is obvious, and we appreciate the editor's comment that an extraordinary confusion exists at the present time with regard to chemical nomenclature. Manufacturers are urged not to add to the existing confusion by giving new names to products already in common use.

We have only one minor complaint to make in the arrangement of the book, and would suggest that, in future editions, a brief statement of the matter dealt with in each particular chapter is given as a page heading, and the continuous repetition of the title of the book at the head of each page be avoided. This change would considerably enhance the value of the directory as a ready reference.

The Geology of the Tuapeka District, Central Otago Division. By P. Marshall. Pp. 79, illus. Bull. 19, New Zealand Geological Survey Branch, Wellington, New Zealand.

Annual Report of the Comptroller of the Currency to the Second Session of the Sixty-Fifth Congress of the United States, Dec. 3, 1917, Vols. I and II. 5¾ x 9, pp. 1142. Treasury Department, Washington, D. C.

The Journal of the Iron and Steel Institute. Edited by George C. Lloyd. Pp. 590; illus.; Vol. XCVII. Iron and Steel Institute, London, England.

Personals

Have You Contributed to the Association of the 27th Engineers?

W. Spencer Hutchinson, mining engineer of Boston, is now in New York.

Courtenay De Kalb, of San Francisco, is in Washington, representing the California chrome producers.

E. William Kohl, Jr., superintendent of the Nicoya Mining Co., San Jose, Costa Rica, is now in New York.

E. T. Corkill, formerly safety engineer for the Sudbury mines, Ontario, is now general mine superintendent.

H. Vincent Wallace, consulting mining engineer, has opened an office at 329 Central Bldg., Los Angeles, California.

Gordon Wilson is leaving Arizona to become mill and cyanide superintendent of the Fresnillo company, at Fresnillo, Zac., Mexico.

H. Douglas Allen has been appointed general manager of the Jantar Nigeria Co., Ltd., and the Kuru Syndicate, Ltd., in Nigeria.

D. Harrington, mining engineer, formerly at the Montana School of Mines, is now with the U. S. Bureau of Mines, Golden, Colorado.

J. B. Tyrrell, mining engineer of Toronto, has returned from a visit to the new gold prospects in the Matachewan district, northern Ontario.

I. Edmund Waechter has accepted a position on the chemical staff of the Carnegie Steel Co., Youngstown district, as chemist and metallurgist.

F. G. Stevens, of Toronto, has gone to British Columbia to investigate a property which the Mining Corporation of Canada has under option.

W. H. Landers, who was recently promoted in France from captain to major, has been ordered to report to the Chief of Engineers in Washington.

J. C. Houston, formerly assistant manager of the Dome Mines, Ltd., Porcupine, Ont., has been appointed manager of the Kirkland-Porphyry gold mine.

Chester Purington sailed recently for Russia with a crew of technical men, to resume the operation of properties in which he was formerly interested.

A. L. Sweetser, formerly New York representative of the Huff Electrostatic Separator Co., has joined the staff of the "Engineering and Mining Journal."

Dr. H. S. Washington, of the Geophysical Laboratory, has been appointed chemical associate to the scientific attachés at the American embassies in Paris and Rome.

C. L. Dake, professor of geology at the Missouri School of Mines, has returned after spending a year on consulting work for Valerius, McNutt & Hughes, of Tulsa, Oklahoma.

Capt. Maurice Cockerell has succeeded Sir Lionel Phillips as director of the department for the development of mineral resources in the Ministry of Munitions, Great Britain.

Richard G. Place has resigned as chief chemist of the Vermont Copper Co., South Stafford, Vt., to accept a position with the Golden Age Mining and Reduction Co., at Boulder, Colorado.

A. E. Collins, for the last five years government mining inspector in northern Ontario, has resigned to become safety engineer with the International Nickel Co., at Copper Cliff, Ontario.

Rush T. Sill, of Sill & Sill, consulting mining and metallurgical engineers of Los Angeles, has been commissioned a captain of engineers and has reported to Fort Douglas, Utah, for training.

Armin A. Schlesinger, president of the Northwestern Iron Co., Newport Chemical Co. and other Schlesinger corporations, has accepted a commission as captain in the Chemical Warfare Service.

W. P. Mullane has been appointed general superintendent of the Sligo Iron and Steel Co.'s plant at Connellsville, Penn., which is now owned by the Commercial Iron and Steel Corporation, of New York.

Martin Schwerin has returned to New York from Quebec, where he has installed a mining plant for the Dominion Mines and Quarries, Ltd., at Black Lake. He will reopen his office in New York.

R. F. Randolph has resigned as general superintendent of the Dominion Iron and Steel Co., Sydney, N. S., and will return to the United States. **H. E. Rice,** formerly assistant general superintendent, is his successor.

Carlos W. Van Law, one of the vice-presidents of the United States Smelting, Refining and Mining Co., and general manager of operations in Mexico and Colorado, has resigned. He will engage in general consulting practice.

Claude Ferguson has resigned as superintendent of the Copper Queen Gold Mining Co., Stoddard, Ariz., and has accepted a similar position at the Consolidated Arizona Smelting Co.'s De Soto and Swastika mines. His address is Ocotillo, Arizona.

Henry H. Armstead, president of Armstead Mines, Inc., operating at Talache, Idaho, has been promoted to be major in the Quartermaster Corps. He has been stationed at Chicago, where he has assisted in organizing stevedore and labor units for overseas duty.

A. N. Diehl, assistant to the vice president of the Carnegie Steel Co., Pittsburgh, Penn., has been appointed general superintendent of the Duquesne works, succeeding the late Edward J. Hamilton. Mr. Diehl was superintendent of blast furnaces at the same works for 15 years.

Clement F. Poppleton, for the last two years with Perin & Marshall, New York, will take charge of building and operating a tin plate plant for the Broken Hill Proprietary Co., Australia. He will design the plant himself and the machinery will be built in Australia under his direction.

E. M. Norris, foreman at the Tramway mine of the Anaconda Copper Mining Co., has been appointed to assist the superintendent of the company, with jurisdiction over the group of properties known as the Boston & Montana, which position was formerly held by **C. L. Berrien,** who is now serving in France.

Andrew M. Fairlie, consulting chemical engineer, has opened an office for general consulting practice at Room 1204, Third National Bank Bldg., Atlanta, Ga. Mr. Fairlie, who has been chemical engineer for the Tennessee Copper Co. for several years, is still retained by that company in a consulting capacity.

Frank D. Carney, chief metallurgist of the Bethlehem Steel Co., Bethlehem, Penn., and **Lewis B. Lindemuth,** superintendent of the crucible and electric furnace departments of the same company, have resigned and will form the partnership of Carney & Lindemuth, consulting engineers in iron and steel metallurgy and practical steel works operation, with offices at 40 Wall St., New York.

Obituary

Howard W. Du Bois died Sunday morning, Nov. 10. A more extended notice will be published later.

Raymond B. Earle, professor of geology at Hunter College, New York City, died of pneumonia on Nov. 10.

J. F. Ripley, president of Ripley Manufacturing and Machinery Co., Joplin, Mo., died in Joplin on Oct. 28.

Ralph T. Godbe, assistant superintendent of the Chief Consolidated Mining Co., Eureka, Utah, died Oct. 29 of pneumonia. He was 30 years old.

Edward J. Hamilton, general superintendent of the Duquesne works of the Carnegie Steel Co., died Oct. 23 at his home in Duquesne, Penn., of pneumonia following an attack of influenza. He was 51 years old.

Frank Stephens, chief electrician of the United Verde Copper Co., died of influenza recently at Jerome, Ariz. He contracted the disease while wiring an emergency hospital, which work he had refused to allow his men to do.

Harold Thompson, mining engineer, died recently of pneumonia after a short illness. He was formerly a resident of Kingston, Ont., and was with the Hollinger Consolidated Gold Mines, Ltd., of Timmins, Ont., at the time of his death.

Winthrop R. Cady, sales manager of the Colorado Iron Works Co., died in Salt Lake City on Oct. 25, of pneumonia following influenza, aged 31 years. Mr. Cady had a record of 17 years' continuous service with the company, and had a wide acquaintance among metallurgists and mining men of the West.

Frederick F. Fredlund, manager of the mechanical department of E. J. Longyear Co., of Hibbing, Minn., died at his home in Minneapolis, on Nov. 1, of pneumonia, following an attack of influenza. He was born in Ishpeming, Mich., and studied mechanical engineering at the University of Michigan.

Societies

Mining and Metallurgical Society of America, New York section, held a meeting on Nov. 13, at the Columbia University Club, 4 West 43d St. The program consisted of presentations of the views of various members as to various reconstruction problems that may be discussed to advantage at subsequent meetings. The opening address was given by J. R. Finlay.

Spokane Engineering and Technical Association was recently organized at Spokane, Wash., under the joint auspices of the local sections of the American Institute of Mining Engineers, the American Institute of Electrical Engineers and the American Society of Civil Engineers. The first meeting was held on Sept. 18 at which a program for the following year was adopted. The second meeting took place Oct. 18, at which the Columbia section of the American Institute of Mining Engineers was in charge.

Industrial News

Western Electric Co., Inc., announces the election of Charles G. Du Bois as vice president.

Traylor Engineering and Manufacturing Co. announces the death on Oct. 26 of its secretary, Francis R. Crispen.

O. H. Sellars, district representative of the Ingersoll Rand Co., at Miami, Ariz., is convalescing at Lordsburg, N. M., after an attack of influenza.

Walter A. Zelnicker Supply Co., St. Louis, Mo., announces the appointment of R. H. Wilson as assistant to the president, with office in St. Louis.

Ricketts & Co., Inc., assayers, formerly of 80 Maiden Lane, New York, have moved to 280 Madison Ave. Charles E. Wagstaffe Bateson, Dr. M. L. Hamlin, and T. A. Shegog, formerly assistant professor of chemistry and metallurgy at the Royal College of Science, Dublin, are associated with them.

Electric Furnace Construction Co., Philadelphia, has made the following appointments: F. W. Brooke, vice-president; G. H. Twose, secretary and treasurer; G. W. Ketter, chief installation superintendent; Neil Neville, assistant to the president in selling and business organization, and G. L. Ashmore, electrical engineer.

United Filters Corporation is moving its Eastern works and testing laboratory into its own thoroughly equipped factory building at 355 Cortland St., Belleville, N. J.; telephone Belleville 5875. About Nov. 15 it will also move the sales office to 65 Broadway, New York; telephone Rector 7598. It requests that hereafter all samples of material for laboratory tests and all filter parts forwarded for repairs or renewals be shipped to the Belleville address, as given. All correspondence with customers will be handled through the New York office.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Drill Core, Discharge Apparatus for. Robert E. Carmichael, Damon, Tex., assignor of one-half to George Hamman, Houston, Tex. (U. S. No. 1,280,159; Oct 1, 1918.)

Excavating Machine. George W. King, Charles B. King, Benjamin Jacoby and Herbert E. Roush, Marion, Ohio, and Grant Holmes, Danville, Ill., assignors to the Marion Steam Shovel Co., Marion, Ohio (U. S. No. 1,280,238; Oct. 1, 1918.)

Explosive. Adolphe Segay, Ware, England. (U. S. No. 1,280,563; Oct. 1, 1918.)

Flume Construction and Car Therefor. Vincent K. Woods, Marble Creek, Idaho (U. S. No. 1,280,352; Oct. 1, 1918.)

Jigs, Chats Separator for. Arpad S Malocsay Miami, Okla. (U. S. No. 1,280,263; Oct. 1, 1918.)

Mine Ventilation. Martin J. Lide, Birmingham, Ala. (U. S. No. 1,280,254; Oct 1, 1918.)

Smelting—Process of Roasting Ores. Albert B. Newman, Langeloth, Penn., assignor to Metallurgical Co. of America, New York. (U. S. No. 1,280,283; Oct. 1, 1918.)

Editorial Correspondence

WASHINGTON, D. C.—Nov. 11

Importation of Low-Phosphorus Iron Ore up to 70,000 tons prior to July 1 from Spain, Sweden, Norway, and North Africa has been allowed by the War Trade Board in a ruling dated Nov. 11. Heretofore importations have been limited to such quantities as could be brought as ballast. All the low-phosphorus ore brought in will be allocated by the War Trade Board.

With the Exception of Shipments from Cuba, Canada and Brazil, no licenses are being issued for the importation of chrome ore. All outstanding licenses were revoked as of Nov. 11. This action was requested many weeks ago, when it became apparent that all the chromite needed could be produced domestically.

NEW YORK—Nov. 12

Interest in the Russian Mining Situation is keen. One expedition sailed for Russia last week, and there is a possibility of three other parties leaving soon.

Activity in Mexican Mining and Smelting is noted in the rebuilding of structures destroyed during the last eight years and the placing of properties in condition for continuous operation.

Manufacture of Aluminum Nitride on a laboratory scale has yielded such results as to warrant the construction of high-temperature electric furnaces at Massena, N. Y., by the Aluminum Co. of America. Further experiments in four-ton lots are now being carried out. If these prove commercially successful, the company intends to build a large plant in the south.

DENVER—Nov. 6

Manufacture of Ferro-Alloys is the latest important venture of the Vindicator Consolidated Gold Mining Co., of Cripple Creek. In purchasing the property of the Ferro-Alloy Co. of Denver, the Vindicator has followed the policy of other well-established mining companies that have found it advantageous to make use of an efficient business organization and technical staff in the development and exploitation of new enterprises. During the last year this company's mining operations in the Cripple Creek district have been seriously restricted by the continual and increasing shortage of underground labor, and the advance in wages and cost of supplies. For the last few months there has been a marked decrease in tonnage from the mines, and ore of lower grade has been drawn from the stopes. The shortage of labor has occasioned the cessation of nearly all development work, thereby causing a constant reduction in ore reserves. The directors have deemed it wise to conserve the company's resources by a reduction in the amount of the usual dividend. The results of the development work during the last two years impressed the directors with the need of acquiring additional property with which to extend the operations of the company. Among the numerous propositions which were presented to the company for consideration was the Ferro-Alloy Co. of Denver, which had been operating for about a year at a moderate profit, but found its operations greatly curtailed by lack of sufficient working capital with which to carry its stocks of raw materials and of finished products until their sale. After a satisfactory investigation of the outlook in the ferro-alloy trade, the Vindicator company concluded the purchase of the Ferro-Alloy Co. on Sept. 18, 1918. The basis of the purchase was the payment of the debts of the Ferro-Alloy Co., amounting to $900,411.15, which amount was more than covered by the liquid assets of the company; and a further payment, together with 6% interest, to be made when realized from the profits of the Vindicator company's operation of the ferro-alloy plant. This acquisition was accompanied by the purchase of a lease and option on a chrome ore property near Glenrock, Wyoming, as a source of supply of chrome ore for the manufacture of ferrochromium by the company. The purchase amounted to $[illegible]. It was found that ample supplies of crude ore of manganese, tungsten, silicon, uranium and vanadium are available in Colorado and adjacent states for the manufacture of ferro-alloys of these metals. The Vindicator company's engineers estimated that the purchase and installation of additional equipment at a cost of about $25,000 would double the capacity of the present ferro-alloy plant, and thereby effect a substantial reduction in the cost of the manufactured products. This installation has been authorized by the directors, and should be completed in about four months. The completion of the payments for the purchase of the chrome ore property, the installation of adequate equipment for the economical handling of the ore, and the continuation of the development as planned will involve an additional estimated expenditure of $20,000, which the company has decided to make. The net earnings of the Vindicator company for the third quarter of 1918 amounted to $95,000. The company has a cash reserve of $225,000.

PHOENIX, ARIZ.—Nov. 8

Voters of Arizona refused to pass a new workmen's compensation amendment at the late election. The movement was backed especially by the small mine owners, represented by the Association of Arizona Mining Men. There has been grave dissatisfaction with present conditions in Arizona, allowing full scope to the "ambulance-chasing attorneys," who all worked hard to defeat the proposed measure. Damage suits are increasing despite all "safety-first" regulations, and now are a serious tax upon the time of the Arizona courts.

The Mines of Arizona not only pay 62% of the taxes of the state and furnish most of the market for agricultural products, but they have proved of large direct financial benefit to the local organization that is in charge of the Salt River Valley reclamation project. For more than a year the Inspiration Consolidated Copper Co., of Miami, has been paying more than $1000 a day for electric power transmitted from the Roosevelt power works of the project, under contract that calls for a maximum of 8000 kw., from works that have about 11,000 kw. maximum productive capacity. Owing to low water back of the dam, the works now are turning out only 3000 kw., of which the Inspiration is getting only 1200, necessitating recourse to its own power plant for almost all electricity needed.

JOPLIN, MO.—Nov. 2

Drilling for Oil and Gas is to start soon west of Baxter Springs, Kan. The campaign is the result of several shallow strikes made while drilling for zinc and lead in the last year. The first hole is to be put down on the Thomas land, where oil was struck a few weeks ago. No deep drilling has been done in the vicinity.

The First Ore Warehouse at Picher, Okla., will be ready to receive ore by Nov. 10. The promoters of the plan are not discouraged by the fact that an agreement between smelters and producers is about to be completed, whereby prices will be definitely fixed, removing the need of a warehouse to store zinc ore for higher prices.

HOUGHTON, MICH.—Nov. 8

Former Copper-District Miners are beginning to return, and larger numbers may be expected soon if the reports of those coming back are to be credited. They explain that most of the men who have been attracted by higher wages in war work now fear that they will have no jobs at all when the war is over. And they also have learned that living conditions in the copper district have advantages that may not be secured elsewhere and that chances for a permanent job are always better here. One thing that impresses the men who left to take war jobs is the difference in house rent. Most of them lived here in corporation houses which rented at $5 or $6 a month. The same houses in the city cost them from $30 to $40 a month. Besides, they were so far from their work that they spent a couple of hours daily on the street cars, to say nothing of the cost of the transportation.

Copper Stocks at Smelteries are low. No copper is being put up for storage, and the close of navigation finds every dock cleaned off. Shipments by rail, by express and by preferred freight continue to go East. Practically all of the output of this district is now going directly or indirectly to the Allied governments. The bulk of the shipments from the Dollar Bay smeltery, which handles the product of the subsidiaries of the Calumet & Hecla, is sent to the French government for war purposes, some being sent abroad in big cargo lots. To obtain any large amount of copper that will be called for in reconstruction work will necessitate a speeding up of production, for the mines today are running not over 80% of normal, with no hope of betterment until the soldiers return from Europe and bring some change for the betterment in the labor situation. Automobile factories in Michigan are reported practically without any copper or brass stocks, excepting those which are required to complete Government contracts upon which they are now working.

COBALT, ONT.—Nov. 9

Mines of Northern Ontario have done their share toward making the second Canadian Victory Loan a success. In addition to an endeavor to get as many of the employees as possible to subscribe, the mining companies themselves have contributed large amounts. The known subscriptions are: Nipissing, $1,000,000; Kerr Lake, $500,000; Temiskaming, $400,000; La Rose, $100,000; Coniagas, $90,000; Lake Shore, $80,000; Buffalo, $50,000; McKinley-Darragh, $50,000; Trethewey, $25,000; making a total of $2,265,000. A number of the mines have not yet been heard from, and when all the returns are received this total is expected to be largely augmented.

VICTORIA, B. C.—Nov. 8

Mining Development in the northeastern mineral district has not been as active during the last year as its mineral possibilities warrant, according to J. D. Galloway, provincial resident mining engineer. This is due to the high cost of labor and mining supplies, especially powder and machinery, and though capital has been available for mining, the advanced price of development has hindered investment in properties in the prospect stage, which necessarily is speculative. Undoubtedly when the war is over many men will return to the northern country, and prospecting, which has practically ceased, will be revived, and important discoveries may be made. Referring to the Keithley Creek section of the Cariboo district, Mr. Galloway says that it is virtually deserted, although considerable placer ground remains, which may be worked at a profit. With the revival of gold mining, which should take place after the declaration of peace, he expects the district will attract more attention.

The Snowstorm Group, which comprises five highly mineralized copper-silver-gold claims situated in Highland Valley, Yale district, will be prospected by the Provincial Department of Mines by diamond drilling under the terms of the Mineral Survey and Development Act, according to the Hon. William Sloan, Minister of Mines, and bids are being asked for 10,000 ft. of drilling. The property has been inspected and reported on by several engineers, among whom are R. W. Thomson and F. B. Freeland, resident engineers with headquarters respectively at Kamloops and Grand Forks; William Brewer, now resident engineer at Nanaimo, B. C., and the late Dr. C. W. Drysdale, formerly of the Geological Survey Branch, Ottawa. Mr. Brewer in 1915 stated, after an examination of the Highland Valley Camp, that though there is considerable tonnage of high-grade bornite and chalcocite copper ore on several of the mineral claims, the future growth and prosperity of the camp will eventually center around the apparently extensive bodies of low-grade copper ore. To systematically and thoroughly prospect and develop these deposits, diamond-drilling would appear to offer more advantages than the slower and more expensive method of opening up the mineral-bearing zones by working openings.

The Mining News

ALASKA

KENNECOTT (Kennecott) — October production was 13,286,000 lb. of copper. These figures include the production of South American properties. The tunnel between the Mother Lode and Kennecott mines is nearing completion.

ARIZONA

Cochise County

PHELPS DODGE (Bisbee)—Fire of unknown origin destroyed the supply house of the Copper Queen branch on October 31.

SHATTUCK ARIZONA (Bisbee)—October production was: Copper, 744,069 lb.; lead, 535,009 lb.; silver, 19,347 oz.; gold, 123.51 oz. Production for 10 months in 1918 was: Copper, 7,991,972 lb.; lead, 1,504,970 lb.; silver, 128,428 oz.; gold, 1048.11 ounces.

HILLTOP EXTENSION (Paradise)—Shipments of lead-silver ore to be made from the company's Chiricahua mountain property. Two carloads a month to be delivered at Rodeo. Property managed by John Gaughran and John Blumberg.

CALUMET & ARIZONA (Warren)—Smeltery production during October amounted to 7,172,000 lb. of copper, of which 4,712,000 lb. was available for Calumet & Arizona.

Coconino County

NAVAJO COPPER (Flagstaff)—Building 100-ton leaching plant. A. A. McCullough is manager.

Gila County

INSPIRATION (Miami)—October copper production was 8,125,000 pounds.

MIAMI COPPER (Miami)—The 100-ton mill to treat carbonate ores has been placed in operation. Mill to be operated jointly with Bureau of Mines.

Greenlee County

SHANNON (Clifton)—Copper production during October was 800,000 pounds.

Maricopa County

ABE LINCOLN (Wickenburg)—Shaft down 700 ft. Have driven a tunnel several hundred feet and cut sulphide vein. E. W. Gettin, of Omaha, is manager, and Charles Mathorst superintendent.

Mohave County

CERBAT SILVER MINING AND MILLING (Chloride)—Has taken over Elkhart and Argyle mines, which it will operate soon.

HUGHES COMPANY (Chloride)—Opening ore encountered in drifting at the Bay State mine. Mine situated near the Midnight and other well-mineralized veins of the district.

HACKBERRY (Hackberry)—Mill expected to begin operations Dec. 15, and will handle 250 tons daily. Shaft is down 900 feet.

WALNUT CREEK (Kingman)—Shaft down 800 feet.

Pima County

NEW CORNELIA (Ajo)—October production was 3,644,000 lb. of copper.

Yavapai County

OCTAVE (Congress Junction)—Begun construction of 250-ton gold reduction plant in Arizona. Shaft down 1300 feet.

UNITED VERDE EXTENSION (Jerome)—To sink shaft to 1700 level. Permanent electric-power lines have been installed in the shaft. Smeltery at Verde treated 12,688 tons of ore in September.

GRUBB (Senator)—C. H. Hooker, A. G. Baker, and A. H. Favour have incorporated the Grubb Mining Co., with a capital stock of $1,000,000. Development of copper property begun.

Yuma County

SWANSEA LEASE (Swansea)—Have laid off 75 miners and discontinued underground work until completion of a 500-ton concentrator on which construction has begun. Lease has been shipping heavily to Clarkdale works of the United Verde company.

ARKANSAS

Independence County

PUGH HOLLOW (Anderson)—Erecting 300-ton washing plant. Operated by Everton Mining and Development Company.

DR. TOOKER (Batesville)—To build manganese plant soon, and will purchase log washer, belts, pulleys, and shafting.

REEVES (Batesville)—Installing third steam shovel. Recenty purchased machinery for 300-ton washing plant. Producing high-grade nugget ore and have considerable wash ore for treatment at the plant as soon as it is completed.

ROBERTS (Batesville)—Operating two manganese properties on the Bayou, and making a good production of high-grade manganese.

WACO (Batesville)—Begun operation of one of the largest and most modern washing plants erected in this region.

DENISON & HANFORD (Cushman)—Sinking shaft, and will start drifting at once, and require underground tracks, cars, and other equipment. Stanley Hanford is superintendent.

ROGERS (Cushman)—Recently taken over by Stanley Hanford and Walter Denison, of Cushman, who have sunk shaft 94 ft. and will do extensive underground work. Have installed power hoist and later will put in underground tracks and cars.

CALIFORNIA

Shasta County

MAMMOTH (Kennett)—Smeltery production during October is estimated at 910,000 lb. of copper.

IDAHO

Boundary County

IDAHO CONTINENTAL (Porthill) — Shipped 77 carloads since July 17, of net value of $231,000. Mine operating two shifts and mill three shifts. Tram, 2000 ft. long, ordered from Riblet Tramway Co. to span Kootenai River.

Idaho County

OROGRANDE GOLD (Orogrande)—New incorporation succeeds older one of same name, and will take over properties here. Judge George Turner, of Spokane, Wash., is chairman of directors.

Shoshone County

BUNKER HILL & SULLIVAN (Kellogg)—Litigation with American Smelting and Refining Co. regarding smelting rates has been settled.

KANSAS

Joplin District

AMERICAN METAL (Joplin, Mo.)—Pumping started nine months ago at mine west of Baxter Springs has lowered water to 100 ft. Several holes drilled and three Pomona pumps in place. Pumping at rate of 2800 gal. per min. Fourth pump being installed to drain ground to 300 ft. Company has already pumped 70,000,000 gallons.

MICHIGAN

Copper District

SENECA (Calumet)—All stock of the Seneca Mining Co. has been taken over by the Seneca Copper Corporation. Shaft now down 110 ft. beyond the turn at the lode.

FRANKLIN (Demmon)—Shortage of labor continues to impair operations. Four machines are stoping north from the 30 level.

MOHAWK (Gay)—Shaft reached 110 ft. depth, and crosscutting has started.

WOLVERINE (Kearsarge) — Removing pillars and widening old 12-ft. stopes where the rock looks promising.

MICHIGAN (Rockland)—Nine stopes opened in commercial ore.

MISSOURI

Joplin District

HARTFORD (Joplin)—No. 2 mine at Carthage closed on account of influenza.

MONTANA

Cascade County

ANACONDA (Great Falls)—Fire destroyed dust mill at zinc plant recently. A temporary mill was erected and operations were continued.

Flathead County

IRON MASK (Kalispell)—Work started on 3000-ft. crosscut tunnel.

Jefferson County

MINAH (Wickes)—To be reopened. Property is silver-lead.

Lincoln County

SNOWSTORM MINES (Troy)—Handled three-fourths of average tonnage during October, owing to influenza epidemic. Cutting out for a side-track at mine, and timbering is being done at No. 7 tunnel.

Powell County

BIG DICK (Elliston)—Driving new tunnel 1200 ft. Preparing road for shipment of ore.

NEVADA

Lander County

AUSTIN-MANHATTAN (Austin) — To resume operations on some of its old properties, and leases are being made. Charles Lyons has secured lease on upper levels of Patriot mine, and work is now being done on 100 level. Work by company in progress in Diana and Belle Wilder mines. Surface equipment will be installed at incline shaft of Diana, and crosscut driven on 200 level toward Trojan shaft. Main shaft of Diana has been retimbered and equipped with gasoline hoist. Development work will be pushed on 120 level first, where good-grade silver ore has been cut. Deeper development is also planned.

Mineral County

SILVERADO (Sweetwater)—Silver ore being opened in development work, and cyanide plant being built. An all-sliming process will be used. Some high-grade ore has been shipped. Silver occurs as argentite and cerargyrite.

Nye County

TONOPAH DISTRICT ore production for the week ended Nov. 2 was 8839 tons, of an estimated gross milling value of $150,263. Producers were: Tonopah Belmont, 2117 tons; Tonopah Mining, 2000; Tonopah Extension, 2293; West End, 930; Jim Butler, 246; Montana, 79; Tonopah Divide, 267; Midway, 74; Halifax, 108; Rescue, 66; North Star, 59; and the MacNamara, 400 tons.

OKLAHOMA

Joplin District

BLACK EAGLE (Picher)—Sinking third shaft, and will install new compressor.

FOCH (Picher)—Name selected for old Sheridan-Adams property, northwest of Picher, recently taken over by employees of Eagle-Picher Lead Company.

OREGON

Jackson County

GOLD HILL MINING ASSOCIATION (Medford)—Installing 10-stamp mill. Operating properties known as the Sylvanite group and large body gold-hearing ore has been cut in 750-ft. drift on 450 level.

UTAH

Box Elder County

SALT LAKE POTASH (Bingham City)—Potash reported to have been found in lake water in Hansel Valley near Snowville. J. Nibley and associates are interested.

Juab County

APEX-STANDARD (Eureka)—Shaft recently started is down 200 ft. Compressor and hoist have been installed and are operating successfully. L. Merriman is general manager.

CHIEF CONSOLIDATED (Eureka) — New shaft down 300 ft. Good progress is being made, although surface water has been a handicap. Manganese ore being hauled from the Homansville section of the property, under lease to Huish and Beane.

COPPER LEAF (Eureka)—New shaft has been sunk 910 feet.

EUREKA-LILLY (Eureka)—Repairs being made to hoist and shaft. Shaft to be sunk to greater depth. R. L. Edwards is superintendent.

GEMINI (Eureka)—Development being done on 1600 and 1800 levels. On 1800 level, new drift is being driven north in ore. Stoping of silver-lead ore is being done by the company and lessees.

GODIVA (Eureka) Spriggs lease has opened a new orebody below the 700 level.

LIBERTY MANGANESE (Eureka) — This company, which owns manganese claims in the Erickson mining district, on West Tintic, has recently made a shipment of manganese from another property near Marysvale, in Piute County.

NORTH STANDARD (Eureka)—New company incorporated to work group of claims in East Tintic, north of Tintic Standard and Copper Leaf. New shaft is to be sunk.

RIDGE AND VALLEY (Eureka)—New ore opened in the Hope lease on the 1600 and 1700 levels, and several cars of silver-lead ore have been shipped recently. New work being done at the No. 2 winze on the 1600 level. An air hoist is being installed here, a headframe has been put up, and the winze is being retimbered. Present depth 80 ft. and will be sunk further. Property operated through the Gemini. John H. McCrystal is superintendent.

TINTIC STANDARD (Eureka)—Main working shaft now down 1400 ft. and in good ore.

TINTIC SHIPMENTS for the week ended Oct. 25 amounted to 126 cars, compared with 144 cars the week previous. For the week ended Nov. 1, 150 cars were sent out by 18 shippers. The wagon road between Eureka and Silver City is being repaired by the county.

Morgan County

NATIONAL POTASH CORPORATION (Devil's Slide)—Company incorporated Oct. 22, under laws of Nevada, to recover potash from leucite rocks of Sweetwater County, Wyo. Have leased Union Portland Cement Co.'s large plant at Devil's Slide, near the Wyoming state line, and will make such changes as are necessary to fit it to produce potash from silicates, using the Edwards process. Company is capitalized for $100,000. Salt Lake, Ogden, and Idaho men are interested. Aman Moore is president and general manager.

Salt Lake County

MICHIGAN-UTAH (Alta)—Bins at platform at the mine and at Tanners Flat are full of ore which has accumulated owing to transportation difficulties. The Triangle Leasing Co. has six cars ready for shipment. Ore carries copper, silver, and lead.

UTAH COPPER (Bingham)—October production estimated at 19,000,000 lb., as compared with 17,785,000 lb. in September and 19,920,000 lb. in August.

ALTA TUNNEL AND TRANSPORTATION (Salt Lake)—Raising on one of the mineral-bearing fissures recently cut to reach contact of shale and ore-bearing limestone. Raise is up 40 ft., and following silver-lead ore. Main tunnel being driven west on the fissure to reach the white limestone underlying the shale.

Summit County

PARK CITY SHIPMENTS for the week ended Oct. 25 amounted to 3,816,090 lb. of ore and concentrates. Shipments for the week ended Nov. 1 amounted to 3,509,050 pounds.

JUDGE MINING AND SMELTING (Park City)—Some additions and improvements being made at the zinc plant, and will be completed by Dec. 1. Capacity will be 30 tons.

NEW QUINCY (Park City)—Development work has recently been started again, through the Daly West. W. B. Cole is superintendent.

PARK UTAH (Park City)—New strike reported. Developing claims covering a portion of the Ontario quartzite not far from the famous old Ontario mine. New fissure vein has been opened and carries some ore.

SILVER KING COALITION (Park City)—A meeting of the board of directors was held in Salt Lake City on Oct. 26, to fill the vacancy caused by the death of the late Thomas Kearns, formerly Senator. F. J. Westcott was elected to the board, and W. W. Armstrong was made president. An executive committee consisting of W. W. Armstrong, W. H. McCormick and W. Mont. Ferry was elected. No business relative to mine operations was taken up at this meeting.

SILVER KING CONSOLIDATED (Park City)—New 150-ton mill at the California-Comstock end of the property, in Thaynes Canyon, is being tried out. Will produce a silver-lead and zinc concentrate. Main drain and operating tunnel, being driven under Thaynes Canyon from Nigger Hollow, has been in lime and shale and is now entering the Park City limestone, which is the ore-bearing rock.

Tooele County

WESTERN UTAH COPPER EXTENSION (Goodwin)—Second compressor installed and placed in operation at property in Deep Creek. Main winze from the west crosscut of the tunnel is down 123 ft. in ore. A. E. Custer is general manager.

WASHINGTON

Ferry County

ADDISON COPPER (Keller)—Raise for ventilation completed from tunnel to shaft in Mammoth claim.

Okanogan County

CABA (Nighthawk)—Mine and Bender 75-ton mill being operated by J. W. Douglas, lessee. Mill operating three shifts.

COPPER WORLD (Nighthawk)—Contract let for two-mile tramway from Copper World and Copper World Extension mines to Palmer Lake. Will cut off eight-mile haul.

Stevens County

ELECTRIC POINT (Boundary)—Tram costing $45,000 has been completed by Riblet Tramway Co., of Spokane, and placed in operation. Length of tram three miles; descent 2800 ft. Bunker of 300 tons installed at upper end and 600 tons at lower end. Sinking in mine will be continued to 1000-ft. depth when men can be secured.

LEAD TRUST (Boundary)—First carload of high-grade ore being sacked for shipment in November.

UNITED COPPER (Chewelah)—October shipments, 14 carloads; net value, $25,000 to $30,000; operating cost, $8000 to $10,000.

NORTHPORT SMELTING AND REFINING (Northport)—Foundations being laid for drossing plant to cost from $50,000 to $75,000.

WISCONSIN

Zinc-Lead District

MINERAL POINT ZINC (Galena, Ill)—Hoskins mine on the Meloy land at Shullsburg, the youngest producer of this company's group of operating properties, has produced and shipped up to Nov. 9 of this year 13,830 tons of raw blende concentrates, and will probably set a new high record of annual production for the district. Property is equipped with a three-jig mill with a capacity of 35 tons an hour, and is operated on two 10-hour shifts. Mine is operated two 9-hour shifts. Depth of shaft is 150 ft. The 1917 high production record of the district was made by the Champion mine of the Wisconsin Zinc Co., with a shipment record of 15,727 tons of blende. The Coker mine, of the Mineral Point Zinc Co., with double mill equipment, was the largest producer in 1916, with a shipment record of 14,031 tons blende concentrates.

VINEGAR HILL ZINC (Platteville)—Derrick and outbuildings being assembled to develop the Jane Copeland tract at Shullsburg. Reassembling of the Kittoe mill has been completed on the Dale Rundell property at Livingston, and mine and plant will soon be placed in operation.

WISCONSIN ZINC (Platteville)—Results of extensive drilling operations assure the reopening of the once-famous Winskell producer at Shullsburg. Churn drilling on the Champion tract indicates the presence of an ore range separate and independent from the vein now yielding a heavy mine production of blende.

CANADA

British Columbia

DOLLY VARDEN (Alice Arm)—Railway and tram line are almost complete, and it is expected that transportation facilities will open tributary country.

FITZSIMONS GROUP (Green Lake)—To be developed under lease and bond by the Consolidated Mining and Smelting Co. Camp has been built and operations will be carried on during the winter.

SILVER STANDARD (New Hazelton)—Completed 50-ton mill and changes, additions, and improvements to power plant and surface buildings. No mining done this year until Oct. 1, all ore for the mill being taken from the dumps.

STANDARD SILVER-LEAD (Silverton)—Net profits in July were $8882 and in August $24,238. Surplus at end of August was $236,232.

LILY B (Slocan)—Shipped first car of high-grade silver-lead ore.

CONSOLIDATED MINING AND SMELTING (Trail)—Have acquired the Voight copper property, on Copper Mountain near Princeton.

ROCHER DE BOULE (Tramville)—Closed mine near Hazelton. May install 50-ton mill next year.

GENERAL HYDRAULIC (Twenty-mile Creek)—Experimental work on black sands has been carried on, although the question of the platinum return is still in doubt.

Manitoba

GOLD PAN (Rice Lake)—To be worked during winter. Shaft now 200 ft. deep and drifting being done at that level. A three-stamp mill will be installed when weather permits.

Ontario

DOME (Porcupine)—Developing on 1200 level near the Dome Extension boundary. It is understood that a new arrangement for the control of the Dome Extension is to be made soon. Rumors are circulated regarding the reopening of the Dome, but this is not likely to occur for some time.

McINTYRE (Porcupine) — Shareholders have approved purchase of stock of the Plenaurum by the directors.

PORCUPINE-CROWN (Porcupine) — Ore reserves said to be over $600,000, and it is expected that when the mines reopen a reasonable profit can be made.

SCHUMACHER (Porcupine)—A meeting has been called for Nov. 14 to ratify a by-law authorizing the sale of 100,000 shares of treasury stock at 45c. per share.

CHAMBER-FERLAND (Cobalt) — Exploration drift being driven near the boundary of the Genesee to prospect area where good results have been obtained by the latter company.

FOSTER (Cobalt) — Shipping weekly from old dump to Northern Customs concentrator.

LA ROSE (Cobalt)—Has taken an option on the Homestake silver property in the Kamloops district, British Columbia.

RELIANCE (Cobalt)—Being worked under lease by John Shaw. About 200 tons of ore has been broken down, and regular shipments to one of the custom mills are being arranged for.

TEMISKAMING (Cobalt)—Has cut new vein on Gans property, development of which is producing commercial ore.

PITTSBURGH-LORRAINE (South Lorraine)—Is expected to close down shortly. Company has been operating Currie property and Wettlaufer mine and mill under lease.

WRIGHT - HARGRAVES (Kirkland Lake)—Will proceed with the erection of a mill. Work is proceeding on the foundation. Machinery will be hauled in over the winter roads.

OTISSE (Matachewan)—Diamond drilling by Colorado-Ontario Development Co. has been satisfactory. Operations suspended pending installation of mine plant. Cost of transportation from Elk Lake during open season approximates $90 per ton, as compared with $15 per ton during winter months.

KNOX (Boston Creek)—Vein 4 ft. wide yielding satisfactory assay has been traced 400 feet.

MILLER - INDEPENDENCE (Boston Creek)—Extensive occurrences of gold tellurides are attracting wide attention. No complete assay plan has been made, and average return is uncertain.

PATRICIA (Boston Creek)—New vein has been cut on 100 and 200 levels.

WEBB CLAIMS (Bourke's Station) — Two good veins have been cut.

HURONIA (Gauthier Township)—Huronia Development Co. has been organized to develop property, under management of J. H. Hebert, of Montreal. Workings are being dewatered.

MEXICO

Sonora

GREENE CANANEA (Cananea)—Production in October was: Copper, 4,300,000 ft.; silver, 137,370 oz., and gold, 1080 ounces.

PERU

Junin

CERRO DE PASCO (Cerro de Pasco)—October production was 2918 tons of blister copper.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsan)—October cleanings were $92,000.

The Market Report

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
7	4.7550	101⅛	49½	11	4.7600	101⅛	49½
8	4.7550	101⅛	49½	12	4.7600	101⅛	48¾
9	4.7550	101⅛	49½	13	4.7600	101⅛	48¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Nov.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
7	*26	†	8.05	7.75	8¼@8½
8	*26	†	8.05	7.75	8¼@8½
9	*26	†	8.05	7.75	8¼@8½
11	...	..	..	..	...
12	*26	†	8.05	7.75	8.15@8.35
13	*26	†	8.05	7.75	8@8¼

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
Nov.	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
7	122	122	137	334	334	29½	28½	54
8	122	122	137	334	334	29½	28½	54
9	...	...	...	.	..	..	..	..
11	122	122	137	334	334	29½	28½	54
12	...	...	...	.	.	.	..	..
13	122	122	137	327	317	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at \$4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Nov. 13, 1918

Everybody is dazed over the sudden advent of peace and the realization that readjustment to new conditions involves grave problems, the full nature of which nobody is yet able to grasp. Most of the markets are best described as being for the moment stunned, and what with the continuance of governmental control and other interferences, they are unable yet to reflect anything.

Copper—There has been no cancellation of orders either by the United States or foreign governments, and none are expected. On the other hand, no new contracts have been made, though specifications have been received for shipments on old orders. The situation at the refineries seems to be becoming a little easier, especially in the matter of labor.

Consumers of copper who were caught by the unexpected change in price of July 2 are almost unanimous in their expressions of gratitude to Pope Yeatman for his effective intervention in the matter. The adjustments were obtained with much less difficulty than was expected. This was due partly to the fact that the quantity of copper involved was much less than was supposed. Though the exact figure has not been given out, it is said that such estimates as have been published were much too high.

Copper Sheets—The base price of copper sheets is 35¼c. per lb. Copper wire is quoted at 28¾@29½c. per lb. f.o.b. mill, carload lots.

Tin—Plenty of tin seems to be available in this country, and some business was done in resale lots, which is permitted by the American Iron and Steel Institute. Banka was offered this week at 73½c., without finding buyers; but probably some business was done previously, for a large consumer was inquiring.

It is understood that the policy of the American Iron and Steel Institute will not be unreasonable. In well-informed quarters there is no expectation that tin will be allocated to consumers who do not want it, as to which there had previously been some fear. The Tin Importers' Association, recently organized, adopted resolutions under date of Nov. 4, 1918, protesting against the placing of the tin business of the United States in the hands of the U. S. Steel Products Co., which "is the largest individual tin importer in the United States, and at times is even a dealer in tin, and the U. S. Steel Corporation, of which the former is a subsidiary, is the largest tin consumer in the world." A. E. Winter is president of the Tin Importers' Association and E. W. Starke is secretary.

Both spot and three months London tin prices for Nov. 5 and 6 were £334.

Lead—The situation remains unchanged.

Zinc—Our quotation of the market this week is necessarily rather nominal, for there were few buyers, and we had reports of only a few transactions. Transactions on Nov. 12 were at a decided recession in price, business in prompt metal having been done around 8.30c. On Nov. 13 prompt was offered at 8.25c., December, at 8@8⅛c., and January, at 7⅞ cents.

We quote high-grade spelter at 11 cents.

Purchasers of zinc ore in the Joplin market on the sliding-scale basis were rather small last week. Smelters who entered into this agreement paid the stipulated price for what ore they wanted. Many of them were previously well stocked up; therefore, they do not now buy at all. The arrangement between the miners and smelters is uneconomic in principle, and probably will not last long.

Zinc Sheets—Unchanged at \$15 per 100 lb., less usual trade discounts and extras as per list of February 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—The demoralization in this market continued, and all kinds of prices were named. We quote spot at 9c. The statistical position of this metal is not good, although the stocks have been greatly reduced from the total of some months ago. A part of the stocks was held by persons who made haste to liquidate when peace came in sight, besides which there was some short selling, and there is probably still an uncovered short interest in the market. The Chinese producers cannot sell at present prices, it being estimated that their freights, duty, and other costs come to about 7c. per lb. for metal laid down in New York. One importing house quotes futures at 15½c. duty paid, but most of these houses do not quote at all.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at \$3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at \$1.50@1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Unsettled and easier. We quote \$125, New York, for California virgin, and \$122 for Mexican. San Francisco telegraphs "No quotation; market unsettled."

Gold, Silver and Platinum

Gold—The Transvaal gold output for September, 1918, amounted to £3,008,267, as compared to £3,135,807 for September, 1917, and £3,144,211 for August, 1918.

The government of India, under date of Aug. 31, according to Samuel Montagu & Co.'s letter, issued a rule prohibiting dealings in any legal-tender coin above its face value, the value of the sovereign being declared to be 15 rupees.

Silver—On Oct. 12, according to Pixley & Abell's circular, there were in Shanghai 25,400,000 taels of sycee and 12,100,000 Mexican dollars.

On Nov. 6 a shipment of \$3,000,000 worth of silver bullion was made from the New York Government Assay Office to India.

The silver market has remained unchanged, with fixed quotations, with the exception that the London official price was lowered on Nov. 12 to 48¾d. on account of reduction in war insurance rate and in order to equalize the London price with the New York official price. Peace conditions are not likely to affect silver prices here so long as our Treasury regulations of silver continue.

Mexican dollars at New York: Nov. 7, 77½; Nov. 8, 77½; Nov. 9, 77½; Nov. 11, 77½. Nov. 12, 77½; Nov. 13, 77½.

Platinum—Unchanged.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 9.—Blende, per ton, high, \$77.95; basis 60% zinc, premium, \$75, Class B, \$65@60; Prime Western, \$55.67@50; Calamine, basis 40% zinc, \$40@38. Average selling prices: blende, \$54; calamine, \$38.25; all zinc ores, \$52.96.

Lead, high, \$105.20; basis 80% lead, \$100; average selling price, all grades of lead, \$99.37 per ton.

Shipments the week: Blende, 7423; calamine, 531; lead, 1268 tons. Value, all ores the week, \$547,300.

A majority of smelting agencies acknowledge to buying blende on the new schedule basis, thereby paying a basis price of \$55.67 for Prime Western grades. One smelting agency, without instructions to pay schedule prices, bought 600 tons ranging from \$50, \$51.50 to \$52.50 basis. Several of the heavier buyers were out of the market, and others were buying light. The Quinton Spelter Co., losing 10 furnacemen by influenza, was compelled to close. Other smelters are seriously affected in Arkansas and Oklahoma.

Platteville, Wis., Nov. 9.—Blende, basis 60% zinc, highest settlement price reported, \$75.95; base price for premium grade, \$75; base price for high-lead blende, \$52 per ton. Lead ore, basis 80% lead, \$100 per ton. Shipments reported for the week were 2398 tons blende, 410 tons galena, and 269 tons sulphur ore. For the year to date the totals are 109,949 tons blende, 7077 tons galena, and 38,374 tons sulphur ore. During the week 2968 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—No market.

Manganese Ore—Buyers seem to be well supplied. They are not in the market.

Molybdenum Ore—No business reported.

Pyrites—Unchanged. There is probability of an embargo being placed on foreign imports of pyrites.

Tungsten Ore—This market was sharply depressed owing to the desire of importers to sell supplies arriving. Buyers, however, were conspicuous by their absence. Offers for high-grade ore for shipment from South America were made as low as $21.

Iron Trade Review

PITTSBURGH—Nov. 12

All the steel mills were closed yesterday for the great celebration, which was vociferous in Pittsburgh and the surrounding mill towns. Impromptu parades were organized, the men carrying banners telling what they had made to help win the war. Fears were entertained that absence might be prolonged, but general reports today are that working forces are normal, and some mills have larger forces than a week ago, owing to the waning of the influenza epidemic. Homestead has about 1000 men away today, as compared with a maximum of 2800 recently. Much of the absence was caused by sickness in the family, rather than among the men, nurses and other help being almost unobtainable.

Cancellations of war contracts, of course, constitute the most interesting subject today. Thus far, steel mills do not report cancellation of important contracts on which they were working, but even for several days there has been cancellation of contracts on which work had not yet begun. There have also been a number of cancellations in connection with erection of the Neville Island ordnance plant, but it is positively asserted that the plans for this plant are modified, not annulled. The 16- and 18-inch gun portion is probably eliminated. The openhearth steel plant is not affected. With less occasion for speed, the construction work will be less expensive.

The belief in the steel trade is that in the course of a short time nearly all contracts for direct war material will be cancelled, the procedure being to attend to the latest contracts first. Production of railroad and ship material will not be affected, except that, on account of the existing surplus of ship plates, the weekly shipments may be reduced for a time. In a few months shipbuilding will probably be at a rate sufficient to absorb 50,000 net tons of plates a week, which has been the quota for the Fleet Corporation for several months.

Though the Government steel prices are about triple the lowest prices ever previously attained, the fair comparison is with average prices, for relatively little steel has ever been bought at minimum prices. Taking the 10-year average, 1904 to 1913 inclusive, present Government steel prices represent an advance of about 110%. Costs are much higher all along the line, and the standard wage rate of today is hardly likely to be reduced materially, even in several years, because the iron and steel industry has hitherto depended chiefly upon immigration for its labor supply, and immigration has been practically shut off for four years. Both the Washington authorities and the iron and steel producers desire to avoid a slump in prices, with a subsequent [illegible] which would be the old-fashioned method of finding a fair level for the market, and prefer to see prices let down gradually to a stable basis. The prospective decline in that case would be a fraction of 50%, and possibly in the course of a year not more than between [illegible] and [illegible] per cent.

Pig Iron—The market continues quiet, consumers showing no disposition to take hold for forward deliveries. Current output goes out on contracts and allocations, as formerly. The pig-iron market may be affected less than the steel market by the end of hostilities; and, apart from temporary considerations, it is observed that there has been so much more expansion in the last three years in steel-making capacity than in blast-furnace capacity, that for several years to come the relative profits of [illegible] furnaces and steel works may be altered, the blast furnacemen getting a larger share of the total profits than formerly. The market remains quotable at the set limits: Bessemer, $3[illegible]; basic, $3[illegible]; No. 2 foundry, $34; malleable, $34.50; forge, $33, f.o.b. furnace, freight from the Valleys to Pittsburgh being $1.40 and from six detached furnaces [illegible] less.

Steel—There is no activity in unfinished steel. The winding up of so many contracts will probably bring into the market much miscellaneous material in odd lots. The market remains quotable at the set limits: billets, $47.50; sheet bars and small billets, $51; slabs, $[illegible]; rods, $57.

Ferro-alloys—Ferromanganese and spiegeleisen are quiet but remain quotable at former levels, $250, delivered, for 70% ferromanganese and $75, furnace, for 16% spiegeleisen. As stocks are ample, and consumption may decrease, and as ore should come down with freer navigation, the market is generally regarded as facing a substantial decline.

Coke—The influenza epidemic has seriously curtailed production of beehive coke in the Connellsville region, and shipments of raw coal also, but blast furnaces do not report important coke shortage. By-product coke operations are well maintained.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	101.125	32.361	44.324	49.500
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(*a*)	207.443	318.875
April	55.910	(*a*)	220.171	329.905
May	63.173	(*a*)	245.114	364.217
June	62.053	(*a*)	242.083	331.925
July	62.570	(*a*)	242.181	360.347
August	62.681	(*a*)	243.978	380.900
September	61.542	(*a*)	244.038	343.905
October	61.851	(*a*)	247.467	335.543
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(*a*) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	8.050	6.650	7.750	30.500	29.50
November	6.249	......	6.187	......	30.500	......
December	6.375	......	6.312	......	30.500	......
Year	8.787	......	8.721	......	30.500	......

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.[illegible]73	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	......	33.95	......	33.95	......
December	37.25	......	33.95	......	33.95	......
Year	$43.57	......	$39.62	......	$40.83	......

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 12
Alaska Gold M.	4⅝
Alaska Juneau	2⅜
Am.Sm.&Ref.,com.	89¼
Am. Sm. & Ref., pf.	110¼
Am. Sm. Sec., pf., A.	92½
Am. Zinc	15
Am. Zinc, pf.	48
Anaconda	71⅜
Batopilas Min.	1⅛
Bethlehem Steel	62
Butte & Superior	23
Butte Cop. & Zinc	11
Cerro de Pasco	38½
Chile Cop.	22½
Chino	42¾
Colo.Fuel & Iron	39
Crucible Steel	55
Crucible Steel, pf.	88½
Dome Mines	14⅛
Federal M. & S.	12
Federal M. & S., pf.	42½
Great Nor., ore ctf.	32⅜
Greene Cananea	54
Gulf States Steel	65
Homestake	91
Inspiration Con.	54¾
International Nickel	34¼
Kennecott	39½
Lackawanna Steel	70½
Mexican Petrol	165½
Miami Copper	28
Nat'l Lead, com	61
National Lead, pf.	104
Nev. Consol.	20¾
Ontario Min	7½
Ray Con	24½
Republic I.&S.,com.	78
Republic I. & S., pf.	99¾
Sloss-Sheffield	50½
Tennessee C. & C.	16¾
U. S. Steel, com.	99⅜
U. S. Steel, pf.	11[illegible]¼
Utah Copper	87½
Va. Iron C. & C.	68½

BOSTON CURB*	Nov. 12
Alaska Mines Corp.	‡.12
Boston Ely	.90
Boston & Mont.	.48
Butte & Lon'n Dev.	.14
Calaveras	1
Chief Con.	3½
Contact	‡.15
Corbin	‡.10
Cortez	.15
Crown Reserve	‡.18
Crystal Cop.	‡.29
Eagle & Blue Bell	‡2½
First Nat. Cop.	‡1⅛
Houghton Copper	.40
Intermountain	‡.05
Iron Blossom	.42
Iron Cap	17¾
Majestic	.31
Mexican Metals	.32
Mines of America	‡1⅛
Mojave Tungsten	.08
Nat. Zinc & Lead	.10
Nevada-Douglas	‡.35
New Baltic	1⅛
New Cornelia	17½
Oneco	.20
Pacific Mines	‡.35
Rex Cons	‡.06
Yukon Gold	.90

SAN FRAN.*	Nov. 4
Alta	.03
Andes	.04
Best & Belcher	.01
Caledonia	.01
Challenge Con.	.03
Confidence	.10
Con. Virginia	.14
Gould & Curry	‡.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.02
Mexican	.10
Occidental	.40
Ophir	.03
Overman	.01
Savage	‡.02
Sierra Nevada	.01
Union Con.	.06
Utah Con.	.01
Belmont	2.50
Jim Butler	.47
MacNamara	.21
Midway	.07
Mont.-Tonopah	.09
North Star	.06
Rescue Eula	.08
West End Con.	1.07½
Atlanta	.03
Booth	.02
Comb. Frac.	‡.02
Florence	.10
Jumbo Extension	.08
Kewanas	.03
Nevada Hills	.02
Nevada Packard	.23
Round Mountain	.16
Silver Pick	.02
White Caps	.11

COLO. SPRINGS*	Nov. 4
Cresson Con.	5.00
Doctor Jack Pot	.03½
Elkton Con.	.05
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.75½
Granite	.19
Isabella	.05¼
Mary McKinney	.07
Portland	1.00
United Gold M.	.12
Vindicator	.30

BOSTON EXCH.†	Nov. 12
Adventure	‡.60
Ahmeek	86
Algomah	‡.25
Allouez	49
Ariz. Com., ctfs.	16
Arnold	‡.20
Bingham Mines	‡10
Bonanza	‡.16
Butte-Balaklava	.35
Calumet & Ariz.	69½
Calumet & Hecla	460
Centennial	13½
Copper Range	50½
Daly West	‡2¾
Davis-Daly	4¾
East Butte	11½
Franklin	4⅛
Granby	‡79
Hancock	‡7½
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	27
Keweenaw	1¾
Lake	6½
La Salle	‡3
Mason Valley	‡3½
Mass	5
Mayflower	4
Michigan	4
Mohawk	60
New Arcadian	2½
New Idria	‡13
North Butte	14¼
North Lake	‡.40
Ojibway	.75
Old Dominion	42½
Osceola	60
Quincy	69
St. Mary's M. L.	‡49
Santa Fe	.50
Seneca	14½
Shannon	4
Shattuck-Ariz.	‡14
So. Lake	‡1½
So. Utah	‡.12
Superior	7
Superior & Bost.	4
Trinity	3½
Tuolumne	.95
U. S. Smelting	49
U. S. Smelt'g, pf.	47
Utah Apex	3
Utah Con.	9½
Utah Metal	2¼
Victoria	3
Winona	1¾
Wolverine	22
Wyandot	‡.50

N. Y. CURB†	Nov. 12
Big Ledge	1 1/16
Butte & N. Y.	‡.75
Butte Detroit	.02
Caledonia	.42
Calumet & Jerome	.50
Can. Cop. Corpn.	2 1/16
Carlisle	‡2
Cashboy	.07
Con. Ariz. Sm.	2
Con. Coppermines	5¾
Emma Con.	‡.03½
Goldfield Con.	.19
Goldfield Merger	‡.01
Greenmonster	‡ 1/16
Hecla Min.	6 1/16
Howe Sound	4
Jerome Verde	.50
Louisiana	‡ 1/16
Magma	35
Marsh	.03
McKinley-Dar-Sa.	.49
Milford	‡.75
Mother Lode	.41
Nixon Nevada	.39
Ohio Cop.	[illegible]
Rawley	‡2¼
Ray Hercules	4
Richmond	‡.56
Rochester Mines	.33
St. Joseph Lead	14½
Standard S. L.	7/16
Stewart	.12
Success	‡.09
Tonopah	‡2½
Tonopah Ex.	1⅝
Tribullion	‡⅛
Troy Arizona	‡.09
United Eastern	4⅜
United Verde Ext.	‡37
United Zinc	‡⅜
Utica Mines	‡.08

TORONTO*	Nov. 12
Adanac	.10
Bailey	.03
Beaver Con.	.33
Chambers Ferland	.09
Coniagas	3.00
Hargraves	.02
Kerr Lake	5.87½
La Rose	.31¼
Min. Corp. of Can.	2.00
Nipissing	8.37½
Peterson Lake	.08
Temiskaming	.32
Wettlaufer-Lor.	‡.02
Davidson	.50
Dome Exten.	.29
Dome Lake	.17
Hollinger	5.75
McIntyre	1.68½
Newray	.12½
Porcu. Crown	.25
Teck-Hughes	.20
Vipond	‡.18
West Dome	.15

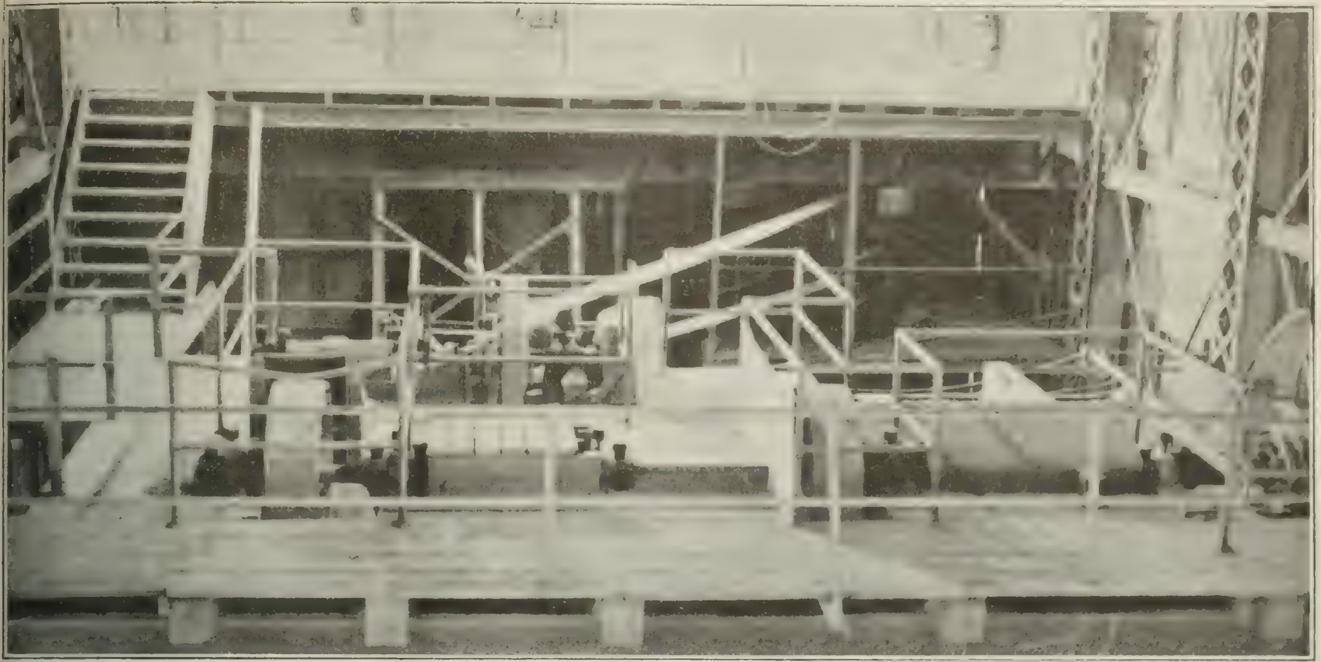
* Bid prices. †Closing prices. ‡ Last quotations.

Engineering and Mining Journal

November 23, 1918

Volume 106

Number 21



GUARD RAILS IN AN ORE-DRESSING PLANT

Hazards and Safeguards in Ore-Dressing Plants*

BY J. S. McKAIG.

A classified list of accidents in ore-dressing plants, followed by a description of the commoner hazards encountered, and practical suggestions as to safeguards and preventive measures.

UNDER the classification adopted by the Department of the Interior, Bureau of Mines, accidents are divided into three classes—(1) fatal; (2) serious (time lost, more than 14 days); (3) slight (time lost, 1 to 14 days, inclusive). Accidents by causes and the percentages due to each for the year 1916 are given in the accompanying table.

An examination of the table shows that machinery caused 33% of the fatalities and 18% of the injuries; haulage system and railway cars or locomotives together caused 21% of the fatalities and 6% of the injuries; and falls of persons and falling objects together caused 9% of the fatalities and 27% of the injuries. The ratio of fatal accidents to the total injured is about 1 to 100.

In a plant where safety work has been established it will be found that by far the largest amount of injuries occur under "slightly injured"; an examination of the accident records will show the importance of training employees against carelessness and foolhardiness.

Accidents will be considered in the order mentioned, and the more important hazards and safeguards will be defined.

ACCIDENTS IN ORE-DRESSING PLANTS, 1916

		Percentage of Total	
		Killed	Injured
1.	Haulage system	9.09	4.59
2.	Railway cars or locomotives	12.12	1.32
3.	Crushers, rolls, or stamps	.....	5.28
4.	Tables, jigs, etc.	.....	2.57
5.	Sundry machinery and equipment	33.34	10.55
6.	Falls of persons	6.06	11.71
7.	Suffocation in ore bins	9.09	.13
8.	Falling objects (rocks, timbers, etc.)	3.03	11.40
9.	Cyanide and other poisoning	.....	.41
10.	Scalding or burning	6.06	1.10
11.	Electricity	6.06	1.66
12.	Hand tools, axes, bars, etc.	3.03	11.31
13.	Nails, splinters, etc.	.....	5.37
14.	Flying pieces of rock from sledging or crushing	.....	3.42
15.	Sundry causes	12.12	29.18
		100.00	100.00

1. Haulage System (killed, 9.09%; injured, 4.59%)—For all haulage work the essential safeguard is to maintain equipment in proper condition. Regular inspections should be made, and the electric-power line should be marked with danger signs.

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*Excerpt from a paper presented at the seventh annual congress of the General Safety Council, 1918.

2. Railway Cars or Locomotives (killed, 12.12%; injured, 1.32%)—Locomotives should comply with the Interstate Commerce Commission standards. Tracks and crossings should, where possible, be constructed overhead or underground. When crossing is on the track level, a railing should be placed parallel to the track, at the proper clearance distance, so that a person will be compelled to walk around it and not be able to step directly in front of a moving car or locomotive. Danger signs should be placed on both sides. The proper railroad clearance for main lines and sidings should be maintained wherever possible. In other cases standard warnings should be established. Loading chutes should be automatically counterbalanced to return to their clearance position when released. Safety wrenches should be used for pulling up or releasing car doors.

3. Crushers, Rolls, or Stamps (killed, 0.00%; injured, 5.28%)—Gyratory crushers under ordinary conditions offer slight danger of injury. When running on wet, sticky material or on large chunks, a man may be required to bar the ore, in which case a proper platform and guard should be provided. Transmission belts and pulleys should be guarded. The same precautions should be observed with jaw crushers. A warning should be issued not to expose the head or body above the crusher, from which pieces of iron or hard rock may fly with disastrous force. Rolls should be inclosed to prevent injury from flying pieces. Guard the pulleys and transmission belts and provide means of reaching the grease cups without danger of being caught. Fingers for supporting the stamps should be kept in good repair, so that stems are firmly held when changing shoes or dies or when cleaning up.

4. Tables, etc. (Killed, 0.00%; injured, 2.57%)—Belts and pulleys should be guarded, and belt-shifters provided. Sumps or under-floor conveyor ways should be protected by removable railings or platforms, and a severe penalty imposed when these are not replaced.

5. Sundry Machinery and Equipment (Killed, 33.34%; injured, 10.55%)—Transmission belts should be guarded on the accessible sides. When overhead, if the belt passes within 8 ft. of the floor, it should be protected with a plate or screen guard. Pulleys and flywheels should be inclosed by protecting screen or plate guard, or railings. When in a dusty place, they should be kept clean and in balance, as it is possible for a cast-iron pulley to fly to pieces. Loose pulleys should be equipped with a standard type of belt-shifting device. Many accidents have been caused by men attempting to shift a belt with their arms or anything handy. Sprockets and chains should be guarded in a similar manner to belt drives. Gears should be inclosed with a removable guard or railing. Clutches should be guarded; and, if in a dangerous place, should have an extension for throwing the clutch arm.

Belts should be carefully hooked or laced to avoid the possibility of catching clothing. In nearly all cases a belt fails at the hooks; the joint should, therefore, be systematically inspected. When any weakness is apparent at this point, the ends should be cut off and rehooked. Removing or putting on belts while running is a dangerous but often unavoidable procedure, and it should be attempted only by experienced men. This rule can readily be enforced by the shift boss or foreman in charge. Motor drives should be guarded and the motors thoroughly insulated at the terminals. Line shafting should be guarded by railing, and all grease cups made easily accessible, if necessary by piping connection to the bearing. No projecting or rough places should be allowed on the shafting. Safety set screws and collars should be used.

Elevators, both chain and bucket, should be housed, with sections removable for repairs or replacement. When repairing, the arrangement for holding in place should be carefully inspected by the head machinist before the men are allowed to start work. Belt conveyors should have all pulley guarded by housing or railing. When the conveyor is above the floor level, steps and a platform should be installed at passage ways for crossing. Belt hooks should be kept in good condition, with no sharp projections that might catch in clothing. Flight and chain conveyors should have the sprockets and chains protected in a like manner. Oil or grease cups near pulleys or moving parts that are not easily reached should be piped out of the zone of danger. When placed overhead or in inaccessible positions, ladders or runways should be installed to obviate the necessity for the oiler to crawl near the moving parts.

6. Falls of Persons (Killed, 6.06%; injured, 11.71)—Runways and platforms should be equipped with standard angle-iron or pipe railings and toe boards. For temporary use, wooden railings strongly constructed will serve. Railings should be 3 ft. 6 in. high, with an intermediate member midway between the top rail and the toe board. The toe board should be 4 in. high. Pipe railings should be made of standard 1¼-in. pipe and fittings, with malleable floor fitting. Angle-iron railings should be 1½ x 1½ x ¼ in. angle top rail and uprights, and 1½ x ¼ in. intermediate rail.

Stairways should have all treads equal and all risers equal, and the tread should never be less than 6 in. nor more than 10 in. When possible, the angle should be 45°, but not more than 60° nor less than 20°. Stairways should not be less than 30 in. between railings, except where construction makes this width impracticable. Outside, or where the steps are likely to become slippery, they should be equipped with approved safety tread. Ladders should be securely fastened in place and have no missing rounds.

7. Suffocation in Ore Bins (killed, 9.09%; injured, 0.13%)—Men should not be permitted to go alone in ore bins nor at any time without the knowledge of the boss. They should be equipped with safety belt and rope.

8. Falling Objects (killed, 3.03%; injured, 11.40%)—Warning signs should be placed where there is danger of falling material. Toe boards on all runways and platforms should be carefully maintained.

9. Cyanide and Other Poisoning (killed, 0.00%; injured, 0.41%)—The drinking-water supply should be regularly analyzed. Where work is done in a poisonout dust or fume, the proper form of respirator should be used. A change house where clean and working clothes can be kept separate, with shower baths and wash basins, is necessary. The lunch room should include facilities for washing before eating.

10. Scalding or Burning (killed, 6.06%; injured, 1.10%)—Local conditions should suggest the best safeguards, but where there is danger of burns from projecting flames a wire screen should be placed in front of the opening.

11. Electricity (killed, 6.06%; injured, 1.66%)—All wires should be inclosed in conduits, and all fuse cutouts and knife switches mounted in iron boxes. High-tension pole lines or exposed electrical apparatus should be marked with a danger sign. Feeders should be marked to prevent cutting in on a high voltage when a low voltage is wanted. Where main-power feeders are run open in wet or damp places, the insulation should include an approved rubber cover. In an alternating-current ungrounded system there exists a so-called "phantom ground," from which sufficient voltage can be obtained to cause death. By installing a "grounding transformer" the voltage will be cut down to a minimum. On magnetic separators, the rheostats should be cut in before the switches are pulled, otherwise an arc is drawn on the switch which may cause a serious or fatal burn.

12. Hand Tools, Axes, Bars, etc. (killed, 3.03%; injured, 11.31%)—Accidents under this heading are generally due to carelessness, ignorance, or foolhardiness. The best means of prevention can be gained by the boss in charge instructing the men in the proper handling of the tools.

13. Nails, Splinters, etc. (killed, 0.00%, injured, 5.37%)—Torn-off boards should have the nails immediately removed or bent over. Nails or splinters sticking out in the timbers or walls should be removed.

14. Flying Pieces of Rock From Sledging or Crushing (killed, 0.00%; injured, 3.42%)—All types of crushing machinery from which pieces of rock may fly should be inclosed as far as practicable with a removable housing. Heavy goggles should be worn to protect the eyes when sledging.

15. Sundry Causes (killed, 12.12%; injured, 29.18%)—This class contains the highest percentage of injuries recorded. In going over accident records the majority of cases are found to comprise sprains, bruises, and cuts. Efficient safeguards include danger signs, the lighting up of all dark places, and the avoidance of piling material carelessly.

Oliver Filter Modifications

By C. T. Rice

In filtering galena froth concentrate, trouble is sometimes experienced in keeping it from settling and building up in the feed hopper of the filter. This also occurs, but to a smaller extent, when handling zinc froth concentrate. Air lifts are provided to obviate the difficulty, but a better way of eliminating it is to belt the drive wheel of the agitator shaft in the feed hopper from an independent shaft instead of from the machine itself, so that it can be kept going when the machine is stopped. If trouble is experienced in cake formation, it may easily be remedied by speeding up the agitator to about 85 r.p.m., so as to throw the pulp against the filter cloth, rather than to form the cake with the filter submerged in the pulp itself, as is generally done. Beaters are sometimes added to the machine by tacking burlap strips to a rotating shaft so as to slap the cake and thereby cause the cracks to close; but a better way is to speed up the filter and not make so thick a cake. By adding the fine concentrate from the tables to the flotation froth, the latter may be made more permeable, so that it can be filtered better and will crack less.

Frequent blowing through the cloth often seems to cause it to blind more quickly. At the Gold Hunter plant, at Mullan, Idaho, a longer life for the canvas is insured by building up a bed of fine table concentrate on the drum before putting on the froth concentrate. The scraper is set so that it does not take the cake off closely, and compressed air is used sparingly. The retained bed of fine concentrate acts as a sand filter to catch the froth concentrate before it is sucked into the canvas. Before adopting this scheme with the filters at the Gold Hunter plant, the life of the cloth was only about five months; and an average moisture content of 8% was obtained by following normal practice. Since the adoption of the new method, which gives a 10 to 11% moisture content in the cake, the same cloth has lasted about a year. When the filter bed of table concentrate is used, the cloth is blown only about once in 24 hours. Filtering is improved by feeding a considerable amount of fine table concentrate together with the froth concentrate.

At the Gold Hunter and some of the other plants in the district trouble has been experienced in holding the scraper blade against the frame. At the Hercules plant, the two Oliver filters have been placed back to back, and three braces are driven between the two to hold the scrapers against the drums. There is one brace at each end and one in the center. A better way of remedying this difficulty has been devised at the Gold Hunter plant by using a cast-iron plate to carry the scraper blade, and by making this plate wide enough to extend beyond the sides of the filter frame, so that it can be held against the drum by adjustable bolts. This plate is 10 in. wide and cast ⅝ in. thick up to within 3 in. of the upper edge, where it bevels down to about ¼ in. It is bolted or riveted to a 1½-in. square rod turned down to 1¼ in. to fit into the bearings of the scraper sent with the machine. The axle carrying the scraper mechanism might be used were it not for the undesirability of shutting down the machine while making the change. To this carrying plate at its upper end is riveted the scraper plate, which extends about 4 in. in front of the cast-iron carrying plate. The scraper plate is only as wide as the drum, but the cast plate overhangs the frame of the machine so that bolts can be brought up from ears attached to the top of the hopper frame to hold it in place. The rods hold the scraper against the drum, and the blade is so heavy that it cannot spring back under the strain, as does the scraper holder sent with the machine.

The Metal and Thermit Corporation is one of the largest recoverers of tin from tin-plate scrap. Its plants at Chrome, N. J., and East Chicago, Ind., are devoted to this industry. Approximately 100,000 tons of tin scrap is treated yearly, and the recovery is approximately the equivalent of 2000 tons of metallic tin. The tin is recovered in the form of pig tin, and also as the tetrachloride of tin. The detinned scrap is compressed into billets, which are sold to iron and steel plants.

A Wyoming Platinum Mine

By H. H. Taft[*]

Two ranges of mountains, in reality high mesas, extend from Colorado into Wyoming, between which the North Platte River flows. The general elevation is between 9000 and 10,000 ft. above sea level. They are remarkably well timbered with tall straight fir, spruce, balsam, and other trees. The snowfall is heavy, from 5 to 10 ft. remaining on level ground; and there are but two seasons—July-August, and winter.

A copper mine was found on the westerly range and named the Rambler; another, on the easterly range, the Medecine Bow, was called the New Rambler. About fifteen miles northwest excitement arose on account of gold discoveries; and, the year being 1876, the district was named Centennial. About this time the outcrop of copper ore was discovered and located, only to be abandoned and relocated several times before a permanent location was made in 1900. From 1901 to 1902 several hundred people settled there, and the town was named Holmes, after one of the owners of the mine. J. T. Holliday, and others from Laramie, became interested and formed the New Rambler Mining Co. A sawmill was erected at the mine, and, later, a small copper furnace to matte the low-grade ore. The richer ore was hauled in wagons to the Union Pacific R.R. at Laramie, 45 miles northeast.

The New Rambler Mining Co. was sold to Chicago people, who organized the Rambler Copper Co. and, later, the Platinum Mining and Milling Co. A concentrating mill was built at the mine and a railroad was constructed by another company, from Laramie into the North Park of Colorado. This road passed within 10 miles of the mine, and the shipment of ore was greatly facilitated. The sawmill and the smeltery were destroyed by fire.

The general rock formation on the east of the range is granite; to the west, gneiss, diorite and peridotite. On the west and north sedimentaries occur—quartzite, limestone and sandstone. There has been heavy glacial action, and near the mine may be found many well-worn quartz boulders. Gneiss occurs at the mine, but the rock from the lower levels is peridotite. There is no evidence of a vein or any of the usual causes of ore occurrence and there is a difference of opinion as to whether a dike or a contact exists. As far as is known now the ore is a pot or kidney of diorite, charged with copper and iron.

An outcrop of copper ore originally caused the location of the property, but the better ore was found under 10 to 20 ft. of soil. There is a record of 7000 tons of 17% copper ore having been shipped. Probably 10,000 tons of ore was mined, and as much more of low-grade material and waste.

The property has been examined by some of the best-known engineers and geologists in the country. The rock classifications are attributed to Prof. J. F. Kemp. Prof. Wilber C. Knight, of the Wyoming University at Laramie, made a study of the ores and rocks. A pupil of his is credited with discovery of platinum in the ore.

The ore is a decomposed diorite charged with gray copper (tetrahedrite) and pyrites, much oxidized and altered, as might be expected in such a wet region. All the oxidation products are present—such as red oxide, and carbonate, and some products of reënrichment, covellite being common. It was from this covellite that sperrylite (arsenide of copper) was isolated, but no one at the mine has identified this mineral. There is a little antimony in the ore and less arsenic. The platinum and palladium content varies directly with the copper, 5% copper ore having about 1 oz. of these metals, 20% copper ore, about 4 oz. A typical assay is: Copper, 5%; gold, 0.02 oz.; silver, 1 oz.; palladium, 0.4 oz.; platinum, 0.6 oz. It is my impression that the deposit is a platiniferous copper ore in the same category as argentiferous copper ores and argentiferous galena. It is a significant fact that platinum occurs in a copper ore in southern Utah and to a small extent in the copper ores of Ely, Nevada.

Considerable prospecting has been done in the neighborhood, but with no practical results. It is doubtful, however, if many platinum-palladium assays have been carried out, and most of the test pitting was done before the platinum discovery was made. The cost of a platinum assay is prohibitive from the prospector's point of view, from $5 to $35 being the usual charge. An assay for the above-named five elements costs $25. The assay is made with from 5 to 10 A.T. in the manner of a crucible gold assay, and the button analyzed by wet methods. An ordinary assay may be made for guidance in prospecting, and the small button tested qualitatively. Both platinum and palladium give richly colored salts, a designation particularly applicable to the iodide. Ordinarily, the prospector depends upon panning, which, in ores like those of the New Rambler, indicates nothing of value. Perhaps in other regions the same thing may happen. Some placer gold work was carried out in the district, but before platinum was recognized as being a constituent of the ores. The underlying peridotite carries 0.6% iron, in the form of magnetite and martite, and 0.014% copper, with practically no platinum and palladium.

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[*] Box 432, El Paso, Texas.

Mining in Isle of Pines Has Future

The Isle of Pines promises to become an important producer of iron, copper, and other ores, says *Commerce Reports*. Eleven mines have already been located, though only two are being actively developed. At one of these, an iron mine near Nueva Gerona, shafts have been sunk to a depth of 117 ft., and, apparently, fine ore is being found. Assays of samples of this ore are being made in the United States and Cuba. A copper mine, also near Nueva Gerona, only awaits the arrival of the necessary machinery to begin development work.

Little has been done at the other mines, chiefly because their boundaries have not yet been officially established. The chief Cuban government mining engineer has arrived in the island, accompanied by two assistants, and the work of establishing the boundaries is now under way. The Cuban government is taking a most active interest in the development of these mines, four of which are said to be owned by Americans, with an American engineer as manager, and the others by Cuban corporations.

Remember the Comfort Fund of the 27th Engineers.

Controlling the Drawing-Off In Caving Stopes

By A. B.

The successful removal of ore from large caving or shrinkage stopes has been accomplished by the use of charts which depict the ore contained in the chutes and the stope above. By systematically keeping track of the ore removed from each chute, and regulating the amounts as required, it has been possible to maintain [illegible] even top contour of the ore, thereby insuring a better extraction than would be possible under a haphazard method. Details of a drawing-off chart.

IN DRAWING ore from large caving or shrinkage stopes, it is essential that the ore be drawn evenly, or on a definite angle, in order to minimize admixture of the ore with the waste overburden. If the drawing-off in such a body is done in an unsystematic manner, as shown in Fig. 1, the ore may draw down through narrow funnels in many of the chutes, and further drawing will pull only waste, or, at best, a mixture of ore and waste. On the other hand, if all chutes are emptied evenly, as shown in Fig. 2, the contact between the broken ore and the crushed capping will present a wavy outline, and the tendency toward piping will be offset by drawing from adjacent chutes

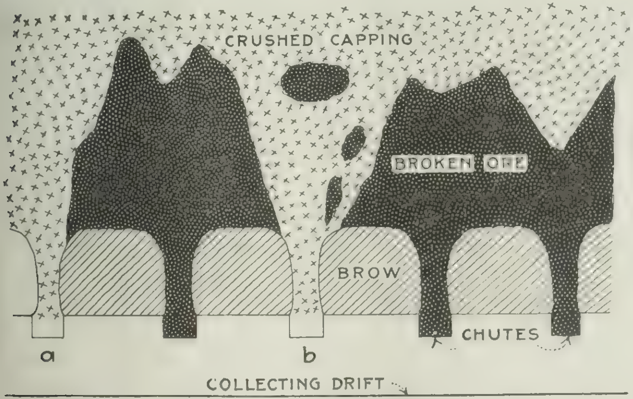


FIG. 1. CROSS-SECTION SHOWING EFFECT OF UNEVEN DRAWING FROM CHUTES

(a) Shows funneling of waste capping through ore. (b) Shows uneven mixture of ore and waste in drawing.

Several methods to represent the amount of ore drawn from day to day and the amount left in the chutes in such stopes have been tried. One scheme, as shown in Fig. 3, consists of a flat board studded with finishing nails which are spaced at intervals corresponding to the positions of the chutes underground. Iron washers are placed on these nails and built up to represent the height of the ore column in each chute. Each washer represents a certain tonnage of ore, so that the stack of washers signifies the height of the ore column in a chute, and, as the ore is drawn, washers are accordingly taken from the nails. By glancing along the top of the board, the contour of the top of the ore pile in the stope can be noted at any time, and the drawing-off which should be necessary to preserve the evenness of the stope can be accurately determined.

In Fig. 3, if every foot in height of ore column over a chute contains 10 tons, each washer can be considered as representing 10 tons of one foot in height, and it will be seen that chutes *A*, *B*, *C*, *D*, and *E* contain 80, 100, 140, 100, and 180 tons, respectively. To draw these chutes so that the columns will be of equal height, chute *A* will not be drawn, 20 tons will be taken from *B*, 60 from *C*, 20 from *D*, and 100 tons from *E*. If it is desired to draw the ore on an angle of 20°, 80 tons will be drawn from *A*. This will empty the chute, according to the model, and waste capping should show in the chute mouth; 60 tons will be drawn from *B*; 70 from *C*; *D* will not be drawn, and 40 tons will be drawn from *E* and it will be necessary to begin drawing from the new chute *F*. To continue drawing at this angle at the rate of 35 tons per day per chute, during the next day or shift *B* will be drawn empty, 35 tons removed from the other chutes, excepting *D*, from which only 30 tons will be drawn, and a new

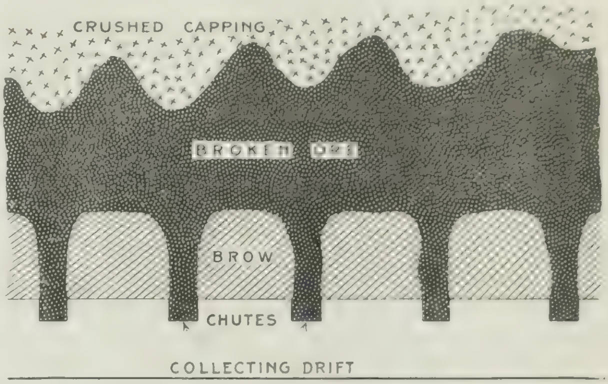
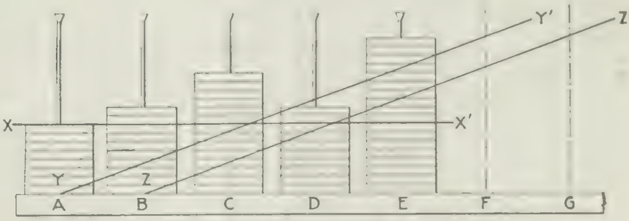


FIG. 2. CROSS-SECTION SHOWING WAVY OUTLINE AT CONTACT OF ORE AND CAPPING OBTAINED BY SYSTEMATIC DRAWING FROM CHUTES



Section across Drawing. Off Model
Each Washer represents one Foot in Height and 10 Tons of Ore

X-X' is Line to which Chutes should be drawn to make them all even and keep Top of Ore Body Level.

Y-Y' is Line to which Chutes should be drawn to establish an Angle of 20° with the Line.

Z-Z' gives the Point to which Chutes should be drawn during the next Period, to maintain the Angle, and keep up a Production of 35 Tons from each Chute pulled.

FIG. 3. MODEL REPRESENTING ORE IN CHUTES

chute *G* will be started, from which 20 tons will be drawn.

Another method consists of a board, arranged as shown, but instead of washers being used small pads of paper are placed over each nail and the pads numbered from the bottom upward at any given interval such as 5, 10, 15, or similar combinations. The original top sheet of each pad gives the number of tons in the chute before the drawing-off begins. If the interval of numbering is 5, then every time five tons are drawn from any chute a slip of paper is torn from the pad and the topmost sheet indicates the number left.

In order to watch closely the drawing of a large caving stope which covered an area of 225 x 400 ft., the ore from which was to be drawn through 1200 chutes, the above methods were considered, but were discarded for the following reasons: (1) The top of the orebody had been top-sliced, and it was realized that considerable timber from the mat and old raises would be drawn through the chutes. This would hinder the drawing of the ore from the chutes, and in many cases prevent making the required tally for each shift. To keep a record of small tonnages drawn from some of the chutes would require too many washers over each nail, as each washer would represent one or two tons only. As the block was estimated to contain 120,000 tons, the number of washers required would be enormous. (2) To show 1200 chutes on a board would require too much space and the operation of the model would be cumbersome. (3) The effort was to be made to draw the stope on a definite angle, so as to preserve, as far as possible, the unity of the mat and prevent admixture of the ore and waste. It was believed that drawing on an angle, the stope could not be closely watched over such a large area by means of a three-dimension model, and by means of the paper pads it could not be watched at all, graphically.

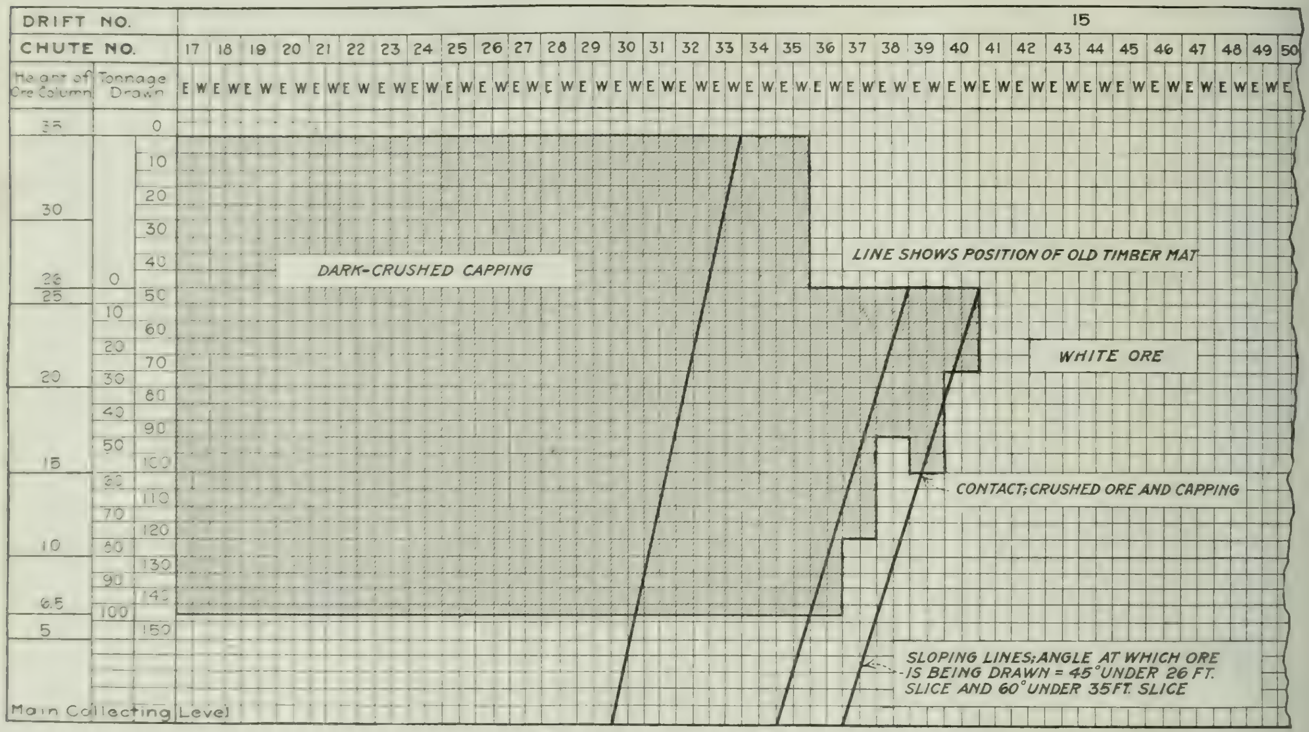


FIG. 4. CHART SHOWING THE DRAWING-OFF OF CHUTES

To overcome these difficulties and devise a system which would show the relation of one drawing-off drift to another, and still be more flexible than any of the above plans, it was decided to chart the daily tonnage, making the use of a separate chart for each drift.

The drawing-off in this stope was done along timbered drifts 25 ft. apart, having chutes on either side of each drift set. The drifts were run north and south, and each set was numbered, so that in one set, for example, No. 58, there would be two chutes, No. 58 East and No. 58 West. In all drifts the corresponding numbered chutes were directly opposite each other, so that the raises extended from any east chute would connect with the raise extended to meet it from the west chute of the same number in the next drift. This arrangement facilitated a comparison of the progress of drawing-off in the various drifts without having a model of the whole stope spread out.

In some cases a slight adjustment was necessary in plotting the tonnage removed from a chute, as there would be from 15 to 30 tons more pulled from a chute than it had been estimated to contain. This excess tonnage was credited not to the chute from which it was drawn but to the adjacent chutes in the same drift, or to chutes in adjacent drifts which carry the same number as the one from which the excess was taken. Generally the ore was credited to the chute which showed the removal of the least tonnage. It may be stated that, after having pulled nearly 75,000 tons from the stope, in no case has this method of balancing chute tallies failed, and in every chute which has been abandoned to date, old timber and waste have appeared at the chute door within five to ten tons of the amount estimated.

The reason for balancing these chutes in this manner is that, owing to the fact that timber from old raises and the mat is annoying to the chute tenders, it is not possible to always pull the tonnage required from a chute. This irregularity causes the ore to run into those chutes which have been pulled the most, concentrating the tonnage in these chutes, to the detriment of those giving trouble with timber. Such irregularities, if allowed to continue, cause mixture of ore and waste and result in loss of ore; and it is in this connection that the drawing-off charts have given the best service.

CHUTE TALLIES

STOPE No.____________ DATE____________

Chute No.	Cars To Be Drawn	Cars Drawn—Day Shift		Cars Drawn—Night Shift		Total Cars Drawn	
		Large	Small	Large	Small	Large	Small

Day Shift Boss____________ Night Shift Boss____________

FIG. 6. TALLY SHEET FOR THE DRAWING OF ORE FROM CHUTES

Composite samples are taken daily of the ore drawn in each drift, and when the charts show that only 30 or 40 tons remain in a chute, samples are taken from that chute. When the assay for any chute reaches the minimum analysis allowed, and if, in the judgment of the bosses, the percentage will not increase, that chute is closed and abandoned.

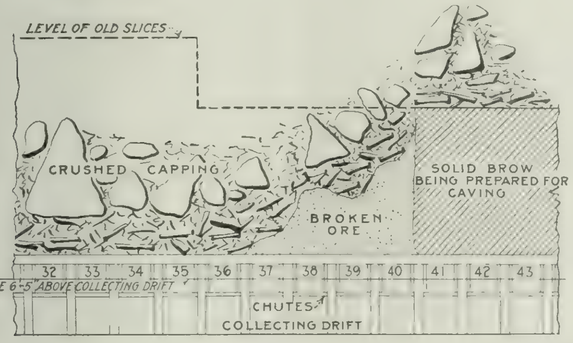


FIG. 5. CROSS-SECTION OF DRIFT AS SHOWN BY CHART

A simple calculation will show what proportion of ore and waste is being drawn over any area, and solving these equations by substitution will give all the data needed, and from which percentages may be obtained.

Let X equal tonnage of ore drawn;

A equal grade of ore as calculated for the block;

Y equal tonnage of waste drawn;

B equal grade of waste capping immediately over orebody;

C equal tonnage of ore and waste drawn from area as shown by tonnage records;

D equal grade of tonnage drawn from area, as shown by assay records.

Then $X + Y = C$.

And $AX + BY = DC$.

The success in the use of these charts is shown by the fact that of the area already abandoned, 90% of the ore computed to be in the block has been recovered and the admixture of waste brought the total tonnage drawn up to 105% of the total tonnage of ore estimated.

Fig. 4 shows the form of the drawing-off chart used for each drift, and Fig. 5 shows the appearance of that drift as pictured by the chart. The difference in the angle of actual ore pile and the graphic representation is due to the disproportionate scale of the chart. Fig. 6 shows the form in which the drawing-off requirements for the day are given to the bosses underground.

Rights as to Stolen Ore

By A. L. H. Street*

Where persons by means of wrongful underground workings extract ore from adjacent property and sell it to a smelting or refining company, the right of the owner of such property to hold the company for the value of such ore is not affected by the question whether the guilty persons have been joined with the company as codefendants or not. But where it is sought to hold the buyer of ore on account of a purchase made from one who was lawfully in possession of the ore under contractual relations with the owner, and who made wrongful sale thereof, then it is necessary to join such person as a codefendant with the buyer. These points were decided recently by the Colorado Supreme Court in the case of Hicks *vs.* American Smelting and Refining Co. (*172 Pacific Reporter, 1055*).

New Illinois Hoisting Record

By H. A. Wheeler†

Orient No. 1 coal mine, in Franklin County, Ill., has just made the remarkable record of producing 32,514 tons in one week of six days, on a single shift of eight hours per diem. This is a daily average of 5149 tons, and the biggest day's output, on Oct. 10, was 6008 tons. The shaft is 600 ft. deep, and 4-ton cars are employed, with self-dumpers in the tipple.

This achievement indicates a hoisting rate of three trips per minute, from one of the deepest shafts in Illinois. It is the highest record for the state, if not for the world.

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Grease Amalgamation of Gold *

By H. A. White

Consideration of the possibility of using grease as a substitute for mercury in the amalgamation of gold, does not, because of that substance's characteristics, warrant expectation of successful application, but attention may be directed to the process in use at Kimberley and the Premier mine for recovery of diamonds by means of grease tables. It must be borne in mind that, although the physics of amalgamation is largely unexplored territory, in the main the practical effect is to use preferential adhesion as a means of concentration. In order to get an idea of the forces thus brought into play, the following experiments were made:

A piece of mill gold was rolled flat, and a square of 2 cm. side was cut from it and mounted on wood in such a manner that a free gold surface could be suspended horizontally from the beam of a balance, and a piece of ordinary banket ore was ground to shape to enable a similar area to be treated in the same way. Each piece had thus an area of 4 sq.cm. and an effective edge of 8 cm. A table was arranged over one pan of the balance upon which the surface to be tried could be placed, and the other arm of the balance carried the counterpoise of lead foil and the additional weights required to break the contact made. The accompanying table gives the results obtained. It may be remarked that free fluid surface contacts gave consistent results on repetition, but that the figures referring to grease or amalgamated plate are only roughly reliable. It appears that a gold surface exhibits greater adhesion to grease or oil than the banket ore surface tried; and that a thin film is effective in accordance with the formula expressing the force with which two surfaces are held together by a film of liquid between them:

$$\frac{2AT\cos a}{d} + BT\sin a$$

where A is the area of the film, B its circumference, T the surface tension, d thickness of film, and a the angle of contact.

FORCE OF ADHESION BETWEEN VARIOUS SURFACES AND GOLD AND BANKET ORE IN THE FORM OF SQUARES OF 2 CM. EDGE

Surface	Banket, Grams	Gold, Grams
Distilled water	1.55	1.67
Thin film of distilled water on glass	8.00	15.00
Mineral oil	1.07	1.33
Thin film of mineral oil on glass	13.00	20.00
Grease, 1 cm. thick on wood	60.00	90.00
Grease, 0.5 cm. thick on wood	180.00	190.00
Thin film of grease on wood	200.00+	200.00+
Thin film of grease on wood under water, pressed down by its own weight	5.00	10.00
After 5 min	25.00	22.00
After 3 hours		45.00
After 16 hours	125.00	......
Firmly pressed	200.00+	200.00+
Mercury (clean)	2.00	13.00
Mercury under water	....	13.00
Mercury on amalgamated copper	...	105.00
Mercury on "sick" amalgamated copper	.	160.00
After 5 min.		160.00
After 1.5 hours	.	200.00+

The grease used in the experiments was a thick dark residual from petroleum distillation, soluble in petrol.

Comparison of Grease-Plate With Mill Amalgamation

A free-milling test of a screen sample assaying 9.6 dwt. showed 41.6% extraction after shaking 10 min. with mercury. This grade would show in the mill about 50% extraction. Ten assay tons of the same material was dropped into 2 in. of water standing in a pan, the bottom of which was thinly coated with grease. It was shaken thoroughly, and immediately washed off with a strong stream of water, which took away all but a few specks, which glistened on the grease and showed gold and pyrite under the microscope. The tailing caught in another pan showed practically no loss on re-weighing and yielded 31.5% extraction, the bulk of the loss being recovered from the grease. The greater part of the pyrite was not apparently retained by the grease, contrary to expectation.

Working-Scale Test

One of the three "overflow" tables attached to a tube mill was covered over with a wooden board (4 ft. 6 in. x 4 ft. 9 in.), on which was spread a coating of grease, and the usual stream of pulp was run over for 24 hours, and left untouched. The grease collected 39 gm. of concentrate, carrying 1250 oz. gold per ton; and the total gold represented only 6% of the gold expected on that plate. The experiment was then repeated, with the modification of removing grease and concentrate every 12 hours. The grease collected 430 gm. of concentrate, carrying 540 oz. of gold per ton, and the total gold represented 25% of the gold expected for that plate.

The experiment was again repeated, with the modification of removing grease and concentrate every two hours. The grease collected 468 gm. of concentrate, carrying 535 oz. of gold per ton, and the total gold represented 28% of the gold expected for that plate. A continuous grease-belt system might be expected to give better results.

Oriental Consolidated Mining Co.

The report of the Oriental Consolidated Mining Co., operating in the Unsan district of Korea, for the year ended June 30, 1918, shows that the company's three mills—the Tabowie, Taracal, and Maibong—crushed 303,672 tons of ore, with a gold content value at $5.90 per ton. Two hundred stamps were in operation for 337 days, 23 hours and 4 minutes, and the amount crushed per stamp per 24 hours amounted to 4.49 tons. After amalgamation, by which the grade of ore was reduced to $3.12 per ton, the tailing is concentrated. The concentrate produced, amounting to 29,606 tons, was cyanided. A summary of metallurgical results is as follows:

METALLURGICAL RESULTS, ORIENTAL CONSOLIDATED MINING CO., FOR YEAR ENDED JUNE 30, 1918

	Extraction		Recovery	
	Per Ton Milled	Per Cent.	Per Ton Milled	Per Cent
Gold recovered by amalgamation	.....	..	$2.78	47.1
Gold extracted by concentration	$2.55	43.2	......	....
Gold recovered by cyanidation of concentrate	.....	.	2.13	36.1
Total recovery in bullion form	.....	.	$4.91	83.2

Average milling cost, including amalgamation and concentration expenses, was 51c. per ton. The average cost of cyaniding concentrate was $2.16 per ton treated, or 21c. per ton milled. The average mining cost incurred at the five mines producing ore was $1.83 per ton. Ore reserves as of July 1, 1918, were estimated at 775,000 tons, valued at $4,090,000. The report is explicit, and results are given in well-arranged tables.

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*Excerpt from the Journal of the Chem. Met. and Min. Soc. of South Africa.

The Porphyry Coppers

III—Mine and Equipment Investment*

BY L. H. GOODWIN†

THE porphyry copper mining companies have not, as a rule, published detailed statements covering plant costs. The annual reports, in all cases, indicate the gross investment in plant, but generally the subdivision of the amount among mines, milling, and other units is not shown.

UTAH COPPER CO. HAS A TOTAL PLANT INVESTMENT OF $32,417,725

The Utah Copper and Chino companies are exceptions, and each year publish the additional investment for each unit of their plant. The accompanying data in Table I have been compiled from the Utah reports, and indicate the total investment as of 1907, with yearly additions from 1910 to date. In addition to the total investment of $24,568,713 in mining and milling properties and plants, the Bingham and Garfield R. R. represents a net expenditure of $7,849,012, making the total in property and plant $32,417,725. Depreciation charges have not been deducted from the figures here presented.

TABLE I. PLANT COSTS, UTAH COPPER CO., 1907–1917

Year	Mine Property	Magna Mill Plant	Arthur Mill Plant	Mine Surface Equipment	Leaching Plant	Total
1907	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	$9,093,251
1908	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	10,286,083
1909	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	10,536,251
1910	$8,205,766	$4,402,769	$1,342,238	$809,251	(*a*)	$14,760,023
1911	95,563	140,955	885,368	93,232	(*a*)	1,215,121
1912	15,500	243,969	785,589	75,062	(*a*)	1,120,120
1913	4,000	284,213	451,892	77,322	(*a*)	817,427
1914	645	142,713(*b*)	55,544(*b*)	75,680	1,351	275,933
1915	42,825	108,143(*b*)	365,238(*b*)	76,928	(*a*)	593,133
1916	23,350	196,285(*b*)	628,844(*b*)	210,855	300,468	1,313,102
1917	612,950	535,192(*b*)	2,082,283(*b*)	284,499	958,930	4,473,854
Total,	$8,953,899	$6,054,239	$6,596,996	$1,702,829	$1,260,749	$24,568,713
Plant and equipment sold, replaced or abandoned during 1917.....						396,268
Net book value as of Dec. 31, 1917..........................						$24,172,445

(*a*) No expense incurred; or, if incurred, not separately reported.
(*b*) Expenditures for purchase of lands for tailings disposal were prorated equally to the Magna and Arthur plants.

Taking as a basis the year of maximum production, 1917, during which 12,542,000 tons of ore was milled, Table II indicates plant costs per ton of yearly capacity.

TABLE II. UTAH COPPER CO.'S PLANT COSTS PER TON OF YEARLY CAPACITY, AS OF DEC. 31, 1917

	Investment	Per Cent. of Total	Investment per Ton Year
Property........................	$8,953,899	22.0	$0.714
Deferred stripping expense.........	8,300,040	20.4	0.661
Concentrators....................	12,651,235	31.0	1.009
Mine surface equipment...........	1,702,829	4.2	0.136
Leaching plant....................	1,260,749	3.1	0.105
Railroad.........................	7,849,012	19.3	0.626
Totals......................	$40,717,764	100.0	$3.25

The item of deferred stripping expense is not essentially different from that for development in underground mining, and is included in the figure representing the total investment required to attain the present rate of production.

Regarding depreciation, the Utah Copper Co. first set up a reserve in 1913, charging 5% of the total cost of all plants and equipment. This rate, or a comparably nominal one, was maintained until 1916; but in 1917, owing doubtless to the new Federal tax rulings, a higher rate was established. To the end of 1917, a total of $3,385,759 had been placed in depreciation reserves.

Table III contains a segregated statement of Chino's investment to date, with the unit costs of its various plants per ton on the 3,608,100 tons milled in 1917.

TABLE III. CHINO COPPER CO'S. PLANT INVESTMENT AS OF DEC. 31, 1917

	Total Investment	Per Cent. of Total	Investment Per Ton of Capacity
Original mine and mill property....	$1,802,796	12.6	$0 500
Additions to mine property........	152,015	1 1	0 042
Drilling expense..................	268,290	1.8	0.075
Surface development	686,470	4 8	0.190
Underground development.........	106,219	0.7	0.029
Deferred stripping charges.........	2,910,197	20.3	0 806
Hurley plant construction..........	7,112,813	49.6	1.972
Mine building and equipment......	1,660,868	11.6	0.460
Total.........................	$14,699,668	102.5	$4.074
Less abandonments, etc., charged to income.........................	362,250	2.5	0.100
Net total.....................	$14,337,418	100 0	$3 97

NEVADA CONSOLIDATED'S PLANT COSTS HIGHER THAN THOSE OF OTHER STEAM-SHOVEL MINES

The plant costs of the Nevada Consolidated Copper Co. serve as another example of a steam-shovel mine, but Nevada Consolidated's operations differ from those of the Utah Copper Co. in that they are of smaller extent and of shorter indicated longevity, with, consequently, a more limited period in which to amortize orebody and plants. The Nevada Consolidated also owns its own smeltery.

The total and depreciated investments in property and plants are summarized in Table IV, and the outlay per ton of 1917 mine production is indicated. Applied to the 4,064,095 tons milled, the total investment of $25,895,953 represents $6.37 per ton. Why Nevada's investment should be so much larger per ton of capacity than Utah's is not apparent. It may be noted that the proportion of the total investment borne by the various items at the two mines agrees rather closely, the principal differences being attributed to the fact that Nevada owns its own smeltery and that Utah maintains the more expensive railroad.

TABLE IV. NEVADA CONSOLIDATED COPPER CO., TOTAL PLANT COSTS AS OF DEC. 31, 1917

	Undepreciated Investment	Depreciation Applied	Per Cent. of Total	Total Investment per Ton
Cost of mines................	$6,187,285	....	23.9	$1 522
Less ore extinguishment......	....	$3,521,015		
Net.......................	....	$2,666,270		
Mine equipment and development.....................	791,947	....	3.1	0.195
Less depreciation	....	$197,992		
Net............	.. .	$593,955		
Deferred charges, stripping account ..	5,454,520	. . .	21.0	1 341
Milling and smelting plant....	9,867,880	....	38 1	2 427
Less depreciation ..	..	$4,634,387		
Net...	. . .	$5,233,493		
Railroad..................	3,594,321		13.9	0 885
Less depreciation.......		$1,101,702		
Net..		$2,492,619		
Total investment.... . .	$25,895,953		100 0	$6 37

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*Parts I and II of this article appeared in the Nov. 2 and Nov. 16 issues, respectively.

†Mining engineer with Rogers, Mayer & Ball, 42 Broadway, New York.

The underground porphyries do not publish enough detail of plant investments to permit as good an analysis as is possible with the reports covering operations at the open-pit mines. Ray Consolidated published detailed costs in 1911, and Table V presents those data, with unsegregated figures for 1917. Tonnage mined in 1917 was 3,621,233, and the total undepreciated investment represents $6.73 per ton—not a great deal more than that of the Nevada Consolidated. The total charge against depreciation was $1,669,231 to the end of 1917, which includes $33,447 carried as depreciation on railroad plant.

TABLE V. RAY CONSOLIDATED PLANT COSTS, 1911 AND 1917

Property:	Total Investment 1911	Total Investment 1917	1917 Investment per Ton of 1917 Capacity
Original property acquired	$5,171,730	....	....
Mill sites and mining claims	177,257	....	....
Reconstruction of old plant	612,043	....	....
Gila property purchased	1,942,354	....	....
Total	$7,903,383	$8,719,313	$2.41
Mine development	$2,120,491	$6,044,968	$1.67
Construction and Equipment:			
Ray mining plant	1,269,275	....	....
Hayden milling plant	3,159,689	....	....
Miscellaneous expense	182,476	....	....
Total	$4,611,440	$7,902,832	2.18
Railroad	1,007,490	1,693,676	0.47
Total	$15,642,805	$24,360,789	$6.73

INSPIRATION CONSOLIDATED

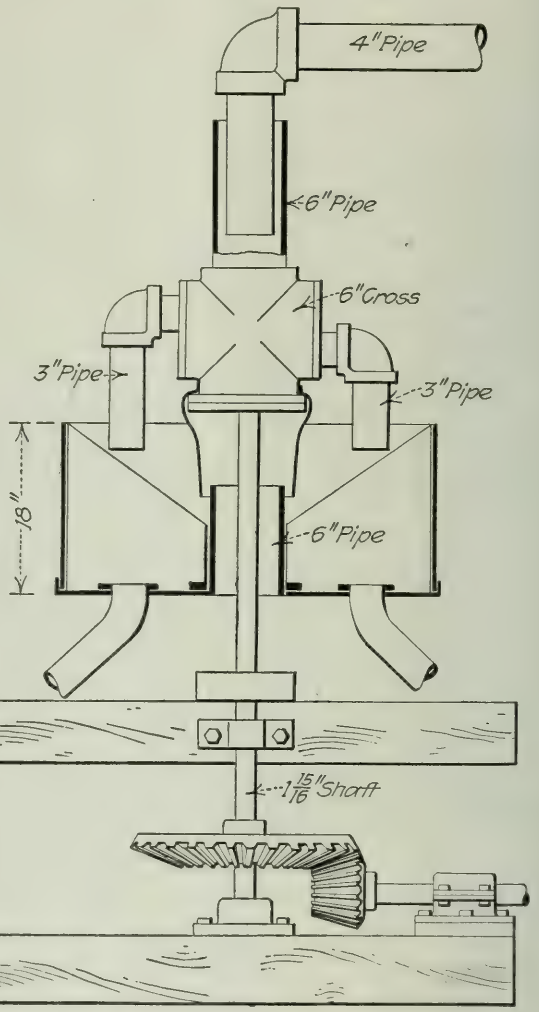
The Inspiration Consolidated Copper Co. does not give subdivided costs in its reports, but the meager information that it does publish is of interest because the report covers the operations of a thoroughly modern plant, recently brought to capacity in a remarkably short time after production was begun. During 1916, 5,316,350 tons was milled from this mine, which is more representative than the 1917 performance, owing to the reduced tonnage caused by the strike in that year. The property and plant investments, as of Dec. 31, 1917, with their unit costs per ton of 1916 capacity, are as follows: Mines, mining claims and lands, $17,110,201, or $3.22 per ton, and buildings and equipment $8,355,041, or $1.57 per ton, which totals $25,465,242 and $4.79 per ton. There has been charged, however, a total of $3,579,312 as reserves for depreciation and development, and this makes the apparent total of the investment $29,044,554, or $5.46 per ton.

The Miami Copper Co. publishes its plant costs in more detail than the other underground porphyries, but its method of bookkeeping does not indicate yearly additions of new construction, nor deductions for depreciation, and the figures are therefore not comparable with the others presented. As of Dec. 31, 1916, its total investment in property and plants was $5,789,554, which represents $3.14 per ton for the 1,842,017 tons milled in the year 1916, but because of the different bookkeeping method employed, comparison should not be made with the other mines.

Hewitt Pulp Distributor

The even distribution of pulp is of vital importance in the efficient work of many types of milling and metallurgical apparatus. At the Gold Hunter mill, Mullan, Idaho, a "kidney" pulp distributor was first used to apportion the pulp to the eight Callow roughers, but it was found that, as the feed was delivered into the rotating box with considerable velocity, the machine fed by the compartment in line with the feed launder received more than the others, and the machine furthest away the least. In order to remedy this defect a feeder, in which the pulp passes down through the center of a rotating hopper pipe, was designed and installed by C. L. Hewitt.

The apparatus was originally arranged for an overhead drive and one distributor pipe, but the Gold Hunter machine is driven from underneath and has two distributor pipes, one of which screws into a hole on the lower side of a bushing in one arm of the 6-in. cross, the other into a hole on the upper side of the other arm. In this way one pipe gets a full load, and the other takes any excess load.



DETAILS OF THE HEWITT PULP DISTRIBUTOR

The accompanying drawing illustrates the manner in which such a machine may be constructed. The equalizer is connected to a vertical shaft by means of flanges. The speed may be arranged at from 26 to 30 r.p.m., and the stationary box divided into as many compartments as there are machines to be supplied with feed. This type of distributor is suitable for splitting a stream of any composition, and will make an even division of the pulp.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

The Gold Question

THE following communication was addressed to a well-known professor of economics in the course of a private discussion of this subject. It is published here as a contribution to the general discussion of this important question:

I have received your letter of Oct. 23, and also the copy of the —— —— of March, 1912, containing your article. The latter I am returning to you in accordance with your request. I have been very glad to read it, for I find that it ties you to the quantity theory in its narrowest sense, i.e. as relates to gold, and gives me some heads for argument with you.

Every one will agree that a price expresses the ratio between the quantity of money paid for goods and the quantity of goods sold. As Hobson says: "This theory admits no question, and requires no exposition. It neither raises nor solves any problems."

But the controversy about the quantity theory is based upon a narrower meaning, and both you and Professor Fisher finally make the quantity of gold the governing factor in the determination of prices.

In your article of March, 1912, you say: "Two forces appear likely to exert a strong influence for some time to come in the direction of higher price levels. One force (*a*) is a continuation of the present large and increasing gold production. . . . The other force (*b*) is the improvement of our monetary and banking mechanism in such ways as to increase the efficiency of money—a result equivalent in its influence on prices to an increase in the supply of money."

(*a*) Since you wrote, prices have increased the most stupendously in modern history, but gold production has been halting and then actually diminishing. Does not this invalidate your first statement?

(*b*) Admitting that a given gold supply may be made the means of a more actively working mechanism, as is correctly suggested, why, if what is called inflation be such a bad thing, if high prices be so objectionable (certainly they are) — why do not the bankers put on the brakes? Even within the last three months the issue of Federal Reserve notes has been greatly increased in relation to the gold holdings. Why? Was it intentionally to put up prices? Why is the Treasury Department so eager to augment its gold? Why has gold supply practically been impounded? Why has an embargo been put on the exportation of gold? Why has the industrial use of gold been prohibited?

If increased gold production, and consequently increased money supply, are primarily responsible for raising prices, by virtue of the increased quantity of money, how do you account for the fact that it is during the periods of high prices that discount rates, i.e. the hire-price of money, are also high? This is the case at present and it has been characteristically the case in the past.

Referring to historical data, such a chart as you offer in your article is too rough wherefrom to draw any reliable conclusions. You are doubtless aware that the U. S. Mint and the *Engineering and Mining Journal* are the only original authorities of continuous record as to world's gold production. Their figures are substantially in consonance. You will find in *E. & M. J.* of Nov. 28, 1908, in a paper by me on "Has the Value of Gold Depreciated," and in the *E. & M. J.* of May 14, 1910, in a paper by me on "A Contribution to the Question of Prices," accurate charts of gold production, index numbers, etc. If you will take the trouble to examine these carefully detailed diagrams you will find a close parallelism of Sauerbeck's index number and the Bank of England rate, and scarcely any between either of them and the world's gold production. But you will find that in comparing the world's gold production with that of iron, copper, lead, and zinc from 1869 to 1909, there was a steady falling behind in the case of gold, lending color to the belief that the production of gold *did not increase fast enough* and that there was a real need to improve the mechanism of monetary and banking systems.

The data of production that I have cited to you go as far back as annual statistics exist, about 70 years in the case of gold, about 50 years as to the baser metals. Do I go too far when I say that the facts do not support your doctrine?

How do you, moreover, account for the wide differences in the exhibition of index numbers upon dissection? An index number that gives a certain line as a composite may, and in fact does, give very different lines when resolved into metals, foodstuffs, etc. If money, and money alone, be the causative factor, ought not all commodities to rise more nearly alike? I have, in a previous letter, inquired how you account for the behavior of rubber and coffee even since 1914.[1]

I grant that any great increase in the quantity of paper money, when credit may have been impaired, as in the present case of Russia, may cause the prices of commodities to rise in terms of such depreciated currency. Nor will I deny that the increase in the quantity of gold has some effect on prices, though, by comparison with the aggregate of business, that effect can be scarcely more than infinitesimal. But this is simply to concede that phase of the quantity theory that is self-evident truth. Moreover, there will be no inconsistency in the admission that a large new yield of gold easily won from rich placers might temporarily depreciate its value. Even more so the discovery of great treasure troves, as in the 16th Century. We might go further and conceive that a scientific discovery that would permit iron to be transmuted into gold would reduce the value of gold to that of iron. But these are conjectures that have nothing to do with conditions that have existed during the last 50 years, or exist now, or with what we have reason to expect.

You, and other exponents of the quantitative theory, regard gold as the master. Nay, more, you attribute to it, in the words of Yves Guyot, a miraculous character. Your opponents regard it not as a master, but as a servant. I am aware whither their logic may lead. A servant may be discarded in favor of another one, or of some improved mechanism. "Modern money," says Hobson, "is becoming essentially 'token' in its character," and he adds that "gold itself when used as money is sinking from its old character of intrinsic value and becoming a form of token money," but he admits that "for purposes of international commerce the present position of gold is such that a financial crisis of any broad character must for a time put general prices upon this basis." Mr. Larkworthy, chairman of the Ionian Bank, goes much further and in his last annual address advocated the demonetization of gold and substitution of a paper currency based on the liquid wealth of the respective countries, i.e. a mobilization of liquid wealth. This is not a chimerical and impracticable idea, for the Greek currency is already established on that system. Moreover, has not our own Federal Reserve banking system approached it, and does not the arbitrary control of exchange between London and New York reflect something of this sort?

But we are stared in the face by the fact that the nations of the world have issued, or will have to issue, approximately 200 billions of obligations that are payable in gold, that all the gold in the world is only about 5% of those obligations (as Mr. Jennings has luminously pointed out), and that the production of gold is diminishing seriously. Eventually the debtors may not want payment in gold, but that may not safely be assumed, and honesty indicates proper preparations to meet the obligations.

The idea of stimulating gold production by means of a subsidy to gold miners is repugnant, but are not the gold miners entitled to friendly consideration in view of the circumstances? You say *laissez faire*, that the situation is just what it ought to be according to economic law; but the governments have not let things alone. Gold reserves have been impounded and the gold producers have been deprived of their rights as free agents. It is possible that they have been deprived of a premium on their product, although of that we cannot be sure; but certainly they have been denied the right to export their product to countries where they could have obtained the benefit of exchange amounting to the same thing. Why would an encouragement of gold production with which to settle adverse trade balances be any more of a tax upon the public than the manufacture of pianos for the same purpose?

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[1] The prices of rubber and coffee have not advanced materially since 1914. Indeed, rubber has declined.

This country, and the world, is going to be called upon to cope with economic and financial problems of tremendous import. It is the duty of economists to give careful consideration to them and to revise previous opinions, if necessary, in order not to be swayed by prejudice in advising against the general good. The fact that American professional economists, in the majority, uphold the quantity theory of money should not lead them to disregard the representations of Laughlin, Hobson, De Launay, Yves Guyot, and others, to speak only of contemporary authorities, especially inasmuch as we are able to show you that as to the general relation between gold production and average commodity prices over the period of about 70 years *the facts do not support your contentions*, and as recently as 1906-10, Professor de Launay, as well as myself, was pointing out the probability that gold production had not been increasing fast enough. W. R. INGALLS.

Granby Consolidated Mining, Smelting And Power Co., Ltd.

The annual report of the Granby Consolidated Mining, Smelting and Power Co., Ltd., for the year ended June 30, 1918, indicates that large coal measures have been acquired, situated on Vancouver Island, and that coke ovens are now being constructed at Anyox, B. C., which are expected to be in operation by Jan. 1, 1919, and to be capable of producing 250 to 300 tons per day.

The total amount of ore smelted was 1,468,393 tons from the company's own mines, and 25,722 tons from other sources. The metal produced amounted to 44,685,001 lb. copper, 550,163 oz. silver, and 30,730 oz. gold.

Gross receipts amounted to $11,644,310.65, which, after the usual deductions, left net profits carried to surplus account of $1,527,132.95, making a total for this account of $4,929,459.67, out of which dividends were paid amounting to $1,500,042. Ore reserves, as of June 30, 1918, were estimated as follows:

GRANBY CONSOLIDATED ORE RESERVES, JUNE 30, 1918

	Tons
Ore containing from 3 to 5% copper	64,740
Ore containing from 2 to 3% copper	10,480,150
Ore containing from 1 to 2% copper	3,017,713
Ore containing less than 1% copper	9,968,605
Total	23,531,208

Development at all the mines has been curtailed considerably because of the shortage of labor, but enough diamond drilling and other work has been carried on to enable sufficient ore to be exposed for the immediate requirements of shipments.

Manganese Near Green River, Utah

The U. S. Geological Survey has just reported the results of a reconnaissance, made by J. T. Pardee, during May, 1918, of 400 square miles in the Green River district south of the Denver & Rio Grande RR. between Thompson and Green River, Utah. The work included an examination of 20 manganese mines and a detailed survey of four square miles in the vicinity of the C. F. & I. mine, made in order to facilitate a close estimate of the ore reserves.

The manganese ore occurs as irregular lenses or "blankets" that lie a few feet below the surface along the bedding planes of a gypsiferous calcareous red sandstone near the middle of the McElmo formation (Jurassic?); as veins and nodular concretions along joints below the blankets; and as fragments in the soil, residual from the weathering of ore of the two forms first mentioned. From a point near Green River the outcrop of the manganiferous beds runs in general southeastward about 25 miles and thence apparently swings northeastward around the La Sal Mountains.

Manganese occurs rather persistently along the part of the bed that was examined, but only in places is it pure enough or in bodies large enough to be considered ore. Few of the blanket deposits are more than 50 ft. long, and most of them measure 20 ft. or less. Generally they are closely spaced for a mile or two, forming rich or workable areas that are separated by long, barren stretches. Ordinarily the workable blankets range in thickness from two to six inches, but a few reach a thickness of three feet. Loose fragments of ore are scattered over thousands of acres, but owing to variations in their distribution and in the proportion of fragments of rock mixed with them, only comparatively small areas are apparently workable under present conditions.

The bulk of the ore has the properties of pyrolusite, which is probably secondary. Wad is widespread but not abundant, and rhodochrosite occurs sparingly in two mines. Many of the blanket deposits appear to be almost pure manganese dioxide. The ore generally contains less that 1½% of iron, little phosphorus, and from a trace to one-half of 1% or more of copper. The residual ore in the soil generally contains 40% or more Mn, from 8 to 15% SiO_2, and less than 2% Fe.

In May, 1918, three operators were producing 400 to 600 tons of high-grade manganese ore a month. Most of this came from the C. F. & I. and Salt Wash mines, operated by the Green River Mining Co. The other active operators were the Needles Mining Co. and J. B. Fonder. The deposits are worked solely by open pits. The bedded deposits (blankets) bear an overburden ranging in thickness from a few inches to six feet, which is stripped off. Residual fragments of manganese ore are separated from the soil by dry screening and hand picking.

Mr. Pardee estimates that 7300 tons of high-grade ore, containing more than 40% Mn, is available for mining under present conditions and without modification of existing methods. In addition, 22,500 tons, chiefly in the residual surface deposits, are possibly available to mining under improved conditions or methods. About 5000 tons of ore containing from 15 to 40% manganese and considerable lime is also available.

Unground Flint, Flints and Flintstones to the extent of about 15,000 tons and valued at $197,156 were imported for consumption in 1917, according to the U. S. Geological Survey. About 10% of this was "boulder flints," ground for use in ceramic wares. Thus more than 50% of the 30,000 tons of tube-mill lining and grinding pebbles used in the United States in 1917 was of domestic origin. Domestic substitutes have proved as cheap as and more satisfactory than imported materials.

A Dry-Concentration Plant in Arkansas

By TOM SHIRAS*

THE dry-process concentrating plant which was put in operation at Yellville, Ark., in the north Arkansas zinc and lead district, recently, by Sutton, Steele & Steele, is the first of its kind to be installed in the state. Although constructed primarily as a demonstration plant, it will be operated as a custom concentrator for a number of small mines, which are without mill equipment, within a radius of five miles of Yellville.

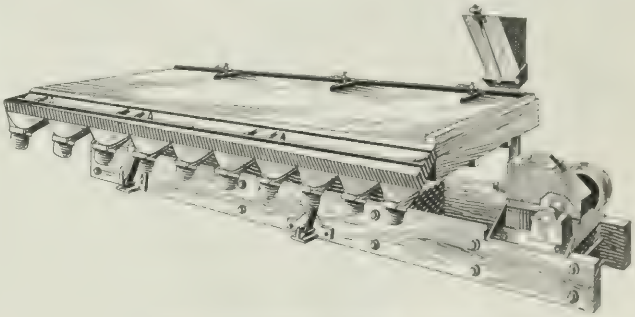
The mechanical equipment consists of a gyratory crusher, a rotary drier, two sets of 27-in. rolls, a de-duster, a screenless sizer, three vibrating screens, one gravity screen, three regular exhaust fans, three dry-process concentrating tables, a belt conveyor for the removal of the tailings, and numerous bins. The power is furnished by two 65-hp. boilers, and one 50- and one 25-hp. steam engine, the larger being used to drive the crushing machinery, the smaller to drive the concentrating equipment.

The floor space required for the tables is 5½ x 11 ft., the deck being 5 x 8 ft. Power consumption is ½ hp. per table. Air is used as the supporting medium for the deck load, instead of water; and the machine resembles in appearance the wet-process concentrating table, except that the deck is perfectly smooth and has no riffles. It is mounted on a shallow wind chest, which, in turn, is mounted on the running gear, and is oscillated lengthwise with a ¼-in. stroke. There are no movable parts in the machine except the head motion, which runs in oil. By virtue of springs, on which the running gear rides, standing at an angle, there is a slight rise to the deck as it travels forward. This produces a progressive movement on the material, causing the pulp to travel rapidly across the deck. The pulp, being dry, separates to some extent, according to the friction value of the particles.

The air is blown into the wind chest under the deck through which it filters, and is regulated in volume by a shutter gate on the intake, enabling the operator to use such amount of air as is necessary, depending on the mesh of the material being treated. The air, passing through the pervious deck from the chamber beneath, instantly expands, forming a film of air on top of the deck, which stratifies the material vertically immediately it reaches there. This stratification is according to the specific gravities of the individual compenents of the pulp, the lightest material being raised to the top and the heaviest remaining on the bottom, all the materials of intermediate density being lifted to their respective positions between these two extremes. The pulp, having been stratified, is now in position to be concentrated by the table.

The deck of the table is adjustable sidewise, standing higher on the side where the feed is delivered, and gradually pitching to the opposite side. The deck stands about ¾ in. higher at the discharge end than at the feed end. The sidewise inclination causes the material to fall toward the low side, whereas the oscillation progresses the material rapidly toward the discharge end. As the material is fed on to the table. the air comes through the porous deck and stratifies it, the lighter material being raised to the top of the mass, and, not being affected by the oscillation of the table, moving forward with the heavier particles beneath, and naturally falling down the incline with greater rapidity than the next heavier grains. Consequently, the lighter material must come off nearer the feed end, in a diagonal line of from 10 to 45° from the feed.

The heaviest material, not being affected by the film of air coming from beneath, and remaining on the deck, is pulled forward and taken out from under the mass first; and is discharged at the opposite end in a straight line from the last banking bar at the upper side of the table. Material in the next class settles down and takes its place immediately below the zone of the heaviest grains, and is in turn pulled out from underneath the mass, carried over, and discharged next below the zone of heavier material. At the same time the gangue or lighter particles, being held at the top of the deck load and not so radically affected by the oscillation of the table, slide to the low side of the deck by the natural law of gravity. Thus the effect of the oscillation on the stratified pulp is to form it into definite zones of clean mineral and gangue, which are discharged at the opposite end of the table from the feed, and along the low side. Sliding fingers under the railing beneath the skirt board make it possible for the operator to divide the zones at any point, and to cut any desired product from the table.



DRY CONCENTRATING TABLE

The screenless sizer consists of an endless, corrugated rubber belt. The corrugations are graduated from $\frac{1}{32}$ in. in depth at the top to $\frac{3}{16}$ in. at the bottom. The belt will handle pulp containing sizes as coarse as $\frac{3}{16}$-in. mesh. The machine is adjustable from an incline of from 26 to 38° from the horizontal, giving all the range needed for any kind of material. Ten-sided beater rollers are placed every 6 in. across, under the belt, and vibrate it slightly. Being run at the rate of about 90 r.p.m., they strike about 900 light strokes a minute, and cause the smaller sizes of the material to sift down through the larger sizes, the material forming its own screen, which is always correct. The sifting action stratifies the feed according to volumetric size, the finest sizes, always on the bottom, being naturally the first to lodge and remain in the grooves. As the mass slowly passes down over the belt, the next coarser size lodges in the next grooves, and so on. The grooves, being graduated, with the finest at the top, permit the coarser sizes to pass on until they reach a groove large enough to hold or retard them. The coarser sizes not being held or retarded so much, travel down the incline faster and leave the belt soonest. The sizes held in the grooves ride forward with the belt according to size. Therefore the coarsest size will come off at the bottom of the belt nearest the feed end.

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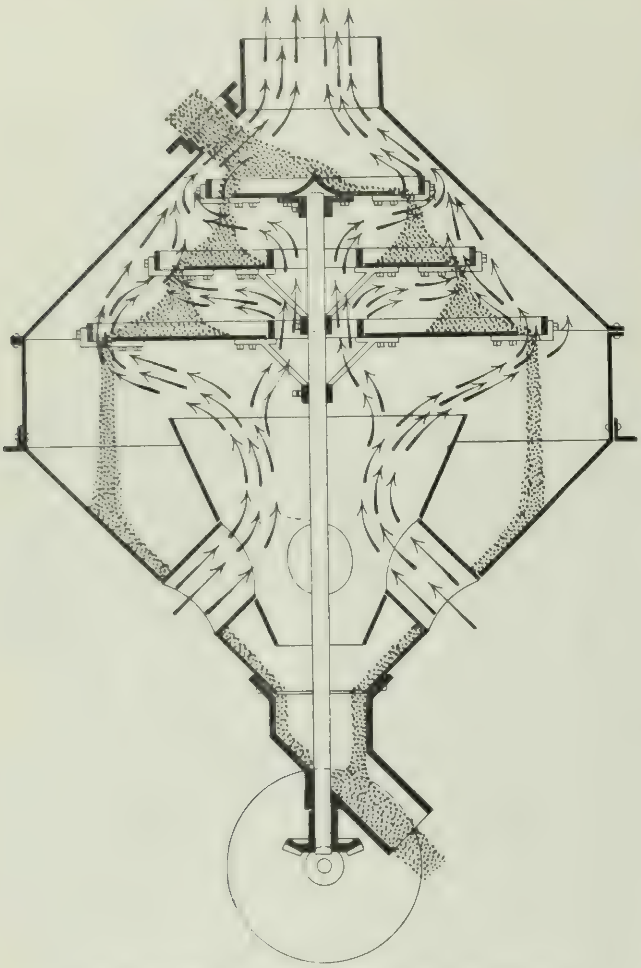
*Mountain Home, Arkansas.

If there is oversize in the mass too large for the grooves, it will travel down faster, as the grooves are too small to retard or hold it, and it will come off the belt at a point almost in line with the feed. The principle of the operation of the machine is that every particle of the same size meets the same resistance in traveling down over the corrugations of the belt, and consequently must come off at the same place. By the aid of movable fingers under the railing in the hopper board, these sizes are divided into as many products as may be desired. The screen measures 6 x 15 ft., surface dimensions.



DE-DUSTER USED AT YELLVILLE PLANT

The drier is of the regular Ruggles-Cole type, and the rolls are the usual breaker rolls found in all wet-process plants. The de-duster is a galvanized-iron cylinder bin with a funnel top and bottom, at the largest place being approximately 4 ft. in diameter. The pulp is fed in on the left-hand side, near the top, and passes slowly down, for a part of the way over a series of three steps on both sides of the machine, to the outlet at the bottom. The air, which is the separating medium, is fed in at two places, one on each side, and directly above the ore outlet at the bottom. It passes through the feed, as it comes into and through the de-duster, three times, before it is discharged. The dust is carried upward by the ascending air currents and out of the top into the dust bins.

The vibrating screens are each 4 x 6 ft. and are set one after the other at an angle of 35°. A 36-in. exhaust fan is used to furnish air for the table that handles the fines; a 40-in. fan on the table that handles the medium-sized product, and a 50-in. fan on the table that handles the coarse. An exhaust fan is also used to furnish air for the de-duster. The belt conveyor is of the regular type running on concave rollers of sufficient size to keep the tailings away from the tables. The mill has a capacity of 50 tons per 24 hours.

The crude ore is first passed through the gyratory crusher, which is set at ¾ in. From there it travels by gravity to the drier, where it is thoroughly dried, and thence to the first set of rolls by elevator, where it is broken down to ⅛ in. From there it goes to the second set of rolls, which are set at $\frac{1}{32}$ in., then passing through a ⅛-in.-mesh gravity screen. From the second set of rolls it is raised by elevator to the top of the mill, where it is passed through the de-duster. The dust goes to the dust bins, and the rest of the product to the screenless sizer, where it is divided into six sizes. All under 24-mesh goes to the three vibrating screens, which are of 24, 40 and 60 mesh, respectively, where it is divided into four sizes. These, with the six sizes from the screenless sizer, make a total of ten products, which are carried by gravity to ten bins directly over the tables, each size having a bin with a hopper bottom and a spout leading to the tables. These ten classes of material are all handled separately on the tables, a size at a time being run.

The plant was designed for use in arid regions or at mines in watered sections which are situated so far from a source of water supply that the cost of installation of a pumping plant would be prohibitive.

Estimating Sludge Depth in Vats*

An ingenious method of measuring the depth of sludge in deep sedimentation tanks is employed at the sewage disposal works of Fitchburg, Mass. The measurements are made by means of a pitcher pump and 28 ft. of 1-in. rubber hose, marked in 1-ft. lengths. The pump is screwed to a 3-ft. plank and attached to the hose by a union coupling. In making measurements, the plank is placed across the top of a gas vent and the hose pushed into the tank until it is near the supposed sludge level. The hose is then lowered an inch at a time. Between each shift sufficient pumping is done to insure a complete change of water in the hose. When the sludge level is reached, the pump will raise sludge. The length of the hose below the chimney top is then noted, and as the distance from top of chimney to bottom of tank is known, it is an easy matter to estimate the depth of the sludge.

The French Price for Aluminum.—The French Ministry of War has fixed the price of aluminum ingot at 6 fr. per kg.

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*Abstracted from the *Canadian Engineer*.

Labor Camp of the Minnesota Steel Co.*

A modern sanitary camp was built during 1917 to house additional extra labor in the plant of the Minnesota Steel Co. and for construction work on the Morgan Park townsite at Duluth, Minn. The layout of this camp, together with floor plans of the bunk house and the boarding camp, are shown in accompanying sketches.

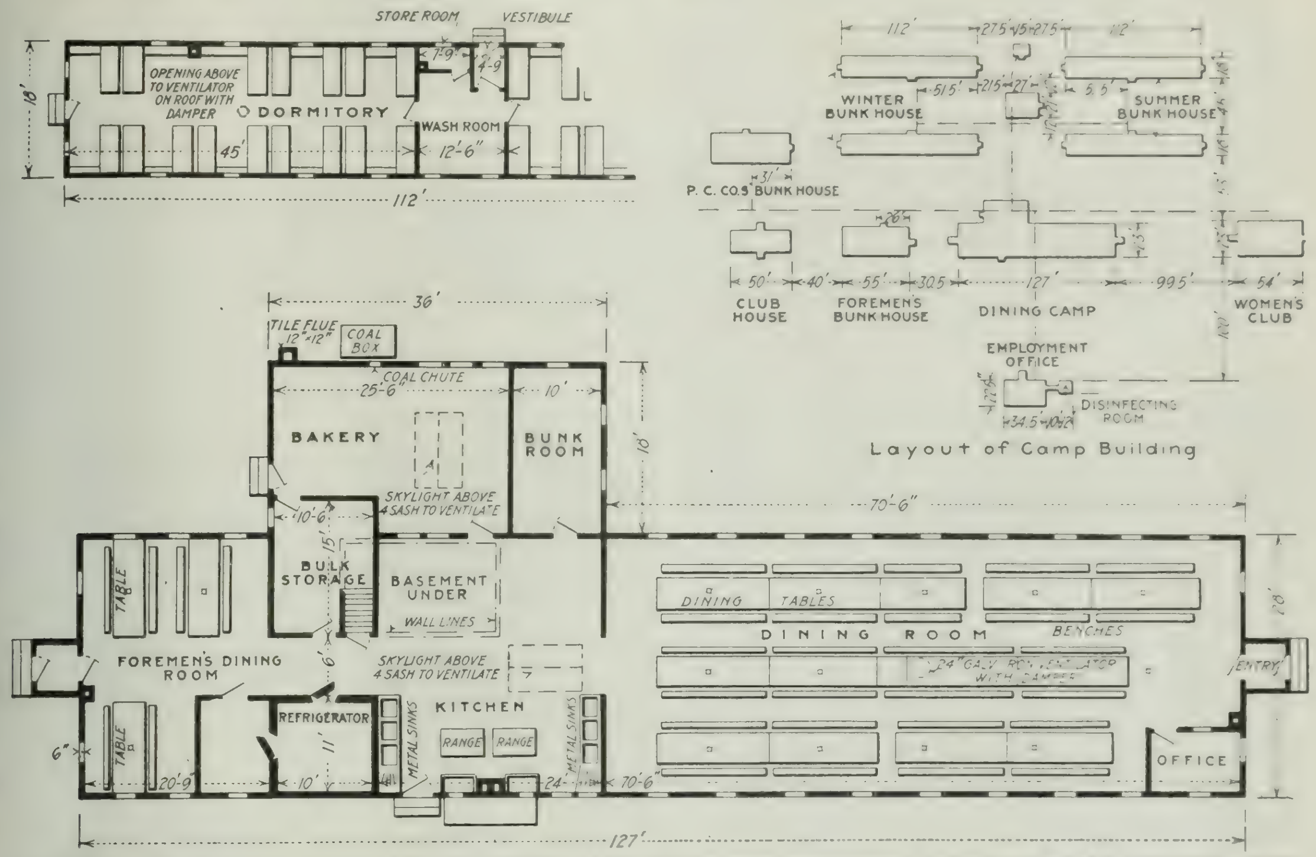
Buildings are of frame construction, set on piers sunk to solid ground, the lower parts being screened for 18 in. below ground by wire mesh to keep out rats and other burrowing animals. Inside walls are 8 ft. 2 in. high. The exterior is of tar paper on the studs, covered with 4-in. material, and varnished. The floors are double, with tar paper between, and the roof is of composition paper. Modern plumbing is installed. The camp is heated by stoves and lighted by electricity.

Included as a part of the construction camp is an employment office for the contractors, in which is a room for the medical examination of men who seek employment. There is also a separate boarding camp suitably arranged for women. No women, however, have so far been employed at the camp. Among the special features of the camp should be noted the club building, equipped with a small store, reading matter, and music, and the separate bath and wash houses, one in connection with the foremen's bunk house and the other for the labor force. There is also a laundry house, where the men may wash their working clothes.

The kitchen is equipped with a separate bakeshop, with a daily capacity of 220 loaves. All the bread, pastry, and cake used in the camps is made here. There is also a root cellar below the kitchen floor and a large ice box and meat-cutting room, well screened.

All washing fixtures are of the "flowing stream" type, to avoid the danger of transmission of disease by common use of washbowls. Sanitary drinking fountains are provided throughout. Shower baths are provided in the central wash house, and a supply of hot water is maintained. All windows and doors are screened.

The camp accommodates about 400 employees and provides quarters for 10 women. It cost approximately $31,500, including the sewers, water lines, roads, and lights.



FLOOR PLANS OF BUNK HOUSE AND BOARDING CAMP BUILT FOR MINNESOTA STEEL CO. NEAR DULUTH, MINN.

West End Consolidated Mining Co.

The eleventh annual report of the West End Consolidated Mining Co., operating at Tonopah, Nev., for the year ended Dec. 31, 1917, shows that 66,833 tons of ore was treated. The gold content of this was 13,593.81 oz., and the silver content, 1,316,327.88 oz. Total recovery of these metals was 12,853.93 oz. of gold and 1,219,860.68 oz. of silver. Total direct mining and milling operating expense amounted to $5.213 per ton during 1917, as compared with $4.380 for the previous year. The increase in tonnage milled during the year, as compared with 1916, amounted to 10,641; and the milling costs per ton were reduced from $2.925 in 1916 to $2.792 in 1917.

Suitable Scratch Pads for the engineering office may be made from used or antiquated blueprints, old forms and reports or other available paper that has one clean side. These may be cut to approximately the same size and bound together by paper fasteners or adhesive tape.

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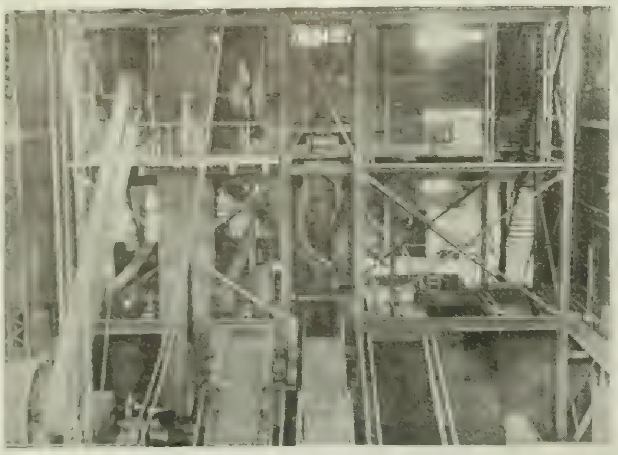
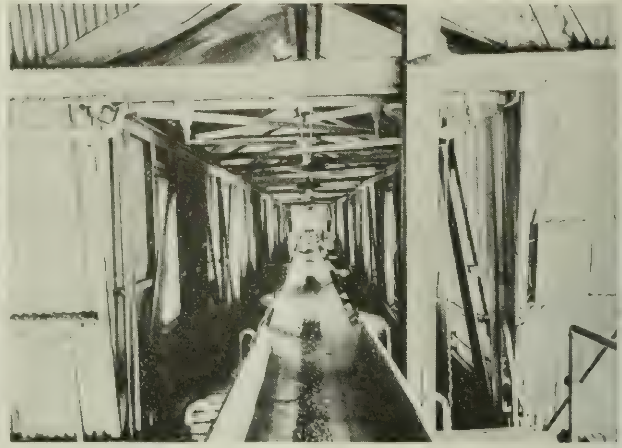
*Excerpt from *Monthly Review* of U. S. Bureau of Labor Statistics, April, 1918.

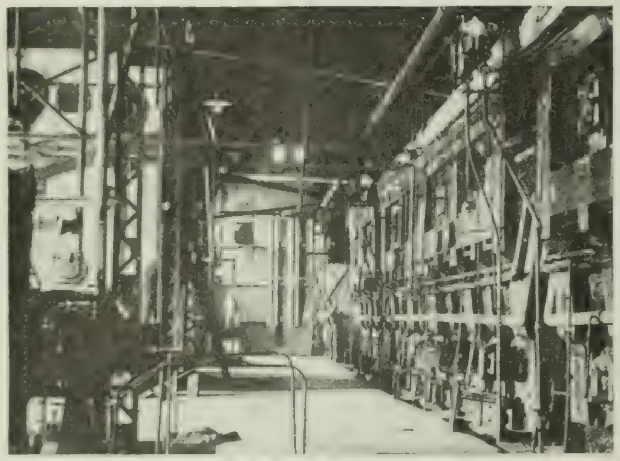
Photographs From the Field



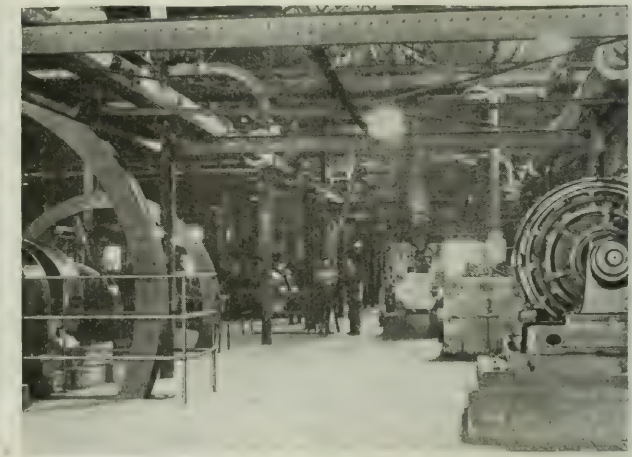
Interior view of crusher plant



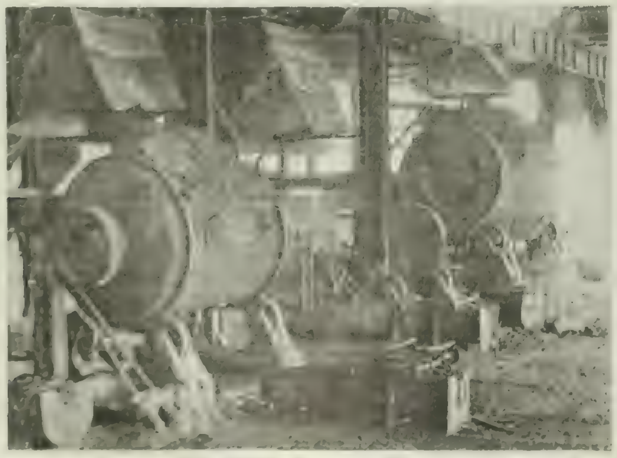
Main conveyor from crusher plant to sampling mill



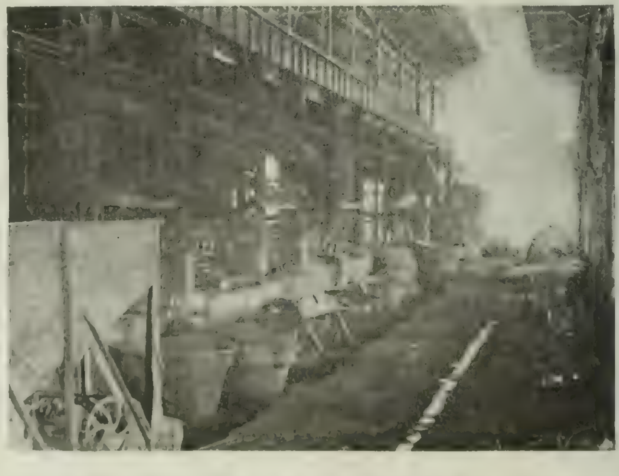
Boiler room at mine power plant



Interior view of main power house

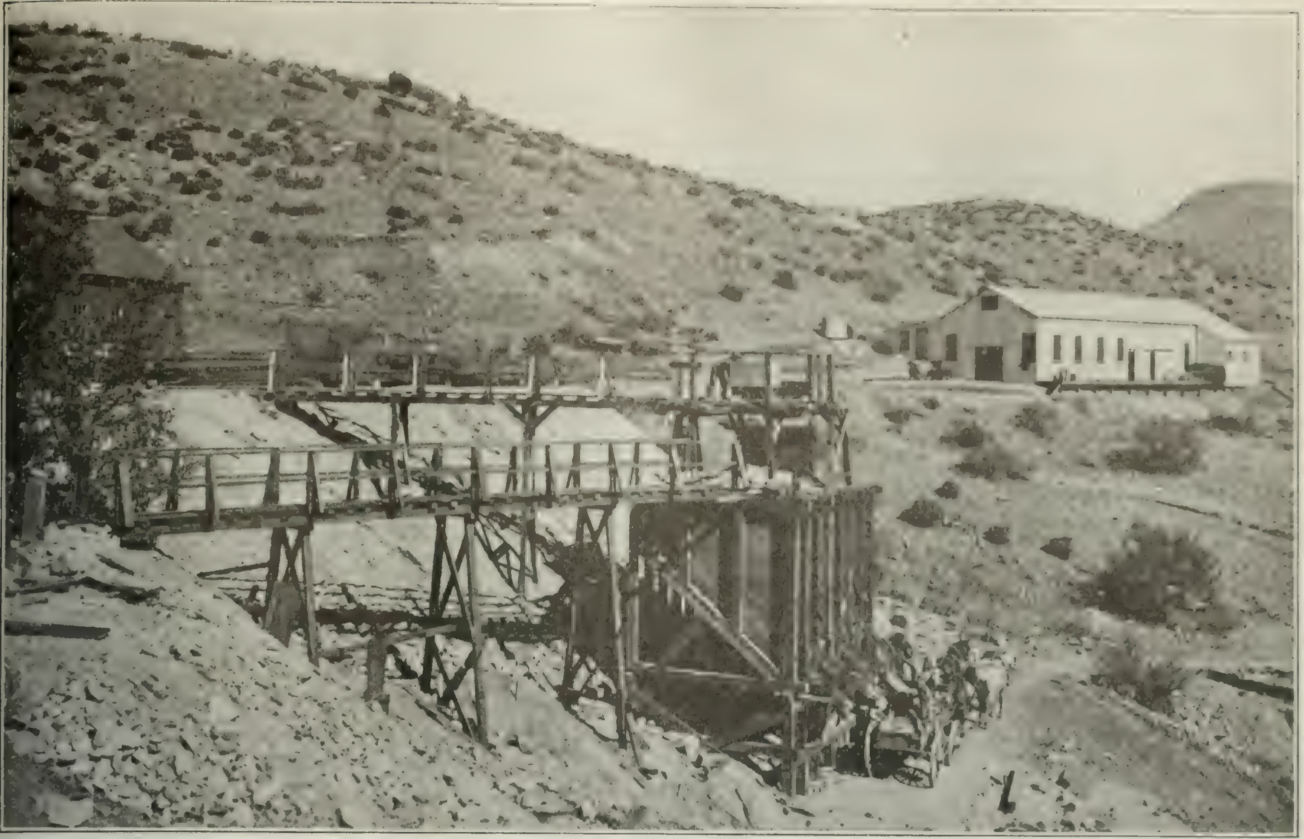


Acid and basic types of converters

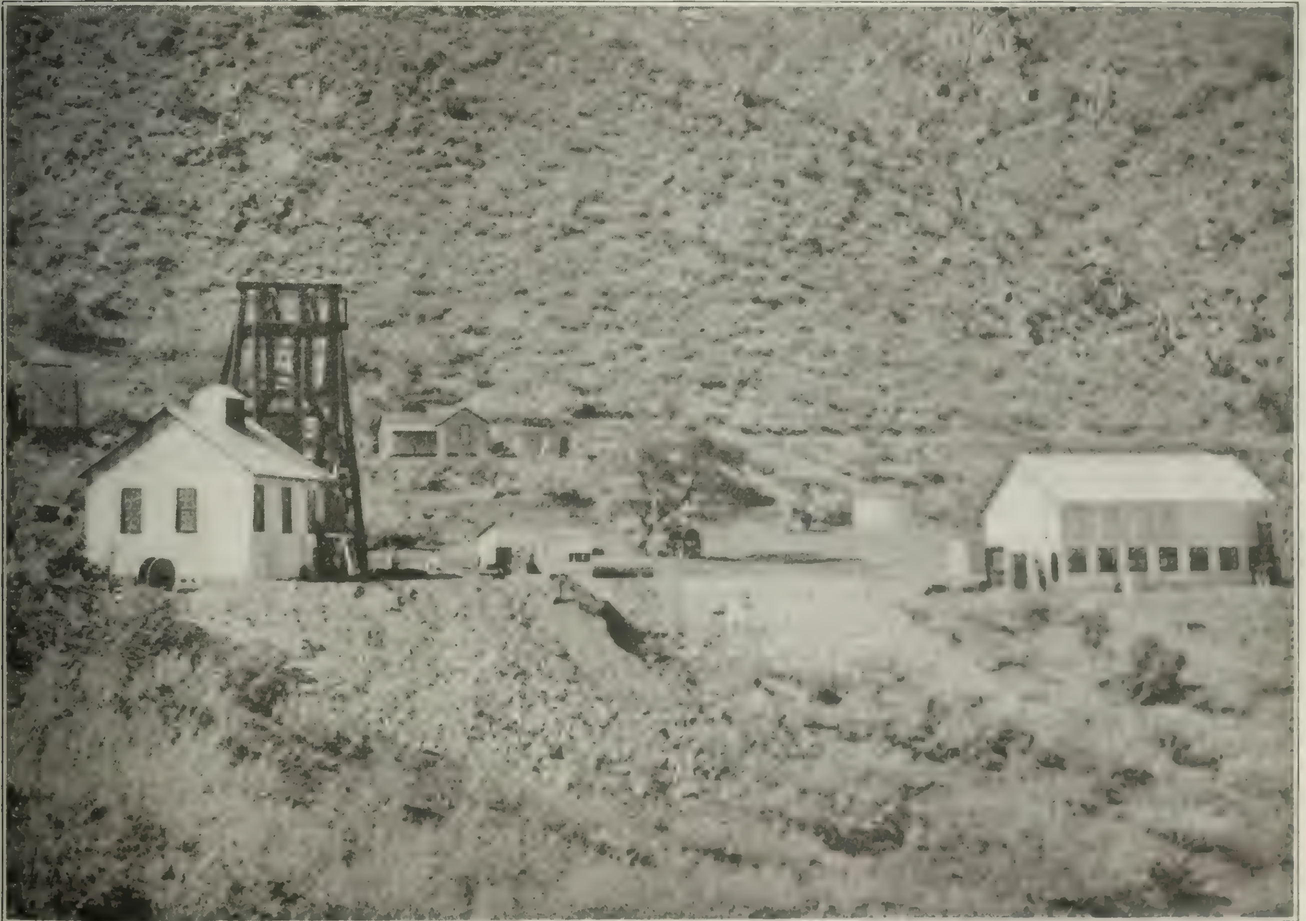


View of main smeltery building

OLD DOMINION COPPER MINING AND SMELTING CO. WORKS AT GLOBE, ARIZONA



ORE BINS AND MACHINE SHOP OF THE NEW DOMINION COPPER CO. NEAR GLOBE, ARIZONA



PLANT OF CALUMET AND JEROME COPPER CO. NEAR JEROME, ARIZONA

Notes on Electric Welding

By H. K. Porter[*]

The repair of machines used in mining and metallurgical operations has always been a source of trouble. When an important piece of apparatus breaks, and the nearest foundry is many miles away, a shutdown is imminent if a new part is not secured in a short time or the old part repaired.

The average railroad machine shop, six or seven years ago, wasted thousands of dollars annually, but this was not realized because most engineers had no faith in electric arc welding processes. Locomotives were idle for weeks while being fitted with new boiler tubes. A number of manufacturers of electrical machinery, however, continued their investigations, and, as a consequence, modern locomotive specifications call for electrically welded boiler tubes and other parts, and the mechanical committees of the railroads favor the repair of bars, plates and similar pieces by the electric process. The United States Navy has a number of welding outfits in constant service, and wonderful repairs have been effected. The interned German ships which had been damaged by their crews were repaired in a remarkably short time; and electric welding was largely responsible for the rapidity with which the work was done.

Many mining companies are wasting money, not through negligence, but because they are not thoroughly posted on the multitude of uses to which an electric arc welding system, efficiently operated, can be put. Butt-welded joints without reënforcements can be made almost as strong as before the break, whereas, with reënforcements, the original strength can be attained. Much stronger and more perfect joints can be made by the electric process than by the usual gas method of welding, and at a fraction of the cost. Another important and striking feature is that, by the electric process, no preheating of the parts to be welded is necessary. With the gas method it is ordinarily necessary to preheat to a great extent, so that the filling metal will not be chilled when it comes into contact with the parts to be welded.

With the electric process, the material to be welded is the positive terminal, and consequently the hottest, and perfect fusion is accomplished because the large volume of heat generated warms the material to be welded to such an extent that it cannot chill the filling electrode or material.

The average electric arc welding equipment is simple in construction and has no complicated parts which require the services of a college-trained electrical engineer. Such an equipment is more nearly "fool proof" than the average mine locomotive, and, with the improved means for protection of the machine, the apparatus can hardly be misused. Good welding can be done with an outfit consisting of a sufficient number of cast-iron grids, but the method is wasteful, because a great deal of electrical energy is dissipated in the form of heat.

Suitable equipment should consist of a motor with low-voltage generator, and means for protection against overloads caused by heavy rushes of current at the time the arc is struck. It is always necessary to make contact, on the material to be welded, with the carbon or metallic electrode, and then break away quickly when drawing the arc, because of the low voltage. The contact must be made before the flow of current starts. It is at the time of drawing the arc that the heavy overload occurs; and if suitable provision is not made, the generator may be made inoperative.

There are a number of electric arc welding machines on the market with which the average man who has been properly instructed can make good welds. He can become one of the most useful men on the property, because, on account of his skill as a welder, he can often keep the plant in operation if there should be an unexpected breakdown.

Cast iron, steel, and cast steel can be welded to advantage by the electric arc system. The enormous saving made in railroad and electric railway shops could be exceeded by the more general employment of welders around the mines. Most mines are inaccessible to sources of supply, and much time is now wasted in the transportation of materials needing repair.

When small pieces are to be welded, metallic electrodes are used, and the current required varies from 50 to 200 amperes, depending upon the bulk of the material. Carbon or graphite electrodes are used when heavier parts are to be welded and where the current varies from 300 to 600 amperes, as in the case of large sections. Varying degrees of current may be obtained by regulation of resistance. The only point which must be safeguarded against is lack of skill on the part of the welder. A poor welder can ruin much material. All the reputable venders of electric welding equipment can furnish the services of a skilled demonstrator at a nominal charge, who can, in ten days to two weeks, thoroughly train a capable man in the successful operation of the equipment.

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[*] Mechanical engineer and sales manager, mine car department, Hyatt Roller Bearing Co., New York City.

Air Screens for Furnaces

An account was recently given in the "Zeitschrift des Vereines deutscher Ingenieure," of the latest methods employed in Germany for screening furnaces, says the *Iron and Coal Trades Review.* Workers tending furnaces, and required to examine the glowing material at frequent intervals, suffered a great deal from the excessive heat radiated, and various devices have been tried to minimize the ill effects. For example, hollow water-cooled furnace doors have been tried, but obviously they afforded protection only while closed. Again, devices have been installed for drawing off the hot air in front of furnaces by centrifugal exhausters placed in front of the furnace opening. An objection to these is that workers are subjected to great variations in temperature, prejudicial to health. According to the article quoted, the most effective device is to fix immediately behind the furnace door a narrow, oblong nozzle, through which cold air is blown upward, thus interposing a screen of relatively cool air between door and furnace. This arrangement is to give adequate protection to the worker, and has the incidental advantage that when the doors of the furnace are opened the escape of flame is checked.

Readjustment, Not Reconstruction

By J. R. Finlay*

Some interesting notes which were read, in the author's unavoidable absence, at the November meeting of the New York Section of the Mining and Metallurgical Society of America. Mr. Finlay summarizes the economic conditions prevailing in the United States at the present time, makes comparisons with other countries, and deals with the question of reconstruction. The relation of industrial power, producing capacity and efficiency is shown, and the importance of mining enterprise emphasized. Historical references are made to Great Britain's sound financial and international position after the Napoleonic wars, as compared with her condition today. The greatness of this country and its vast resources are forcibly portrayed, and attention is drawn to the fact that not the least important result of the Great War is that the United States is now the banker of the world. While material success in this and many other directions is a matter for congratulation, it is neither disloyal nor unreasonable to hope that other peoples will also rise to greatness from the ashes of a devastated and exhausted Europe; for, as Mr. Finlay aptly concludes, there is more profit and satisfaction in dealing with a prosperous and contented nation than with one that is disorganized and bankrupt.

I WISH to call your attention to some simple matters of arithmetic and geography which we used to learn in school, but which some of us may have forgotten. One of these familiar statements was that the United States was about as big as the whole of Europe. Some of our doctrinaire friends will undoubtedly have a contemptuous answer to this recollection of geography, saying, perhaps, that the school books never ought to have said any such thing; that space is not greatness; that our presumed bigness is a mere aggravation of our littleness—for are we not little in spirit, art, and ideas? But though I do not wish to be placed in the spread-eagle class of patriots, I disagree with the self-disparaging doctrinaires, and join forces with the geographers.

That the United States is, in sober truth, equal to the whole of Europe in those elements that constitute national strength—industrial, political, military, or naval—is the main fact to consider in all discussions of reconstruction. Moreover, I imagine that well-informed men in Europe may recognize the fact more clearly than we do.

To prove this thing, it is necessary to get down to arithmetic, but before we can apply the arithmetic perhaps it is necessary to call attention to the axioms with which we may start.

The war has proved one thing so thoroughly that we may take it for an axiom—namely, that the mass of military power is about equal to the mass of industrial power. The same organizing forces that create one create the other. A weak industrial nation is not a great military nation, and the people who try to make it so will find that they are building up a sophistry. On the other hand, a strong industrial nation is not necessarily a military one, but that is a matter of its own option. It can be, whenever it wants to be; and it will want to be whenever it feels a necessity strong enough.

Political Power in International Affairs

Another axiom is that political power—international influence—is in proportion to this interchangeable industrial or military power. I say power, not the assertion of power, or the use of it. The fact that some clever leader in an inferior nation may attract great attention in international affairs, and give his country the appearance of power, may be due wholly to the fact that some superior nation does not oppose him. It may have no reason to, or it may not have a leader who can use its power.

Another axiom is that the industrial power of a nation is not measured by gold or by foreign trade or by bank statements. It is simply the producing capacity of the people, which will be a function of their numbers multiplied by their efficiency and again by their natural resources. Another axiom, which brings us nearer home, is that industrial power is based on mining, for the fundamentals of manufacture are dug from the ground. You cannot make machinery without an assemblage of metals; and you cannot produce metals without fuel, or run machinery without it. Still another axiom is that the cheapest place to manufacture iron is the cheapest place to manufacture machinery and the cheapest place to run that machinery. Therefore, industrial activity centers in the area of iron manufacture. And still another axiom is that subject colored populations are a negligible factor in comparison with the white nations. Their productivity is infinitesimal, their organizing ability nil, and they furnish nothing to the white men except materials to work with.

An Analysis of the Situation

I have called these statements axioms, because they seem so to me. They may not be accepted without question; but I think they will stand analysis, and I proffer them as starting points for political and economic speculations. If these statements are true, what is the arithmetic?

This country uses as much coal as all Europe put together—600,000,000 tons a year. It produces as much iron as all Europe put together; and twice as much copper as all the rest of the world. It has as much land as all Europe, and that land is just as good as, if not better than, that of Europe. Capital is produced not by a mass of peasants, however industrious those peasants may be. The Chinese are industrious, but they have no capital. The Russians are sturdy workers, but they have none either. Capital is produced by profitable and organized industries. By this measure we shall find that the United States produces as much capital as all Europe combined. The question of how that capital is used, whether it is invested at home or in foreign countries, has nothing to do with its existence.

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*Mining engineer, 45 Cedar St., New York City.

A COMPARATIVE UNIT OF INDUSTRIAL ACTIVITY

It strikes me that the amount of coal consumed by a nation may be taken as a fair, though perhaps a rough, measure of the use of machinery, as well as of the organization of industry. This idea has excited indignation, I believe, among some, but it is not unreasonable. A better measure would be the sum total of mechanical power; but the statistics of that, except for coal, are not so easily obtained. The United States uses its share of water power, and of gas power, too, probably in full proportion.

Some critics complain that this mass of crude force is no measure of soul, of intelligence, or of grace. Perhaps it isn't; but our most soulful national competitors would like to have it, just the same. I do not claim that machinery produces our intelligence. I claim that our intelligence produces the machinery. Judged by the amount of machinery produced, the United States may claim considerable intelligence. I am willing to believe that moral, artistic, and other desirable qualities are somewhere tucked away in that intelligence.

It is, of course, a fair criticism that this country may be producing easily, for the reason that it is simple to produce in this country, because of the virgin resources of the continent—that efforts may be centered on mere production and not on making an economical use of what is produced. That is a fair field for inquiry, but a true comparison with other nations would be difficult to make. It is to be taken for granted that other nations excel in many respects, even in fields of industry, and that they always will. But, as compared with other countries, the United States does not seem to be putting an undue strain upon its resources. Half the known coal of the world is in the United States—five times as much as is in Europe.

THE QUESTION OF RECONSTRUCTION

But what has all this to do with reconstruction? Have not these facts been measurably true any time these last 25 years? Yes, they have been true; but it took a war to make ourselves and the rest of the world conscious of it. That is the function of wars. A war is not won by chance, although there is a big element of chance in it, but by the operation of forces that were in existence before the war began. In making plans for the future it is necessary to pay attention to the proportion of things which has been established by the war.

This country, or, to speak a little more comprehensively, North America, comes out in a position strangely parallel to that of the British Isles at the end of the Napoleonic wars. England was practically uninjured in that struggle. Her armies fought only in a limited field and in small numbers. Her chief effort was at sea. Her losses of men were spread over a period of more than 20 years. Business at home was generally prosperous, and the country was the acknowledged leader, not only in the new processes of manufacture based on the use of steam, but in volume of production and in capital. England was the international banker, as well as the distributer of the world's goods and the greatest manufacturer. She was a creditor nation, and her trade policy was soon to be changed in accordance with that fact. Her international influence was supreme in proportion to the weight of all these reasons.

For many decades this position of England seemed impregnable. She finally lost her position as the greatest iron producer, and also, no doubt, as the greatest wealth producer, first to the United States, about 1890, and then to Germany, a decade or so later. The industrial power of the United States is at present about twice that of the entire British Empire. If we group Canada in the industrial sphere of the United States, where it assuredly belongs, we shall find the disparity to be much greater; and it is bound to increase without any visible limit.

CONDITIONS AMONG THE ALLIES

In the meantime the nations of Europe are hurt. They will soon make up their losses in population, no doubt, if they can regain their prosperity. England is the least injured of the Allies, but she has not escaped so easily this time. She has lost two millions of men in killed and seriously wounded; she has been brought to contemplate starvation as a practical possibility; and her industrial equipment, notably her merchant marine, has suffered considerable depreciation. Moreover, she has lost so much money that she has probably forfeited her position as a creditor nation, certainly so far as the United States is concerned. On the Continent the chief industrial nations have suffered an industrial loss which might be likened to a destruction of working capital and an enormous depreciation of plant. It is notorious that the railroads all over Europe are in a terribly neglected condition. I am not talking about the area of the battlefields, upon which attention has been concentrated, but about almost the whole area of the Continent.

In Germany the loss of working capital has been prodigious, beyond doubt. Take for instance her position in copper. Her normal business during the war period would have caused her to import 1,000,000 tons of copper from the United States. She probably needs that much today. She is no doubt in the same position regarding many other staples, such as cotton, wool, and rubber. In depleting her working capital thus, she has lost the power of paying freely for new supplies. Moreover, her plants are run down and need repair. Thus, as a business concern, she is no longer in the first class, but is now among those that have to stagger along with out-of-date equipment and hand-to-mouth finance. In addition, she will be compelled to go to countries that have just been her enemies to find supplies with which to keep her people busy; and in those countries her agents will be met with hostility and suspicion for some time to come.

RECONSTRUCTION PROBLEM IN EUROPE

In Europe they have a real problem of reconstruction, compared to which we have no problem at all. Not a window pane has been broken in this country, or in any of its dependencies, as the direct consequence of war. The military losses are so small that it is possible that the death rate in 1918 will prove to be less than in 1916 —so small, at any rate, that it will have no visible effect on the vital statistics. Industrial equipment is in as good condition as ever, and business is suffering only from shortage of labor caused partly by an excessive demand for our products, but mainly by the diversion of young men into the Army and into those industries that directly supply armies.

The return of all these men—and women, too, by the way—into peaceful and permanent occupations, is the main problem. There is no end of material to work with. The only thing to find out is what we wish to make and what we wish to have. It will be readjustment, not reconstruction. It will not be overhauling the car, but will be merely resetting the timing gear. There are no particular new problems, but there is, perhaps, an accentuation of old ones.

THE PART AMERICA WILL PLAY IN THE RECONSTRUCTION OF EUROPE

The main thing will be to adjust our ideas to the new international position, and this will bring new interests and probably some day a change of national policy. The change amounts to this: In former times the United States went to foreign countries for money; now they will come here. The lender is the banker. The United States is already a creditor nation to the extent of a good many billions, and I imagine that the part it will play in the reconstruction of Europe will add a good many billions more. In the days before the war who ever heard of an American buying the bonds of foreign governments? Now look at the list published every day in the Stock Exchange reports! Our banks have begun to establish branch offices in foreign countries, and it is probable that they will find increasing reason to do so. I suppose Americans will soon be trading in the bonds and stocks not only of foreign nations and cities but also of foreign business enterprises.

While the process is going on there will of course continue to be an excess of exports over imports, but that excess will be an investment made in foreign countries on which a return of interest and principal will be expected. It constitutes a growing claim on the production of these countries. The moment the investment ceases, the payment of interest will mean an excess of imports over exports. That is the position of a creditor nation. International balances must be paid in goods. It would do this country no good to have the nations of Europe send us all their gold, with which we might buy our own products. We have those goods without buying them. The real function and value of the gold paid us by foreigners is to enable us to buy goods in foreign countries.

POSITION OF CREDITOR NATION

Now, the logical attitude of a creditor nation is different from that of a debtor nation. It seems to me the former is pretty sure to lean toward free trade and to be less anxious to increase its population. However that may be, it is certain that a creditor nation, which becomes a creditor only by virtue of investments abroad, is bound to take a deeper interest in foreign affairs.

To the extent to which the United States has arrived at this position, its business men, as well as the Government, are already compelled to know more about the resources and the economic and political condition of the rest of the world. The State Department will play a more important part in the Government than it ever has before, and will continue to do so, and would do well to cultivate sound advisers on the broad subject of international economics.

Some people have a dread of what other nations may do in the way of dumping cheap goods here. I find it impossible to sympathize with these fears. The country can be no richer than it can make itself with its own labor. So long as that is well employed on our amazing natural resources, the United States is bound to be the richest country in the world, and the more other peoples produce the better off it will be.

There is much more profit and satisfaction in dealing with a prosperous nation than with a disordered and bankrupt nation. Those who fear foreign competition, it seems to me, are afraid not of the foreigners, but of their own unwillingness to adjust themselves to the facts. That is the real problem—to engage only in business for which our resources are adequate, and to avoid those enterprises in which our resources are not adequate. For instance, suppose potash can be made here at twice the cost for which the Germans can sell it. If this country persists in making it, by virtue of a tariff, it will certainly be keeping business away from the Germans, but with equal certainty it will be making its own people pay for the privilege. When it is a matter of distinct public policy, such as a provision against shortage in time of war, there may be good reason for promoting such unprofitable enterprises, but people are entitled to make such provision in the cheapest way, and that is not likely to be accomplished by putting a permanent burden upon the people.

THE PRESENT ECONOMIC OUTLOOK

Such is, to my notion, the broad economic outlook of the United States upon the rest of the world. The interest of the mining industry is primarily the interest of 10 or 12% of our population, and, secondly, the interest of the industry that is responsible for the commanding position of this country in the affairs of the world. Our mines furnish the basic staples which make our manufacturing area the great clearing house of the world's trade, not the only one, but incomparably the greatest one in the possession of any nation.

Recent events have shown that the United States is not detached from the rest of the world, and also that it has a giant's power. There will be a certain temptation to use this power to exploit blatant conceits and emotional fancies, as well as new social and economic theories. There will be more need than ever for sound education and common sense.

It is to be hoped that the American soldiers now in France, who are the flower of the country's youth, will bring back a respect for the opinions of other people, some knowledge of the foreign point of view, and a desire to know something of the world as a whole. These men will soon be the leaders of this nation, and I believe that theirs is the duty of directing the future course. Those who went over first were among the best; and it would only be fair to them, and probably the best thing for the country, that they should come back first. They doubtless included the most intelligent and enterprising—the very men most capable of making a place for themselves, and who can add most to the constructive ability needed to adjust things here.

American Mining After the War

BY KIRBY THOMAS*

THE war has stimulated and curtailed, as well as diverted in unexpected ways, the activities of the American mining industry. Accomplishments during the war have been creditable to the leaders and workers in the industry, and to the established and extemporized official organizations which have assumed the task of shaping the business to the nation's war needs. This unusual, and in some cases extreme, stimulation and adjustment of a varied and complicated field of activity like mining has created conditions which will call for broad and wise direction and control after the war, when more normal, but much modified commercial, financial, and transportation operations are restored.

The artificial demands and prices for special metals and minerals created by the war needs, or by reason of restrictions on foreign supplies, must be adjusted more or less violently when the war is over. The results of such adjustment will be disastrous to the special interests involved, unless there is preparation and anticipation on the part of the Government agencies and the operators concerned. This general problem certainly calls for the best thought and study on the part of expert talent in the industry, and effective aid from official and other associations.

Ways and means for giving "first aid" to the industry should be adopted in advance of the critical period which is approaching. Special tariffs, embargoes, and restrictions on competitive imports, or reduced special regional freight rates on the Government-controlled railroads, have been already suggested. The Minerals Bill, with its minimum price regulations and shield of direct Government aid, has been proposed as a panacea. Other proposals will come forward with a realization of the nature and importance of the problems.

A particular example will emphasize and illustrate. What can and should be done to sustain and maintain the business of manganese mining, which has been extremely stimulated during the war? This business has grown from a yearly production of about 3000 tons in 1913-14 to more than 300,000 tons yearly in 1917-18; and no inconsiderable capital outlay for the properties and for their development and equipment is involved. It is true that most of this, except in the "wild-cat" operations, will have been amortized out of war profits; but the organizations and the equipment will still have a potential value which will make it desirable to continue operations during the life of the properties, even if the profit per ton is small.

It is not probable that the present "pegged" prices for manganese can be long maintained when normal sea transportation is restored, which will permit the import of manganese from Russia, India, and Brazil. Besides the advantages of cheaper labor, the foreign deposits are generally more extensive and of better average grade than any in America, and more easily mined. Most of the present American sources of manganese, except a few in the South, are remote from points of consumption and costly to operate.

Under these conditions, will the new and vigorous manganese mining industry of the country entirely collapse, or are there means and policies by which it can be continued during the natural life of the deposits? A tariff to exclude the foreign ore from competition in the vast local market, and permitting its use for products for export, has been advocated. This, of course, involves the whole gamut of the protection-free trade arguments of not long ago, and comes distinctly into the realm of politics. A direct bonus from the Government is also advocated, possibly to be recouped out of some plan of differential taxation, which will place the tax cost where it can be best and most equitably paid.

The adoption of better practices and machinery, and tax exemptions are other plans suggested. The establishment of nearer markets for the remote deposits to save freight on the crude products might prolong indefinitely the Western operations. Whatever the solution may be, the problem is worthy of the united and best efforts of the technical men and operators concerned and of the Government authorities.

The same general questions are involved with relation to the future status of the American chrome and magnesite industries, likewise chiefly war-born. The tungsten and molybdenum producers are already asking "What of the future?" The tungsten operators have, in general conference, asked for a tariff in order to insure the maintenance of the present high price of $24 a unit after the war. The molybdenum producers have already been jolted by a sudden withdrawal of demand for their costly product. Can they be guaranteed a regular demand and price to justify the large outlay incident to the treatment of the low-grade deposits which afford a large and regular supply?

The base metals—copper, zinc, and lead—are more subject to the natural laws of supply and demand than the special products already mentioned. Can the producers of these metals meet a reduced price and pay the higher wages which may likely prevail after the war? Improved machinery will probably help; and better and cheaper explosives should surely be available when the war is over.

The future of the money metals—silver and gold—is largely dependent on the solution of gigantic problems of international finance. Certainly the mining industry should be heard in the councils of the nations considering this subject; and some competent spokesmen should be selected to advocate requirements and protect the interests of the precious-metal industries in the proper place when the time comes.

The unnatural and forced currents of distribution of coal and iron, due to the exigencies of the war, must be readjusted, and a general and broad plan to accomplish the needed readjustment will certainly be better than a "save-himself-who-can" procedure. A strongly increased demand for the materials used in the non-essential industries must follow the close of the war, for needs are accumulating on account of the deferred production of recent years. Thus the clay, kaolin, feldspar, building stone, and other properties producing similar materials will be called on to greatly increase output, and probably before the country's labor condition has been restored to normal.

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The domestic requirements for sulphur (brimstone) have been quadrupled during the last two years and are still increasing. What will be done with the surplus production capacity? How can the country meet best the requirements for nitrates and potash for fertilizers after the war? Will the war-stimulated potash production be blotted out by competition from the admittedly cheaper German product?

These are a few of the problems facing the American mining industry. They are briefly presented to form the basis for the general postulate that the engineers and others charged with the progress and success of this very essential national industry have responsible and important duties to perform. It is necessary to urge that the task of solving these national problems be taken up now by individuals and the proper organizations, so as to have the best solutions and procedure ready as soon as possible.

German Machinery in African Plants*

Bernard Price, the chief engineer to the Victoria Falls and Transvaal Power Co., recalled, before a recent congress of South African manufacturers, the history of the connection between that company and German electrical machinery, and the story cannot be repeated too often. Mr. Price said that the combined undertaking of the Victoria Falls and Transvaal Power Co., Ltd., and its subsidiary, the Rand Mines Power Supply Co., Ltd., constituted the largest concern supplying power in the British Empire, and he thought it would be of interest to the congress to learn how it came about that so much of the plant installed by these power companies had been manufactured and supplied by enemy firms. In his opinion, the history of these power companies was one of the best object lessons which could be cited in illustration of the methods by which Germany had developed her industrial power.

When the Victoria Falls and Transvaal Power Co., Ltd., was promoted about 12 years ago, every effort was made to raise the initial capital in Britain, but the cautious methods of British banking houses prevented that consummation, and, in the end, the industrial banks of Germany took up the original debentures. Having established the business with this initial capital, all further money was raised in Britain, and the influence of the German banks was quickly terminated, but in the initial stages the two large electrical manufacturing firms in Germany, namely, the A.E.G. and Siemens companies, through their close association with the banks, were enabled to obtain valuable contracts on lucrative terms. In the later stages of development the position was reversed, and the German manufacturers met keen competition. Important contracts had to be placed in 1912, when every effort was made to obtain the required plant from British firms, but it soon became apparent that the German manufacturers were prepared to reduce their prices to any extent necessary to retain the business connection. It was not a question of a few per cent.; in fact, the price was altogether a secondary consideration. These German firms had made up their minds to dump their products at low prices rather than lose the business. Though it could not be said that the German plant had proved an unqualified success, there were no technical grounds for refusing to accept it; and no board of directors in those pre-war days would have felt justified in sacrificing the interests of shareholders merely with the object of avoiding the purchase of foreign machinery.

In course of time the same position would recur unless adequate steps were taken to prevent the dumping of enemy products in Allied countries. Why was it, Mr. Price asked, that Germany had been able to establish such a strong position in the industrial world? In the first place, it was due to the financial organization whereby her manufacturing concerns had obtained the liberal support and assistance of banking houses. Secondly, it was because of the amalgamation of manufacturers into a few powerful concerns, which, by reason of their enormous output of standardized articles, were enabled to reduce their cost of production to the lowest possible level. These huge corporations had acquired the financial control of many power-supply undertakings, which were then forced to purchase their machinery from the controlling manufacturer at relatively high prices. In addition to this, the manufacturing firms had combined as members of a cartel for the purpose of maintaining prices to all customers in their own countries. The assured profits earned by those means had enabled the manufacturers to write down the capital value of their factories until their works stood at a nominal figure on the books. Under these circumstances, goods could be dumped in foreign countries at even less than cost price without ultimate loss, because the increased output thus secured cheapened production, and, by taking such foreign business at low prices, an ever-extending market for future output could be established.

Germany must be beaten at her own game, and this can only be done by organizing production and distribution on a more efficient basis. Today there are two enormous electrical manufacturing undertakings in Germany, and two in America, whereas in Britain there are numerous much smaller concerns. Mr. Price maintained that salvation lay in combination and coöperation between existing manufacturers, coupled with an efficient scheme of organization, not only of production, but also of distribution, right down to the ultimate consumer in every market of the world.

Mount Bischoff Tin Mining Company

The semi-annual report of the Mount Bischoff Tin Mining Co., Registered, which operates mines and milling and smelting plants at Waratah, Tasmania, for the half year ended June 30, 1918, indicates that 226 tons of concentrate was produced from the treatment of 44,041 tons of ore. The total quantity of tin oxide smelted on account of the company, including that obtained from tributers, was 237 tons, which yielded 143½ tons of tin. Ore reserves are given as 1,185,000 tons, with an average content of 0.29% tin. Dividends distributed during the period aggregated £16,500.

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*Abstracted from the *South African Mining Journal and Engineering Record.*

Industrial News from Washington

By Paul Wooton, Special Correspondent

Would Continue Federal Supervision

Great advantage can come to American industry, according to the belief of the chairman of the War Industries Board, if much of the conservation and standardization, which has been accomplished as a matter of necessity, can be continued. The various measures undertaken, he observed, had been projected and carried through under the stress of the war program—each measure taken up with the individual industry involved, and no attempt made to establish a general policy. Properly conceived, he declared, a policy of industrial conservation and standardization in time of peace would make for a saving in materials, money, and labor, and a consequent increase in productive capacities. Standardization of types and styles in various classes of commodities, he said, would make for cheaper costs of production, and, resulting therefrom, lower prices to the consuming public. The possibilities from such economies, he remarked, constituted one of the great lessons learned from the war.

The Iron and Steel Institute Committee, in the course of reconstruction suggestions, emphasizes the point that a continuation of governmental supervision of industry for the present is highly desirable. It is agreed that many changes in operating conditions of the steel mills will be necessary from the transition from a war to a peace basis. Some concellations and adjustments in war contracts will follow, but owing to the removal of many restrictions imposed on non-war industries, and the immediate demands of such industries, a probable resumption of Federal, state, and municipal improvements which had been temporarily suspended, and the demands from abroad for foreign construction which are already taking definite form, it is believed that the change can be accomplished in an orderly and a systematic way.

New Uses for Zinc Sought

As zinc smelters and rollers, in response to the war demand, have hitherto enlarged their plants to double the normal pre-war capacity, the War Industries Board is studying ways of developing possible new uses for zinc, so as to utilize this increased output. George C. Stone, of the non-ferrous section of the board, points out that the chances of increasing the uses of the metal are good. This is particularly so in the case of rolled sheet. In this country, Mr. Stone says, the rolled-zinc production has never been more than 10% of the spelter output. In Europe, many of the larger producers roll from 50 to 100% of their output.

An objection to developing new uses for sheet zinc is the fact that the present demand nearly equals the capacity of the mills. Additional output would require new construction in rolling mills and modifications in machinery for putting the sheet into useful shapes. For that reason, and because of the fact that considerable time will be required to educate the public to the advantages of zinc for roofing, which is the use that promises most from a tonnage standpoint, Mr. Stone concludes that the increased use of castings is even more important at the present time than is an attempt to expand the use of sheet zinc. As the spelter-producing capacity of the country is in excess of the demand, ample material for castings is available. The probabilities are that castings could be substituted more readily for brass, aluminum and other metals than would be the case with sheet metal.

Though there are many ways in which zinc can be used to great advantage, Mr. Stone pointed out that care must be taken to keep in mind the following industrial applications of the metal: It is quite soluble in acids and in alkalies; its strength is comparatively small and may be reduced importantly by exposure to relatively low temperatures (above 300° F.); its coefficient of expansion is high, about double that of steel; and it is not fireproof, but can be burned in a hot fire.

For purposes of ready comparison, the more important advantages in using zinc, as given by Mr. Stone, are: It is little affected by ordinary atmospheric agencies, as when exposed to the weather it soon becomes coated with a thin and firmly adherent coating of the basic carbonate, which completely protects it, except from acids; it is very ductile and is easily formed into complicated shapes; it is susceptible to a high polish or can receive a dull or a frosted polish; it can readily be plated with gold, silver, nickel, or brass, and takes any of the finishes commonly used for brass or bronze articles; and it can be enameled if care is taken not to overheat in baking. Mr. Stone has compiled a list of nearly 200 articles for which zinc has been proposed or is already used.

For Gradual Change to Peace Footing

Reconstruction problems are being considered in scores of daily conferences between officials. Certain general policies are being followed, but the details have been decided upon in few instances. Every effort is being exerted to make the transition from a war to a peace footing as gradual as possible.

Most of the forward steps taken during the war will not be retraced, states George Otis Smith, director of the U. S. Geological Survey. He says:

> America's unparalleled assets in mineral reserves have met the war-time test, and an unexpected degree of self-sufficiency in raw materials has made possible the marvelous expansion of manufacturing industries. The resultant increased burden put upon transportation has made too apparent the need of logically directing the agencies of distribution and of thus securing efficiency through economy. With this lesson in national thrift, taught by war, has come the realization that prices may be too low as well as too high—that adequate supply has larger meaning to the nation than cheapness, and that stabilizing industry by reducing hazards to a minimum takes away the only justifiable reason for large profits. So, whether the emergency has expressed itself in the demand for greater engineering efficiency, for a manifold increase of domestic output, for a much more economical use of transportation, for the rigid control of distribution, or for the fixing of prices high enough to insure production and low enough to prevent profiteering, these novel experiences in political economy are of more than passing interest.

Monthly Copper Production for 1918

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

It should be noted that the totals for the months covered by the table are different from those published last month, the production of United Verde Extension, which was not previously available, having been added.

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo and Katanga companies, whose copper does not come to the United States.

MONTHLY CRUDE COPPER PRODUCTION, 1918

	July	August	September	October
Alaska shipments	3,994,204	4,245,557	4,216,816	4,142,744
Arizona:				
Arizona Copper	4,000,000	4,300,000	4,330,000	4,060,000
Cons. Ariz. Smelting	1,430,000	1,250,000	1,200,000	1,200,000
Inspiration	9,000,000	9,000,000	7,800,000	8,125,000
Magma	800,000	900,000	747,805	949,455
Miami	4,793,082	5,374,198	5,012,865	4,945,178
New Cornelia (*a*)	2,300,000	2,838,000	2,468,000	2,390,000
Old Dominion	2,533,000	2,064,500	2,292,000	2,373,000
Ray	7,300,000	6,625,000	7,250,000	7,490,000
Shannon	794,225	708,000	722,000	800,000
Shattuck Arizona	672,024	682,861	686,844	744,069
United Verde Extension	1,037,520	4,627,260	4,623,300	4,702,500
Other Arizona	24,727,751	26,363,078	25,002,934	26,604,700
California:				
Mammoth	1,330,000	1,320,000	1,140,000	910,000
Michigan:				
Calumet & Hecla	11,118,426	10,718,520	10,341,468	11,929,929
Other Lake Superior (*b*)	7,000,000	7,000,000	7,000,000	7,000,000
Montana:				
Anaconda	25,400,000	24,900,000	21,800,000	23,450,000
East Butte	2,076,460	1,714,358	2,134,700	1,823,000
Nevada				
Mason Valley	1,190,177	1,032,702	1,682,340	1,086,200
Nevada Cons	6,400,000	6,500,000	6,670,415	6,700,000
New Mexico:				
Chino	6,310,396	5,065,818	7,936,000	7,063,000
Utah:				
Utah Copper	16,021,766	19,920,947	17,785,000	19,000,000
Eastern smelters (*b*)	1,750,000	1,750,000	1,750,000	......
Total reported	141,979,031	148,900,799	144,592,487	......
Others, estimated	17,350,000	16,650,000	13,400,000	......
Total United States	159,329,031	165,550,799	157,992,487	......
Imports: Ore and concentrates, etc	12,898,436	18,546,115	10,828,810	......
Imports in blister, etc	19,543,854	42,519,271	37,570,650	......
Grand total	191,771,321	226,616,185	206,391,947	......
British Columbia:				
Canada Copper Corpn	232,647	159,821	......	......
Granby Cons	2,167,077	2,820,207	3,371,535	......
Mexico:				
Boleo	1,697,360	......	1,764,000	......
Cananea	5,000,000	5,000,000	4,900,000	4,300,000
Phelps Dodge, Mexican properties	4,217,296	4,063,322	4,308,845	3,791,602
Other Foreign:				
Braden	7,036,000	6,690,000	6,020,000	(*c*) ......
Cerro de Pasco	5,238,000	5,786,000	6,150,000	5,836,000
Chile	7,556,000	8,496,000	7,346,000	8,548,000
Katanga	4,894,200	4,894,200	4,887,598	......
Backus & Johnston	1,324,823	2,052,091	2,435,442	......

(*a*) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery, which is included under "Other Arizona." (*b*) Estimated. (*c*) Not reported.

The production of the United States by months since the beginning of the year is as follows:

	Pounds
January	165,431,568
February	160,011,364
March	185,525,168
April	163,207,096
May	181,070,350
June	166,723,599
July	159,329,031
August	165,550,799
September	157,992,487

The item "Alaska shipments" gives the official figure of the U. S. Department of Commerce. Kennecott production for July, August, and September was 5,090,000, 5,280,000, and 5,508,000 lb. respectively.

Contract Cancellations a Problem

Foremost among the subjects brought to the fore by the cessation of hostilities is the matter of cancellation of contracts. In this connection, the Chamber of Commerce of the United States recently informed the President that much apprehension and disturbance had been caused through such cancellations by some Government agencies, though public attention had hardly been attracted to it, because of the sensational war news. This was causing uneasiness among the banks, the communication said, that were extending credit to the contractors. The organization urged the creation of a clearance committee to pass upon all proposals to cancel contracts, in order that raw materials that would be released by the stoppage of war production might be allocated to industries able to use them immediately for peace-time needs. This committee would serve until an adequate organization could be effected.

Before the armistice was signed, the Secretary of War had already appointed a board of contract adjustment, clothed with the necessary powers to settle any disputes relative to War Department contracts. The decisions of this board are final, though appeals may be made to the Secretary of War. The board as constituted consists of three members with the rank of lieutenant colonel.

For some time to come, according to a statement made by the chairman of the War Industries Board, a large proportion of present Government contracts must continue, so as to make possible a gradual lifting of the restrictions and curtailments that have been imposed upon industry. It is also pointed out that provisions had already been made, as published by Maj. Gen. George W. Goethals in Supply Circular No. 88, dated Sept. 7, 1918, for terminating contracts before completion. These provisions cover cancellation for contractor's default, termination in the public interest, assignment of sub-contracts, and taking possession of contractor's plant.

Referring particularly to termination in the public interest, payments are to be made by the United States, in the event of such termination, for articles completely manufactured at the time and for raw materials; also for articles in process of manufacture and the contractor's outstanding obligations incurred in good faith in connection with the performance of the contract. Provision is also made for payment of a fair amount on account of depreciation or amortization of plants, facilities, and equipment provided by the contractor for the performance of his contract.

In return, the United States is released from its obligation to take the remaining articles, not manufactured, specified in the contract and to pay anticipated profits to the contractor on the unfinished portions of the contract. The contract provisions have been worked out with care to meet the situation presented both by fixed-price contracts and cost-plus contracts.

A large number of contracts now outstanding do not specifically provide for termination in the public interest. If it becomes necessary so to terminate these, it is assumed that the parties will generally desire to adjust their rights on the basis of the equitable principles established by the contract provisions contained in Supply Circular No. 88.

Tin Dredging in Burma

Six important tin-dredging companies are operating in Burma and vicinity. These include the Bangnon Valley M. L. Co., with one dredge; the Deebrook Dredging M. L. Co., with two dredges; the Rahman Tin Co., with one dredge; the Ratrut Basin M. L. Co., with one dredge; the Siamese Tin Syndicate, with three dredges; and the Renong Tin Dredging Co., with three dredges.

Work on several of these properties has been hampered during the year on account of the difficulty in obtaining spare parts for the dredges; and, in some instances, the closing down of one or more units was found necessary on this account. In spite of such disabilities, the Bangnon company, during the 1917-1918 period, paid dividends amounting to 25%; the Deebrook company, 10%; the Rahman company, 20%; the Ratrut company, 25%; the Siamese company, 30%; and the Renong company, 15 per cent.

The high price of tin alone saved the last-mentioned company from reporting a reduction of profit for the year to June 30, 1918, according to the *Statist*. A good deal of the ground dredged was of a clayey nature, and the tin yield was lower per cubic yard. The operating results are compared in the table.

DREDGING OPERATIONS OF THE RENONG TIN COMPANY

		— Black Tin —			Working —Costs—		——Working Profit——	
Year Ended June 30	Ground Treated Cubic Yards	Output, Tons	Per Cubic Yard, Lb.	Value Ton Tin (Approx.) £	Per Cubic Yard *d.*	Ton Tin (Approx.), £	Total, £	Per Ton Tin (Approx.), £
1914	699,212	292½	0.94	118	7.9	78¾	11,598	39⅝
1915	1,006,740	301	0.66	97	10.8	152	16,523(*a*)	54¾
1916	1,823,519	827½	1.07	111½	8.1	74¼	30,864	37¼
1917	2,170,177	970½	1.0	123¾	9.0	83¼	38,983	40
1918	2,033,357	841.8	0.93	174⅛	11.4	115	49,746	59⅛

(*a*) Loss.

The rise in the cost of production per cubic yard dredged is attributable to the increased duty on tin, which amounted to £27,879, against £15,139 for 1915-16 and £11,000 for 1914-15. The depreciation allowance is again on a liberal scale, a total of £10,945 being written off, as against a capital outlay of only £895. After including sundry receipts and deducting sundry expenses, the net profit totals £54,269. The capital remains unchanged at £112,267, of which £25,000 is in 15% cumulative preference shares and £87,267 in ordinary shares of £1 each. The preference dividend calls for only £3750; the total distribution on the ordinary is maintained at 30%, absorbing £26,180, and a provision of £5000 has to be made for income tax. Over one-third, or £19,339, of the profit is therefore undistributed, and of this £5000 is allocated to reserve fund, as against £6500 last year, and the carry-forward is raised by £14,339 to £18,520, subject to directors' extra remuneration (which amounted to £3,500 for 1916-17) and excess profits duty.

Thanksgiving for the 27th Engineers

Every day is Thanksgiving Day since the Hun was smashed, but the great national festival now approaching can well be made the occasion for especial remembrance of our mining regiment in France. In no year of our lives has there been greater cause for rejoicing than at this time. Celebration has been the keynote everywhere. But it is not human to celebrate alone, and the mining man can get an extra thrill by setting them up for the 27th Engineers through the agency of the Comfort Fund.

The regiment is still in France, and will doubtless be there for a long time to come. The signing of the armistice, even if followed by a formal peace, will not at once make tobacco and other comforts more plentiful than they have been in the past. The value placed upon tobacco is too well known to need further recounting.

It is not strange that the Comfort Fund touched the right spot with the mining regiment from the first, though it is only incidentally a "tobacco" fund. It has furnished anything from a cigarette to a brass brand, and will continue to do so if it will make our miners abroad feel happy. So there is still a chance for the man who forgot about the Comfort Fund or did not know that it existed. Big or little, all donations are welcome, and now is the time to send them in.

We are informed that Companies A, B, and C of the regiment were engaged, early in October, in what was a warm sector of the Western front. Captain Welsh, of Company A, wrote us under date of Oct. 5, and inclosed a copy of a letter which he received in August from Brig. Gen. H. A. Smith, which letter follows:

Aug. 6, 1918.

Capt. Norval J. E. Welsh,
Company A, 27th Engineers,
American Expeditionary Forces.

My dear Captain:

As your company is leaving the ——— area tomorrow for ———, I take this opportunity of expressing to you, to your officers, your non-commissioned officers and your men, the regret I feel at parting with your organization.

The administration of your company has always been excellent. It has the best kitchen, dining room, billets and arrangements for comfort of the men in the ——— area.

Please take some means of making this letter known to the officers and men of your company.

Hoping that some time I may again have the pleasure of having in my command your fine organization, I am,

Very sincerely yours,
H. A. SMITH.
Brig. General, Commandant.

The above letter indicates the high respect which the officers and men of this company had won. Incidentally, we may mention that Company A was the first of the regiment to go over. It was followed by Companies B and C, together with Headquarters. Finally, Companies D, E, and F, accompanied by the band, embarked in July.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johann	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hulst	20.00
Lawrence Addicks	20.00
R. R. Boyd	25.00
E. R. Varela	5.00
W. J. Olcott	25.00
J. E. Clennel	10.00
C. M. Eye (monthly)	10.00
Total	$18,843.27

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Because of the work involved in administering the Comfort Fund, contributions are acknowledged only by publication in the *Journal*.

Mexico on Gold Basis

President Carranza signed a decree on Nov. 13 reforming the monetary system of Mexico by placing it on a strictly gold basis. The recent monetary crisis was caused by the exportation of silver half-peso pieces, which, as the result of the high price of silver, were worth more as bullion than as coin. Business has been handicapped recently by the scarcity of change. Under the new decree peso and half-peso pieces will be coined with less silver in them, thus making their exportation profitless.

New gold coins now being minted are worth two and one-half pesos. Millions of pesos in silver and half-peso pieces, called "tostones," recently have disappeared from circulation. These have been demonetized to prevent speculation in the new pesos. It will be illegal for any one to give more than 20 pesos of them as change.

Latin-American Demand for Steel

Latin-American concerns wishing to specify American structural steel for building and railway purposes can now do so without difficulty by referring to pamphlets in Spanish and English just issued by the Bureau of Foreign and Domestic Commerce. These pamphlets are intended to facilitate sales of such materials in Latin countries, and are published in response to numerous requests from those countries.

The text defines with scientific accuracy the generally accepted American standards, as adopted by the American Society for Testing Materials, and the publication of the series has been made possible by the coöperation of the American Society of Civil Engineers, the Bureau of Standards, and the Bureau of Foreign and Domestic Commerce. One of the pamphlets announced is entitled, "Standard Specifications for Structural Steel for Buildings," Industrial Standards No. 8. The others deal with locomotive construction. The pamphlets can be purchased at 5c. a copy from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from any of the district or coöperative offices of the Bureau of Foreign and Domestic Commerce. Other numbers of the series will follow.

Trieste Orders Michigan Copper

Two days after Trieste was occupied by the Italians, a large manufacturing firm cabled inquiries to a Michigan copper company, writes our correspondent from Houghton, Mich. Copper prices were agreed upon immediately, and shipments by express started for New York for foreign transportation. This incident may indicate something of the possibilities of the readjustments of general business that will now take place. Before the war Trieste was a big importer of copper. As an instance, the Quincy Mining Co., of Michigan, shipped practically 50% of its output to Trieste buyers, most of whom were manufacturers who wanted the copper for their own use, and not simply importers and resellers of the metal.

Manufacturing in Trieste had developed rapidly in a decade, and Quincy copper had become so popular in that city that the buyers there outbid consumers of the metal in the United States.

When the war broke out, Trieste, unlike Hamburg and Bremen, had not a large stock on hand. Shipments ceased immediately, as Austria was blockaded by the fleets of the Allies. It is interesting, however, to note that at least half of the big firms that have been purchasing copper at Trieste bore Italian names. Italian capital had much to do with the upbuilding of Trieste's commerce and industry, notwithstanding the fact that the city was under Austrian rule. The belief here is that Trieste will adjust herself to the new conditions and that the Italians will have control of the government with the approval of the people of the city.

New Steel Projects Abroad

Great things are expected from the recently returned exploration expedition to Spitzbergen, according to the London correspondent of *Iron Age*. Vast deposits of 60% iron ore are reported to have been discovered, and enormous coal seams, cannel, bituminous and anthracite. Plans are now going forward for putting up large iron and steel works there. The promoters, the Northern Exploration Co., are sanguine, and talk of getting the blast furnaces up by next year and the steel works by 1920, but it is hardly likely that this program can be adhered to.

Two new companies have just been founded in Finland in which the Krupps are interested. The Jussaro Gruva company is to take over and extend the iron mines of Fishars and Dalsbruck companies. The capital is 2,000,000 marks. The ore, which is said to be rich, is to be smelted at the Krupp works. Another concern for prospecting all over Finland is the Finlands Malmundersoknings company, also with a capital of 2,000,000 marks. The Krupps are to supply the experts, but do not hold the majority of shares.

It is probable that the Altos Hornos de Corral, in Chile, owned by French capital, which has been idle for several years, will be put in operation again.

Raw-Material Control Main Problem

The after-war business problem receiving the most important attention at present in England is that of the control of raw materials and shipping. Detailed studies of sources and methods of control and distribution are being made, but there appears to be no agreement as yet on the general principles of control. On the one hand, powerful interests are urging the immediate coöperation of Great Britain, France, and the United States for the formation of a world control which will, at the appropriate time, be able to distribute raw materials as seems best. On the other, some are pointing out that such action would in principle be contrary to President Wilson's policy of "no economic combination within the League of Nations."

It is understood in London that American Government opinion believes that a free field should be left for developing a new world policy on raw materials and shipping. As a matter of fact, world arrangements are already being made with the sanction and even the assistance of the British government in regard to oil and metals, and shipping plans change or develop daily. The American Chamber of Commerce in London has urged commercial bodies in America to consider the entire subject.

Editorials

The Results of the War

FIRST and most important of all, the policy of Prussian autocracy is destroyed. With it goes the dream of an empire of Mittel-Europa, and a dominion from Berlin to Bagdad. As direct consequences, France is relieved from the threat of the dagger at her throat, and conquered nations in Europe are liberated. The right of peoples to their own nationalities is restored. There will be many other results, but this is the great one. It has been achieved at enormous cost and at great loss to France, Belgium, Serbia, and Poland, which have been ravaged by the invader. Italy and Rumania also have been ravaged, but they entered the war after it had begun, and took their chances. The other countries had no option. How are those innocent parties going to be indemnified? Naturally, by the criminals, but how?

Stephen Lausanne wrote in the New York *Times* of last Sunday:

> France must have reparation, for seven of her departments—equal in area and wealth to the State of New York—have been laid waste, burned down, and razed. Three hundred and fifty thousand houses have been broken into, pulled down and shattered into bits, and it has been computed that merely to rebuild them it would require an army of 100,000 men working for 20 years. Who is to furnish that army? France? No, but the destroyers and incendiaries. Of course they will protest, and implore, and complain that it is sentencing German youth to hard labor. They will try to soften the hearts of neutral countries. In the name of common fairness, should they be listened to?
>
> Those 350,000 houses contained some 500,000 beds, which were either stolen or destroyed, and 1,000,000 Frenchmen at present have no roof over their heads, not even a pallet on which to sleep. So we shall have to go to the thieves and plunderers and take the 500,000 beds and bedding we need. More cries, more complaints, more lamentations. The women of Germany will say it is inhuman, that war is being continued after war is over; they will cable to the women of America. (And even as I write these lines the news comes that they have done so.) In the name of common fairness, should they be listened to?
>
> The mines of Northern France have been scientifically and cleverly tampered with, filled with water, or destroyed. Not a ton of coal can be extracted from Lens for another two years. The normal output of these mines cannot be restored for another five years. Meanwhile who will supply France with the coal she so badly needs? England? No. Why should it be England? It will be Germany.
>
> When in July, 1918, the American boys entered Chateau-Thierry, they found stacks of parcels ready for shipment, containing all the linen, silver and jewelry of the unfortunate inhabitants. To whom were those parcels addressed? Not to the Kaiser, but to the women of Germany, to the old men of Germany, to the people of Germany, who were the accomplices and beneficiaries of all this systematic house-breaking.
>
> And here is an example of how the German people appreciated these robberies. Here is a letter recently forwarded to me and which was found on a German officer made prisoner by the French troops:
>
> "Mansbach, July 3.
>
> "I have safely received the 21 parcels, and many thanks for them. I wish you could have been there on Saturday, at the unpacking of the five parcels, which I received together, to hear the remarks made at the sight of the pretty drawers, the petticoat, the shirt, the little bonnet, and the shirtwaist. One could see that they came from well-to-do people. It would be best if you could go back to such places; you might find more things. Everything is useful to us.
>
> "YOUR MOTHER."
>
> Such a letter, which no American woman, no French woman would have ever written or signed, gives a little idea of the character of the people we are dealing with.
>
> There must be reparation, or it would be enough to make one despair of justice on earth.

The civilized world is now reviling the late Kaiser and demanding his punishment, but it is doing so only because he is the figurehead, the symbol. When he led Germany into the war, the military caste was for it, the business men were for it, the professors in the universities were for it, the entire people were for it, including the same socialists who are now in control of the German government. They wanted loot, they thought they were going to get it, and they turned against the old rulers only when it became clear that they were going to lose. Already the Germans have begun to squeal. They have protested against the terms of the armistice requiring them to give up locomotives and railway cars. Yet what was demanded of them was only what they had stolen from France and Belgium. We must not be too lenient.

Yet we cannot fail to view with alarm the gaining of control in Germany by socialists and the general spread of socialism. For ourselves, we are unable to draw any fine distinctions among the several kinds of socialists—parlor socialists, collegiate socialists, and all the rest down to the bolsheviki. To us they all look very much alike. Now, if a nation, in the exercise of its freedom, desires to be socialistic, and suffer the consequences, that is its own business, just as an individual may, if he chooses, inoculate himself with typhoid fever, providing he does not endanger other people. In Germany the rest of the world now has a peculiar interest, for it looks to Germany not only to disgorge the loot, but also to repair the damages that it did, when breaking into and occupying its neighbors' houses. There is the ever-present danger that the Germans, having become socialists, will do internal looting among themselves, just as happened in Russia; wherefore France and Belgium may not be able to recover what was stolen from them. And, furthermore, the socialists, by destroying the factories of Germany, may make it impossible for that country to work for the payment of its obligations. America has a direct concern in this, for the less that Germany is able to do for France and Belgium the more will America have to do. Of course it may be argued that internal destruction in Germany would be very foolish on her part, which would be true; but mobs are never anything but foolish.

Therefore the treatment of Germany should be managed with great wisdom, especially with a view to the preservation of order there. People are always most disposed to orderliness if they be comfortable, both as to food and protection against the elements. We have got to furnish Germany with raw materials and we have got to trade with her, for otherwise she cannot work to pay her bills. The destiny of the Germans is to work. An idle Germany or a merely self-supporting Germany, would be of no use to its creditors.

What About Labor?

LET us not delude ourselves. Neither the prices for commodities nor the wages for labor are going to remain at the present heights. Some people talk about a maintenance of commodity prices. Other people say that labor will never consent to a reduction of present wages, which therefore must remain where they are. Nobody with common sense expects anything of this sort. It ought not to be, and will not be. This is not to say that the future relations between capital and labor in the division of wealth will not be fairer, and other relations also, than they used to be. But wages are going to be determined by economic law, and the policies of Gompers and Frankfurter and the edicts of governmental bureaus are going to have nothing to do with it. The laborer is going to get what he earns, and ought to, but no more. During the war he has often got more, for he had to be appeased lest he should strike and delay essential production. The taxpayers footed the bill as a part of the war expense. The exigencies disappeared on Nov. 11, and therein developed the first fundamental change in conditions.

Two things then happened immediately: (1) Overtime and Sunday work at fancy extra rates of pay were discontinued. (2) From our own metallurgical industry, where work is regularly organized on a 24-hour basis, we get reports that the men exhibited a new attitude on Nov. 11. Those who had demanded increases on top of increases, and under the leadership of a few trouble makers had been insatiable, suddenly became quiet. Being no fools, they appreciated that a job was worth a lot more on Nov. 11 than it had been on Nov. 10. By the same reasoning we expect that the next development will be for more work to be done per man, which in itself will ease the labor situation. The increase in labor supply by demobilization of the troops will come later, and perhaps its climax will be delayed for a long time, even until such time as when more men will be keenly needed, the preliminary readjustment having been accomplished.

Indeed, the first stage of readjustment is the critical one. The immediate question is what is to be done with the makers of ammunition. Here, for example, is a factory in which 1000 persons were employed in pre-war times and in which 20,000 are now occupied in making cartridges. They ought not to be summarily turned adrift. Yet it would be preposterously wasteful to keep them making cartridges. They have got to be returned to the textile mills, boot and shoe factories, machine shops, and domestic service, whence they came, but Washington has arranged no plan for that. The industries themselves have not been free to make plans, save in some cases. In many cases they have got to await the readjustments by consumers, so that the latter can and will place orders again. In the present juncture, specific plans for useful work to be done at once would be worth far more than all the doctrines and essays of Felix Frankfurter, Robert Bruere, and the rest of the doctors.

The talk about not letting wages come down until the cost of living has come down is delusive. Like the dog chasing his own tail, it does not get anywhere. The peaceful demand for many ordinary commodities will not revive until their cost has come down, and the latter will not happen until labor cost has diminished, either by lower wages or increased efficiency. The representations that the high cost of living will prevent are pure buncombe. There is scarcely any generalization that is more perfectly established by repeated investigations in many parts of the country than that the cost of living increased about 1.5 times that of the middle of 1914. The wages for common labor have increased at least twofold (refer to the specific figures of the steel industry, for example). Of course, there are groups of workers who have benefited less than the average, just as there are others that have enjoyed more, but, speaking generally, there is a good deal of leeway between the ratios of 1.5 : 1 and 2 : 1. The notorious fact that so many men have been able to earn their living by the work of only four days per week has been ocular evidence of this. Every industrialist knows that the output of products in quantity per hour of labor has been much less during the last year or two than in pre-war times. We heard the rate of production put at only 66⅔% by an experienced observer, speaking only a fortnight ago. That is a very difficult generalization to make with even approximate accuracy, and we are disposed to regard the figure of 66⅔% as too low for an average of all industry, but that it has been far below 100% there is no question.

We have no doubt that there will be resistance by labor to any changes. It is not unlikely that there will be an attempt to unionize the labor in industries more extensively than is at present the case and keep the jobs within the unions. Some employers may acquiesce to such a plan. Others may refuse, and there may be disputes about it. But the one thing that is certain is that the wages for labor are going to be determined by economic law. The classic economic doctrine that labor is the residual claimant upon the product of industry, i.e. that after rent, interest, and profits, which are determined and limited by competition, have been deducted from the produce of a community, labor gets all the rest, may not hold true during such a period as the last four years, but under natural conditions it is generally true. Now, more than ever, should labor be taught that its real interest is to produce more, which is to earn more, and employers should not attempt to diminish labor's residual claim by abolishing competition among themselves or artificially enhancing profits by other means. And just as it is the interest of labor to earn the maximum, so is it the duty of the employer, which means that he should ever be alert to improve his methods of production. Wide differences of plant efficiency, administration, etc., are really the inspiration of social unrest among workers, rather than conditions that are intentionally designed to be evil. The social reformer, who does not understand production, is a far less important person in the promotion of human welfare than the engineer, who does.

But, for the immediate question of readjustment, we submit to Washington that shipbuilding, locomotive building, and some other things must go right on, for the world is going to be short of those things for a long time to come. The world is also going to need an immense quantity of steel rails, structural steel, sheet metals and other things, that may be produced now and piled up until needed. There are some things, sulphuric acid for example, that cannot be stocked extensively, owing to lack of storage capacity, but even in such a case there might be such an expedient as taking acid to the phosphate works and accumulating acid phosphate that some day will be needed.

The economic question in such procedures is how much money should the Government, i.e. the whole people, contribute to stocking up, charging off the expense to the war. The same might be said as to housing plans, public improvements, etc. Without any doubt, strenuous efforts should be made early next spring to transfer the maximum number of men to the farms, and now is not too soon to begin arranging for that. Domestic service offers a ready haven for many women who are now operating trolley cars, working in factories, etc. But the immediate problem is to discontinue the production of shells, cartridges, rifles, explosives, etc., and to take care of the thousands who will be thrown out of employment at Bridgeport, Bethlehem, Lowell, Hopewell, and similar places.

The Tin Situation

THE tin importers of this country have united in a protest to the War Industries Board against the method that has been adopted for the purchase and distribution of tin, which we have described in a previous article. Their protest, which is phrased very moderately, focuses upon the impropriety of the Government putting the tin business of this country in the hands of the United States Steel Products Co., a subsidiary of the United States Steel Corporation, which is a very much interested factor. We fancy that the explanation of the War Industries Board would be that the Steel Corporation, or one of its subsidiaries, is the only private concern that would, or could, finance the business on the lines mapped out by the Inter-Allied Tin Executive. The War Industries Board, with its well-known aversion to speculators, would probably say also that it was desirous of clearing importers and traders out of the way, with which the Steel Corporation, if it were frank, would doubtless concur. In the latter thought there is something akin to the policy of the Russian Bolsheviki in dispensing with middlemen on the theory that they were useless leeches. Economists have never been able to take that view of honest merchants, and the Bolsheviki found that instead of eliminating a rake-off on wheat in the interest of the people, the latter did not get any wheat at all. Of course, this is not to imply that the Steel Corporation will not get any tin, but it may easily turn out that it will not get enough or will get too much.

Therein is the great danger of a buying monopoly, such as the Inter-Allied Executive has devised. A selling monopoly will always have product enough. A buying monopoly, on the other hand, may so mismanage as to discourage production before it even becomes aware that things are going wrong, and may find itself in straits to obtain necessary supplies. Or it may find itself overbought at prices that are too high. In short, whereas a free and natural market is the expression of the composite of the knowledge and opinion of many men, a buying monopoly is based upon the judgment of a few, and the chances for error are enormously increased. This begins to be apparent even in the brief career of the tin-buying monopoly.

The War Industries Board has, in fact, bungled the tin business from the beginning. Mr. Baruch was warned by experts as early as April, 1917, that the tin situation should have immediate and careful attention, but he paid no attention to the matter until after conditions became acute, in fact not until the early part of 1918, when they had become very acute. Even then the War Industries Board, which had been organized and come into charge of things, did not go to the trade for advice; much less did it go to economic experts, but in the main contented itself with consulting *consumers*. We pointed out repeatedly that the first thing to do was obviously to increase the production from Bolivian ore, which easily could be done, but no attention was given to that important thing, and it was only two or three months ago that the second largest tin smelter succeeded, after many difficulties, in getting going. The next most obvious procedure was to curtail non-essential consumption. In the latter the War Industries Board did good work by recommendation and otherwise, but we are not sure that high prices for tin were not in themselves the most effective agent. We know that they were in at least one important branch of consumption.

Anyway, the tin market, in spite of all governmental interferences, reflected many of the characteristics of a natural market. The culmination of the advance was attributable, as usual, to the buying by frightened consumers. As usual, they over-bought. And, as usual, the price receded as soon as they ceased buying. The situation in tin had become distinctly easier when the project for international control was proposed and launched last August. That project did not even have the excuse of preventing profiteering, for the price for tin sold for export in Singapore and Penang had already been limited by the government of the Federated Malay States.

With the advent of peace we are beginning again to have a domestic market. The supplies of tin in the hands of consumers have been large for some time, and some of the holders are now willing to resell. The tin smelted in this country from Bolivian ore is free, and this supply is gradually increasing. Ore supply is plentiful. The use of substitutes for tin continues. In some cases the loss of the market will be permanent, no matter what the price for tin may be. The trend of tin is rather clearly downward, in spite of the sealing of the Eastern markets.

In the meanwhile, the agents of the Inter-Allied Executive have been buying tin, supposedly at high prices, which is to be allocated and parceled out to consumers at cost. There are many indications that the buyers will find themselves long on tin at high prices. It will be enlightening to the disinterested observers, but probably uncomfortable to interested concerns, to await the unraveling of this business. Will the governments and the United States Steel Products Co. shoulder the load until they can eat it up? Or will they cease buying and refuse to let anyone else buy except of their stocks at cost price, which, of course, they could compel sooner or later if they should fence off the primary markets and discourage production? People are naturally nervous about these dangerous uncertainties.

There are many who, like the tin importers, criticize the War Industries Board for putting the domestic tin business practically in the hands of the largest consumer. The intentions may have been proper enough, but, even so, the look of the thing is not good. The tin merchants are naturally resentful over being eliminated from business, and quite unnecessarily, they think. Our own opinion is that the War Industries Board has been consistently stupid in tin and displayed its culminating stupidity in promoting the international control at a time when the need for anything of that sort was rapidly passing, which its own information ought to have taught.

The Fundamentals of Readjustment

WE RECOMMEND a careful reading of Mr. Finlay's paper, published in this issue, which was read at the meeting of the New York section of the Mining and Metallurgical Society last week. Mr. Finlay is an engineer who is also an economist, and his expressions upon broad questions are characterized always by a practical insight and philosophical reasoning.

We remember how, in the fall of 1914, when most of us were prophesying a brief duration of the war, which we thought would be terminated by the Russian steam-roller progressing to Berlin, Mr. Finlay scoffed at such ideas, expressing the opinion that Germany, owing to its industrial power and organization, was stronger than all of the Allied powers combined. He elaborated that thought in a remarkable paper before the Mining and Metallurgical Society toward the middle of 1915, when he implied, if he did not specifically express the opinion, that Germany was likely to win the war, just by reason of its superior mechanical power and organization of it.

Some people rather took umbrage at this, and characterized Mr. Finlay as being pro-German. He was not pro-German in sympathy, but he appreciated Germany's might. He saw things more truly than did the rest of us. We learned in course of time that not only was the Russian steam-roller not going to Berlin, but also that there never was a Russian steam-roller. We passed through the grievous days of 1916 and 1917, when France was bleeding, and even in the early months of 1918 we saw Britain with her back to the wall, and the whole world trembling lest America were too late. We saw the surrender of Germany after the mightiest power of all had come in. Great Britain, France, Italy, and Russia had really been carrying on their fight for three years against odds.

Mr. Finlay's paper of 1915 was prophetic. His recent summary of conditions and expression of opinion are therefore the more interesting.

Russia and Mexico

IN CHANGING the old order of things and planning the formation of socialist republics, it will be well to remember that the world has witnessed during the last 10 years not only one but two disastrous examples of what happens. Aghast at the colossal destruction in Russia and the terrible fate of her people, many have forgotten that exactly the same fate befell Mexico. There was not indeed the same socialistic preaching in Mexico. The Mexicans never were much as debaters and soap-box orators. Their rule always was to let the rifles speak. However, the Mexican revolution started from the well-meant attempt of Madero to change the old order of things, so as to redress some wrongs, and the result was passage of power into the hands of rogues, burglars, and bandits, and eventually anarchy, with a despairing, starving people destitute of the intelligent leadership that could guide them to reasonable comfort.

The real leaders of a people are not those who talk eloquently from soap boxes and rostra, but those who can teach how to make two blades of grass grow where only one grew before. Mexico has perhaps learned that by now, but the rest of the world has been too busy with other things to lend her a hand. Russia will learn it too, but her process of learning would be facilitated if her talkers could be suddenly struck dumb. Will other countries that have socialistic aspirations profit from these dreadful examples, or must each people learn from its own experience?

The Federal Trade Commission on Nov. 16 issued a formal complaint against Minerals Separation, Ltd., Minerals Separation American Syndicate, Ltd., etc., on the grounds of the impropriety of the terms of the licenses for the use of flotation patents of those companies. Some of the charges are well founded, and have already been the subject of representation in the *Journal* and other members of the engineering press. However, the Federal Trade Commission is apparently quite incapable of getting anything right. It seems to be unaware that the flotation patents have been the subject of extensive litigation and that the U. S. Supreme Court has definitely determined the rights. Also, with its characteristic obliquity, the Federal Trade Commission aims to convey the impression of Germanic misdemeanor, whereas the parent company in this case is composed of as good Britishers as ever walked in shoe-leather, and the same determine its policies.

The Honorable Mr. McAdoo, Secretary of the Treasury, Member of the Federal Reserve Board, Director-General of Railways, etc., has added to his offices that of Director-General of the American Railway Express Co., which is administering the entire express service of the country. Just as we have become accustomed to seeing Mr. McAdoo's name inscribed in every railway car, on every timetable, on every dining-car menu, etc., we may now expect to see it emblazoned on every express wagon in the land. It will take many historians to record all that macadoes, macadid and macadone; but the New York *Sun*, with its usual wit and ingenuity, says that one of the pressing needs of the day is the early unmacadoodling of the railways.

Washington has told the newspapers and the public to do everything possible to conserve paper, and we are all trying to save it. At the same time we should like to see the appointment of a committee for economy of paper in the publications of Government departments and of Congress.

We hope that the Kaiser and the Crown Prince will be adequately punished, but our satisfaction would be enhanced if Lenine and Trotzky could be tried at the same time and punished in the same way.

BY THE WAY

Dr. James Douglas left an estate which was valued, according to the transfer tax return, at $18,635,722. Of this amount, $670,255 was cash, $961,000 Liberty Bonds, $468,498 other bonds and notes and $15,172,000 corporate stock.

The territory on the left bank of the Rhine within the German Empire to be evacuated by German troops represents in productivity about 75% of the empire's industry, omitting shipbuilding; more than 70% of its mining products, and over 10% of its agriculture. It includes only 20,000 square miles, which had before the war a civil population of over 11,000,000.

Principally because of the monetary uses they serve, gold and silver are placed among metals in a separate class, and are jointly referred to as "precious metals," says the *Wall Street Journal.* The contrast in their value is illustrated in the recent shipment from the Assay Office to India of $3,000,000 worth of the white metal. The consignment weighed about 103 short tons, and in a solid mass had a bulk of 316 cu.ft. On the other hand, a lot of gold of equal value will tip the scales at a little under five short tons, and occupy a space of only 8½ cubic feet.

The advent of women in new fields of industry, caused by the shortage in man-power, is certain to produce some interesting results, writes J. V. N. Dorr. The following letter, written from Denver, indicates that when women become properly established as mine promoters they will make George Graham Rice look like a veritable piker:

Dear Sir:

I wanted to know if you would be interested in large mining properties. I have a gold, silver, potash, alum and sulphuric acid mine. Developed only with view of selling. Am waiting for the necessary paper now. Mining engineer's report estimates the visible ore would have the following absolute values:

Gold and silver	$12,617,921
Gold, silver and potash	57,233,983
Gold, silver, potash and alum	90,013,983
Gold, silver, potash, alum and sulphuric acid	104,750,242

There is possibly 500,000 tons of float on mountain; 980,726 visible tons in tunnels; out-croppings, cross veins, and feeders to dikes, 3,064,059 tons. Have not before offered this property. Price, $2,000,000 for three-quarter interest.

If you are not interested, would be glad to have you place me in communication with anyone you may know who would be.

Yours very truly,

MISS FLORENCE A——.

Who would have thought, says the *Oregonian,* after reading of the gay old days on the Comstock lode, that Nevada would ever vote for prohibition? There were in Virginia City about 100 saloons, according to Dan De Quille, most of which were known as "bit houses," where everything cost one "bit," or 12½c. The money in circulation was wholly gold and silver coin, the smallest piece being the dime or "short bit." There being no smaller change, the dime also passed for 12½c. or "long bit." Thus whenever a customer threw down a quarter of a dollar in payment for a cigar, he got back a dime and so paid 15c. for his smoke. The 20-cent pieces fathered by Senator Jones, of Nevada, about 1875, were introduced to cure this little ill. Speaking of "short bits," a hoodlum one day went into a cigar store in Virginia City, and after getting a "bit" cigar, laid a dime on the counter and picked up a 25-cent piece lying there, saying as he walked off, "Just the change." The astonished shop keeper gazed after the young man and finally said, "Vell, how vas dat? Dat makes der right change, sure; but it looks like it vas made der wrong vay. Next time I makes der change mineself."

From an ancient treatise on metallurgical practice, published in England in 1683, and translated from the German by "one of the Deputy Governors of ye mines Royall," we abstract the following interesting paragraph, which refers to a quaint method of gold recovery: "There are also Flinty and Hornstony Gold Veins, in which the Gold is very subtil and thin, and is mingled with other Water-flowing Gold oars. The best way of preparing them is: That such Flints and Hornstones, provided there may be had wood enough in the place, may in a special Roast Oven, made on purpose, be burnt; first very hard and well, and when it standeth in the greatest heat, pour water upon it, that it may cool suddenly, and so the subtil flaming Gold will be, at it were, frighted, at the incorporated oar, and run together, and become a round body, and is strengthened and remaneth the better in washing, also 'tis better prefered; likewise the flint by quenching doth become so *brickle* that afterwards, in great quantity, it may easily be buckt and separated, and is not so hurtful (after it is roasted) to the tender Gold, as before (when it was raw) because the hard flint among the gold oar doth more hurt in bucking in respect of its weight, and the muddiness carrieth away so some of the gold with it, in the mudy water; but seeing that it is very rare to find plenty of wood in such places where flinty Hornstone Gold Veins are, therefore everyone is left to try the best way."

The Bawdwin (Burma) mines, known to the Burmese as "Bawdwingyi," or "great silver mines," have been worked for silver for hundreds of years, though they did not attract the attention of Europeans before 1795, according to J. Coggin Brown in the records of the Geological Survey of India. The date when Chinese operations began at Bawdwin is lost in antiquity. According to the government archæologist in Burma, the date is 1412 A. D. in Western reckoning, though by others it is placed at more than 1000 years ago. So little was known of the mines that in 1895, when the sixth edition of the quarter-inch topographical map was compiled, their position was not marked. Bawdwin was finally abandoned by the Chinese about 1868 as a result of the great Mohammedan rebellion in Yunnan. Mr. Brown expresses the belief that Messrs. Sarkies Brothers, of Rangoon, were the first to apply for a prospecting license over the area, on Jan. 8, 1902. In 1904 the Great Eastern Mining Co. applied for a mining lease at Bawdwin, which was granted by the government of India. However, operations were deferred, and in 1906-07 a new company, known as the Burma Mines Railway and Smelting Co., Ltd., obtained the Bawdwin lease for 30 years, after purchasing the interests of the Great Eastern Company. In 1907-08 the name of the company was again changed to Burma Mines Co., Ltd. In 1914, the finances of the company were reorganized, and the Burma Corporation, Ltd., was formed. This is the present operating company.

Personals

Have You Contributed to the Association of the 27th Engineers?

John L. Malm, of the Malm-Wolf Co., has gone to St. Louis on professional business.

Herbert C. Hoover arrived in New York on Nov. 15 and sailed for Europe the following Saturday.

J. B. Tyrrell, mining engineer of Toronto, is on a visit to Porcupine, in northern Ontario.

O. M. Bilharz is vice-president of the Leader Mining Co. in the Batesville district, Arkansas.

Pope Yeatman, with other members of the War Industries Board, has arrived in Europe.

Lieut.-Col. H. H. Stout, of the Ordnance Department of the U. S. Army, arrived overseas early in November.

Eugene Dawson, with the firm of Rogers, Mayer & Ball, has returned to New York from a six months' examination trip to Alaska.

Arthur B. Parsons, recently returned from Burma, where he was associated with the Burma Mines, Ltd., is now in Butte, Montana.

Walter Douglas, president of the Phelps Dodge Corporation, has returned to New York from an extensive trip to the company's properties in the Southwest.

E. A. Cappelen Smith, consulting metallurgical engineer for the Chile Exploration Co. and the Braden Copper Co., has been elected a vice-president of both companies.

Hoyt S. Gale, of the U. S. Geological Survey, has been visiting the leucite deposits in Wyoming. He also spent some time in Utah, conferring with potash producers there.

Charles J. Brown, formerly superintendent of the blast furnaces at the Donora, Penn., works of the American Steel and Wire Co., succeeds **Charles H. Williams** as assistant general superintendent of the works.

Elmer E. Warren has been made superintendent of the Smuggler Mine and Milling Co., of Lyons, Colo., recently organized to develop the old Smuggler mine. **C. F. Lutes**, of Fredonia, Kan., is president.

George A. Laird, formerly associated with Henry L. Doherty & Co., is at Ray, Ariz., having been elected secretary of the Ray-Broken Hill Mining Co. He is also acting as resident advisory engineer to that company.

Dr. Herman Fleck has been appointed consulting chemical engineer of the Chemical Production Co., operating at Owens Lake, Inyo County, Calif. He will continue to act as consulting engineer to the Chemical Products Co. of Denver, Colorado.

H. DeWitt Smith, mine superintendent of the United Verde Copper Co. at Jerome, Ariz., formerly with the Kennecott Copper Corporation, Alaska, has been appointed to a position with the Aircraft Production Board, and will be stationed at Dayton, Ohio.

Oscar Lachmund, formerly manager of the Canada Copper Corporation, has opened an office in Spokane, Wash., where he will engage in the work of revising smelter contracts, determination of processes of ore treatment, and mine examination and management.

John McConnell, for several years general superintendent of the plant of the United Alloy-Steel Corporation, Canton, Ohio, and for the last year metallurgical and engineering adviser of that corporation, has resigned to go with the Interstate Iron and Steel Co., Chicago, where he will have charge of producing alloy steels.

Zay Jeffries, of the Aluminum Castings Co., Cleveland, Ohio, recently registered at the office of the American Institute of Mining Engineers, New York. Others who registered of late were **V. W. Aubel**, night superintendent, Broken-Hill Proprietary Co., Ltd., Newcastle, N. S. W., Australia; **Oswald M. Lewyn**, Union Miniere du Haut Katanga, Kambove, Belgian Congo; **T. C. Roberts**, Perth Amboy, N. J.; and **John P. B. Webster**, manager, Kyshtim Corporation, Ltd., London, E. C., England.

Lieut.-Col. Reuben Wells Leonard, mining engineer of St. Catharines, Ont., has been elected president of the Engineering Institute of Canada for the coming year. He served in the North West Rebellion, after which he joined the engineering staff of the Canadian Pacific Railway Co. on survey and construction work. After many years of railroad work, he took up the promotion, in 1906, of the Coniagas Mines, Ltd., Cobalt, Ont., becoming president of that company as well as of the Coniagas Reduction Co., Ltd., Colonel Leonard is also commanding officer of the Corps of Guides, Second Division.

Obituary

Charles R. Van Hise, president of the University of Wisconsin, died Nov. 19. A more extended notice will be published later.

V. M. Robinson, of Lafayette, Ind., died at Great Falls, Mont., recently, as a result of inhaling fumes in the arsenic plant at that place.

George Reinmiller, assistant superintendent of the Engels Copper Mining Co., Calif., died recently of Spanish influenza, aged 49 years.

Robert M. Green, general manager of the Butte Copper Czar Mining Co., Butte, Mont., died recently from an attack of Spanish influenza.

Sir George Hingley, chairman of N. Hingley and Sons, Staffordshire, England, and one of the best known British iron masters, died recently.

T. D. Hawkins, formerly chief engineer for the United Verde Copper Co. at Jerome, Ariz., died recently at the officers' training camp at Camp Benjamin Harrison, near Indianapolis.

George Smith, a prospector, was drowned Nov. 7, when his canoe upset near the falls above Indian Chute portage. At the time of his death he was on his way to do assessment work in the Matachewan district.

Charles A. Peet, mining engineer of Salt Lake City, was drowned Nov. 7, in a shaft of the Key West mine near St. Thomas, Nev. He is believed to have fainted and fallen from the 200-ft. level to the water, a distance of 70 ft. Mr. Peet was born in Athens, Penn., in 1879. He studied engineering at the University of Utah, and had been in practice since 1902 in Utah and Nevada.

William Letts Oliver, mining engineer, died Nov. 4 at his home in Oakland, Calif., aged 74 years. He was born in Valparaiso, Chile, and was educated in England. After his graduation, he became government engineer in charge of nitrate plants in Chile, and later went with Cross & Co., of California, soon becoming manager. Mr. Oliver organized the Tonite Powder Co., and the California Cap Co., and was also one of the owners of the Oliver Manufacturing Co. and the Doak Gas Engine Company.

Societies

Northwest Mining Association, Spokane, Wash., has reëlected G. B. Dennis as president and Frank C. Baily as secretary. Other directors are Frank A. Ross, J. W. McBride, J. W. Turner, J. C. Haas, and Edward Pohlman.

American Steel Treaters' Society was recently organized to promote the arts and sciences connected with heat treatment of steel, by discussion of processes and equipment. The following officers were elected: T. E. Barker, president; A. F. Boissoneau, first vice-president; E. J. Janitzky, second vice-president; and A. G. Henry, secretary-treasurer.

American Institute of Mining Engineers, New York Section, held a joint meeting with the American Society of Mechanical Engineers, the American Society of Civil Engineers, the American Electrochemical Society, and others on Nov. 20 at the Engineering Societies Building, New York. J. E. Johnson, Jr., presided. The subject of the evening was "The Demand for Steel and the Conservation of Steel." One of the speakers was J. Leonard Replogle, director of steel supply of the War Industries Board.

Chemists' Club, New York. A portrait of the late Charles M. Hall, presented by the Aluminum Company of America to the club, was unveiled on Oct. 11, previous to the regular meeting of the New York section of the American Chemical Society. Ellwood Hendrick, president of the club, spoke briefly of the life of Mr. Hall and of his work on aluminum. He then called upon Dr. C. F. Chandler, who told the story of Mr. Hall's discovery, at the age of 22, of the solubility of alumina in fused cryolite and all that this discovery has meant industrially.

The Engineering Foundation has received $100,000 from Ambrose Swasey, president of the Warner & Swasey Co., Cleveland, for the endowment of engineering research. This is in addition to his gift of $200,000 in 1915, which made possible the establishment of Engineering Foundation by the United Engineering Society, representing the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. Mr. Swasey is a past president of the American Society of Mechanical Engineers. His latest gift was made to express his appreciation of the war services rendered to the country by the United Engineering Society and the Engineering Foundation.

Trade Catalogs

Barr Pneumatic High-Speed Hammer. H. Edsil Barr, Erie, Penn. 3½ x 8; pp. 6; illustrated. A descriptive folder that will be sent free on request.

Victor Oxy-Acetylene Cutting and Welding Apparatus. Great Western Cutting and Welding Co., 884-886 Folsom St., San Francisco, Calif. Catalog No. 11; 7 x 10; pp. 20; illustrated.

Rocks of Cripple Creek. Ward's Natural Science Establishment, Rochester, N. Y. Catalog No. 35; 6 x 9; pp. 24; illustrated. Descriptive of a petrographic collection of rocks from Cripple Creek, Colo. By Harold L. Alling.

Allen Cone. Allen Cone Co., El Paso, Tex. Bulletin No. 5; 6½ x 9½; pp. 47; illustrated. This pamphlet describes the cone as a classifier, a deslimer, and a dewaterer. The special feature in connection with it is the patented float control, by which the spigot opening is regulated to discharge the settled sands as fast as they accumulate but no faster.

Vacuum Drying Apparatus. J. P. Devine Co., Buffalo, N. Y. Bulletin No. 101A, illustrating and describing in detail all types of Devine patented vacuum chamber dryers; bulletin No. 106, describing Devine single and multiple effect vacuum evaporators, vacuum pans, distilled water evaporators; bulletin No. 107, on Devine high-efficiency vacuum pumps of the rotary and the slide-valve types. These bulletins are skillfully illustrated with photographs showing actual installations. Copies free on request.

Beaumont Gates for Coal, Ashes, Coke, Etc. Beaumont Manufacturing Co., Philadelphia. Catalog No. 37; 6 x 9; pp. 32; illustrated. This catalog describes types of gates for handling coal, coke and ashes, which the company has adopted as standard. The gates can be used with any dry-flowing material and are carried in stock for immediate shipment. Catalog No. 30, on coke-and coal-handling systems for gas plants, will be sent on request; also Catalog No. 33 on similar systems for boiler houses, and Catalog No. 34 on skip hoists for coal, ashes, and coke.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum—Art of Treating Alunogen, Halotrichite or the Like. Maurice Barnett and Louis Burgess, New York, N. Y. (U. S. 1,280,636; Oct. 8, 1918.)

Concentration, Process of. Thomas A. Janney, Garfield, and Charles M. Nokes, Salt Lake City, Utah. (U. S. No. 1,281,018; Oct. 8, 1918.)

Cyaniding—Process of and Apparatus for Precipitating Materials from Solutions. Thomas B. Crowe, Victor, Colo., assignor to Merrill Metallurgical Co., San Francisco, Calif. (U. S. 1,281,249; Oct. 8, 1918.)

Electric Treatment of Gases and Vapors. William T. Hoofnagle, Glen Ridge, N. J., assignor to Electro-Chemical Products Co., New York. (U. S. No. 1,280,471; Oct 1, 1918.)

Oil Shales and Coal, Extraction of Hydrocarbon Products From. David T. Day, Washington, D. C., assignor to Verner Z. Reed, Denver, Colo. (U. S. No. 1,280,178; Oct. 1, 1918.)

Smelting—Method of Sintering Ores. Elmer John Heilman, Perrysburg, Ohio. (U. S. No. 1,280,221; Oct. 1, 1918.)

Zinc, Process of Recovering. Frederick Laist, Anaconda, Mont., assignor to Anaconda Copper Mining Co., Anaconda, Mont. (U. S. No. 1,281,031-032; Oct. 8, 1918.)

Editorial Correspondence

WASHINGTON—Nov. 16

Further Activity Under War-Minerals Act awaits authorization from the White House, though no intimation in this respect has been received. The President already has allotted $100,000 for work in connection with potash, arsenic, and zirconium. Recommendations have been made that a further allotment be made to permit of a really comprehensive campaign to make the country independent in the matter of potash supply. As many are of the opinion that potash can be produced in this country, once the industry gets a good start, as cheaply as it can be imported, it is regarded as probable that the President will allow advantage to be taken of the authority granted in the War-Minerals Act.

A Metal Combination of six concerns, with headquarters at London, New York, and in Germany, and in affiliation with great German metal interests, is charged by the Federal Trade Commission to be practicing unfair and destructive methods of competition in the American market, aiming at monopolizing the American minerals separation, industry. The commission has issued formal complaint against the six concerns and three of their agents. The concerns or persons named are Minerals Separation, Ltd., Minerals Separation American Syndicate, Ltd., Minerals Separation American Syndicate (1913), Ltd., all of London; Beer, Sondheimer & Co., of Frankfort-on-the-Main, Germany, and Beer, Sondheimer & Co., Inc., and Minerals Separation North American Corporation, New York City, and Benno Elkan, Otto Frohnknecht, and Harry Falck, of New York City. The concerns are charged with enforcing agreements "with intent, purpose, and effect of stifling and suppressing competition," by which they undertake to prevent independent concerns from making, selling, or leasing any apparatus, process, paraphernalia, supplies, data, etc., used in concentration and separation of ores not covered by patent rights controlled by the combination. They are also charged with attempting to prevent mine operators, metallurgists, engineers, and others from using any such independent commodities except with the combination's permission, and with extorting exorbitant commissions and royalties from both independent concerns and from mine owners, metallurgists, and engineers, and with compelling these latter to surrender to them all inventions they might make in respect to apparatus for the concentration or separation of ores. They are further charged with: Discriminating as to royalties exacted from mine operators, between favored operators and operators whom they desire to "discipline, punish, and make examples of"; and with discriminating as to commissions exacted from independent concerns, between favored concerns and concerns whom they desire to "discipline, punish, and make examples of"; falsely and maliciously disparaging independent commodities, independent concerns, and mine operators, metallurgists, and engineers who prefer to use such independent commodities or who deal with such independent concerns; falsely and maliciously claiming and asserting exclusive rights, under patents and otherwise, in excess of rights actually possessed, in respect to apparatus, paraphernalia, processes, supplies, data, etc., used in separation and concentration of ores; maliciously threatening to prosecute patent infringement suits against independent concerns, mine operators, metallurgists, engineers, and others for manufacturing, selling, leasing, licensing, and using independent commodities in respect to which they falsely and maliciously claim exclusive rights; and intimidating and coercing mine operators, metallurgists, engineers, and others to refrain from using independent commodities by withholding or threatening to withhold licenses to use apparatus, processes, etc., controlled by them. They are further charged under the Clayton anti-trust act with making exclusive purchase-selling contracts, fixing prices, rebates or discounts on condition the purchaser shall not deal in or use commodities of independent competitors. The concerns and individuals against whom the Federal Trade Commission has filed charges are cited to appear before the commission in Washington on Dec. 30, 1918.

NEW YORK—Nov. 16

Platinum will no longer be received at the New York Assay Office, by order of the War Industries Board and the Ordnance Department of the Army. Announcement to that effect was made by Vernon N. Bovie, superintendent of the Assay Office. The Government, Mr. Bovie added, had platinum sufficient for its needs. The New York Assay Office has taken care of the entire platinum requirements of the Government. In jewelry and in other forms it has received, since the United States entered the war, more than 60,000 oz., which it has sent to ordnance plants.

SALT LAKE CITY—Nov. 14

The Proposed Amendments to the constitution of the State of Utah, which were voted on Nov. 5, are understood to have all been carried—amendment No. 1, on prohibition, and amendment No. 2, on tax exemptions, by big majorities, and No. 3, the mining amendment, by a smaller majority. The official returns on these amendments have not been announced, but there appears to be little doubt as to the result.

Efforts to Settle Apex Lawsuits now pending between the Utah Consolidated and Utah Apex companies by merging the two companies have so far met with little success. The original Apex suit, based on early decisions in Bingham that "the limestone bed is the lode," was brought by the Utah Consolidated against the Utah Apex. Recently the Utah Apex has brought suit against the Utah Consolidated, claiming $1,750,000 damages for ores alleged to have been illegally removed from orebodies that apex in the latter's property. This suit is based on the ground that the mineral-bearing fissures, which are responsible for the orebodies, apex in Utah-Apex's claims. The hearing of these suits, should they come to trial, will undoubtedly furnish some interesting data for mining men who follow cases of this kind.

PHOENIX, ARIZ.—Nov. 13

United War Work Campaign has been vigorously pushed by Arizona mining men. Norman Carmichael, general manager of the Arizona Copper Co., Clifton, has had charge for the state. W. C. Browning, manager of the Magma Copper Co., of Superior, has been chairman for Pinal County, a place filled in Cochise County by G. H. Dowell, general manager for the Copper Queen at Bisbee, and in Gila County by W. G. McBride, manager of the Old Dominion at Globe. Charles F. Willis, former director of the Arizona State Bureau of Mines, has been loaned by the Phelps-Dodge Corporation to direct the state speakers' bureau.

BUTTE, MONT.—Nov. 16

Inquiry Into the Rightful Ownership of the cement copper flotation process has been concluded here, and some of the best-known mining lawyers in the country were represented at the hearing. Benjamin H. Dosenbach, consulting engineer of the Butte & Superior and the Jackling interests, and Milton F. Webster, of the Merrill Chemical Co., of San Francisco, are the contestants for the patent. At the hearing Mr. Dosenbach was represented by J. Bruce Kremer, of Butte, and John M. Colt, of Washington; Mr. Webster retained Archibald Cox and Harry A. English, of New York. Dosenbach claims to have discovered the process in November, 1914, and Webster says that he made the discovery in December, 1914. At the conclusion of the hearing there was an adjournment to Washington, D. C., where the lawyers will submit briefs on Jan. 11, 1919. The process is for the treatment of carbonate and oxide ores.

WALLACE, IDAHO—Nov. 15

Stockholders of Caledonia Mining Co. have been notified by Stanley A. Easton, president, in a statement accompanying the November dividend checks, that beginning Jan. 5, the monthly dividend rate will be reduced from three cents to one cent. For several months the company's earnings have been less than the dividend, the difference being made up from the surplus. Although this is still large, Mr. Easton says it will be required to pay Federal taxes next June and must be preserved. On Sept. 30, surplus was $518,003. Efforts to find the oreshoot in the lower or Keating tunnel have failed, and the reserves above are steadily being reduced, resulting in decreased production. During the nine months ended Sept. 30 the company paid $703,350 in dividends.

HOUGHTON, MICH.—Nov. 18

Labor Shortage, which for two or three years has held down copper production, has been relieved more by the advent of peace than by the combined efforts of mining companies and the Federal Government. Men are beginning to come into the Lake Superior camp in fair numbers, and they report that others are following. With the impending closing of munition factories, through suspension or completion of existing Government and Allied contracts, it is expected that thousands of copper miners and trammers from this district, who jumped at the high pay offered in war work the last two or three years, will be looking for places again. Detroit, Grand Rapids, Milwaukee, Chicago, and other points are losing laborers, who are going to the copper and iron mining camps. An immediate increase in the copper output is expected to result.

As Selling Prices for Copper will continue at 26c. a lb. until Jan. 1, at least, copper authorities feel that there will be sufficient time to stabilize the market, so that after that date a radical movement up or down will be unlikely, at least for some time. Domestic consumers of copper, in the meantime, are venturing into the market somewhat, it is stated, and no decrease in the demand from abroad is anticipated. Michigan companies believe that a strong demand for the metal will continue for some years, owing to reconstruction and the resumption of electrical work, suspended because of the war or delayed because of war needs for copper and other material. The equipping of copper mines with electrical and other machinery will go ahead more rapidly, with the war over. It has been exceedingly difficult to get prompt deliveries on much of the equipment ordered during the war, although Calumet & Hecla and subsidiary companies have installed 35 or more battery locomotives for tramming. The Hancock, Mohawk and other companies are putting in similar equipment.

Construction Programs, which were halted because of the war, will now be pushed by the copper companies. These programs, it is said, call for the expenditure of several millions of dollars at Calumet alone. Mill alterations will go ahead more rapidly at the Calumet & Hecla's regrinding plants at Lake Linden. The installation of two additional heads at the Dollar Bay plant of the Lake Superior Milling and Smelting Co. will also be pushed. One of these is for the use of the Hancock Consolidated and the other for the Isle Royale. At this plant, too, a new turbine, to be operated by exhaust steam, is to be installed. All buildings have been constructed and boilers installed. The Isle Royale will continue its new shaft work. The Mohawk, which started some months ago at its mills at Gay to drive a new tunnel under Lake Superior for its water plant, and is putting in a new turbine, can now push the work more rapidly. The Quincy company will be able to get delivery at last on the equipment lacking for the complete installation of its new 10,000-ft. hoist. The Michigan will complete its mill, which probably will go into operation in the coming year. Changes planned by the Mass, the Victoria, the Copper Range and other companies will be made during the year, and the Franklin will expedite the development of its No. 2 shaft. Both the Seneca and the Mayflower-Old Colony need more men in shaft-sinking work. Both companies have conclusively proved the existence in their properties of copper in commercial quantities, the Seneca drilling into the Kearsarge conglomerate. The New Arcadian, New Baltic, South Lake, North Lake, Indiana, Adventure, perhaps the Keweenaw Copper and other companies which suspended because of the scarcity of labor and high war costs, are expected to resume operations the coming year. In the iron mining districts of Michigan, as well, renewed activity is expected. The last Lake shipments of copper will probably go east by water within the next few days.

Isle Royale is producing 3700 tons daily from six shafts, and tonnage will be increased to 5000 within a year if labor situation permits. Twelve electric motors are in use, and eight more will be put into operation as soon as delivered. Motors now in operation are doing good work. The mill at Houghton is handling 2100 tons daily, including Sunday. Tonnage to Lake Mill No. 1, at Point Mills, has been as high as 1800 tons in one day, and dropped as low as 500 tons, but has recently averaged between 28 and 30 cars per day. Three heads at Point Mills are at the service of the Isle Royale company and a fourth is being made ready for its ultimate use. More are seeking employment each day. The Government work at Senter is not as attractive as when the operations started, when it drew away many Isle Royale men, who are now returning to the mine. Men are also coming back from Detroit and other cities. Isle Royale is the mine most favored in the district by the average man who has been employed underground in the immediate vicinity, because the mine is new and not deep and homes are close to Houghton. The largest tonnage is coming from shafts 4, 5 and 6. No. 7 has not been equipped for a large tonnage, but is opening ground on a par with that coming from No. 6. Nos. 1 and 2 still get good results from the West vein, which has a grade of ore permitting a commercial profit. The whole surface plant seems to have undergone a complete rejuvenation.

JOPLIN, MO.—Nov. 18

Decision to Shut Down the Zinc Mines until the surplus stocks of ore in the district are exhausted was made at a meeting of the greater portion of the producers of the field, held in Joplin, Nov. 16. During the last week, the production was about 7500 tons, and the purchases made by the smelters amounted to only about 4000 tons. A similar record was made the previous week. Smelters are disinclined to lay in stocks of ore at present prices, when they feel there is a possibility that spelter prices will fall during the course of reconstruction. Ore producers understand this, but feel that it would be folly to continue production at normal, or near normal, under the circumstances. A resolution was adopted at the meeting which provides that the shutdown shall become operative as soon as 60% of the production of the field has signed an agreement to close; it shall last until another meeting of operators decides that operations shall be resumed. Producers are particularly anxious that the proposed shutdown shall not be interpreted as a violation of the recently made agreement between smelters and producers whereby ore prices are governed by the average weekly spelter price as quoted by the "Engineering and Mining Journal." The surplus stocks of ore in the field that have been accumulated in recent weeks are to be disposed of at this agreement price. It is not an effort to force higher prices for ore, simply a measure of protection, so that if spelter prices should lower it would not leave the district with a large amount of expensively produced ore on its hands.

Flotation Plants are becoming more and more popular in this mining district. Most of the larger properties are now equipped with them and many of the smaller mines. The E. C. Summers Engineering Co. has started the erection of a plant north of Tar River and expects to build several during the coming year, possibly as many as half a dozen. The equipment at the plant now building includes a modern flotation machine, four sludge tables and a Dorr thickener. This will likely be the standard equipment for the plants that are to follow. Leases on a number of sludge propositions have been taken by the company.

TORONTO—Nov. 16

Readjustment of Industrial Conditions to a peace basis is a problem engaging the attention of the Canadian government in view of the sudden stoppage of work on munitions and other military requirements. Instructions were given by the Imperial Munitions Board to discontinue all first work on shells on Nov. 15, all work in process to be completed by Dec. 14, after which date all manufacture of shells is to cease. The munition industry, in anticipation of the close of the war, has for some time been slackening down, and many manufacturers have been preparing for a change by establishing other lines, but at the end of September the total number of munition workers in Canada, according to the figures of the Canadian Labor Department, was approximately 250,000. Many of these will be absorbed into the new branches of industry undertaken by their present employers, but, making every allowance on this score, employment will have to be provided on a large scale for those thrown out of work. Conferences have been held at Ottawa between the Reconstruction Committee of the Ministry and representatives of the railways, the street companies, and car-construction companies, the result of which appears to indicate that, owing to the great demand for labor in these allied industries, the transition period will be passed with a minimum of difficulty and hardship. The railways are now short of men and must next spring make heavy expenditures for improvements which have been necessarily postponed during the war. Additional construction may be undertaken, but in any event a large number of additional workers will be required. The government has ordered 125,000 tons of steel rails from the Dominion Steel Corporation and 75,000 tons from the Algoma Steel Co., and further orders will soon be placed, which will insure the activity of the steel companies for a year or more. The Grand Trunk, Canadian Northern and Intercolonial railways are now much below their requirements in rolling stock, and the government will be obliged to give heavy orders for cars in addition to the outstanding contracts, which are keeping the car companies busy with work ahead for months. The general feeling as regards the situation is highly optimistic.

The Demand for Chrome has resulted in the opening up of a group of mining claims in Reaume Township, six or eight miles southwest of Cochrane, where a deposit of chrome ore was found by D. O'Connor about six years ago. Development during the summer is reported to show encouraging results. The region is easily accessible by water route from the Transcontinental railway.

The Mining News

ALASKA

Alaska Shipments of domestic copper ore, matte, etc., to the United States during October were 8524 gross tons, having a copper content of 4,142,744 lb. and valued at $1,078,350.

ARIZONA

Cochise County

ARIZONA BISBEE (Bisbee)—Sinking two-compartment shaft to 280 ft. Surface equipment installed. Ned Creighton, Phoenix, president.

BORAS LEASE (Bisbee)—Operating new copper property. Harry Jennings in charge.

COPPER QUEEN (Bisbee)—Handicapped by shortage of mine supplies owing to burning of supply house. Phelps-Dodge warehouse at Douglas drawn upon; some salvage from fire.

DENN-ARIZONA (Bisbee)—Shaft down over 1700 ft. Labor shortage delaying development.

WOLVERINE & ARIZONA (Bisbee)—Shipping carload a day.

Gila County

OLD DOMINION (Globe)—Production seriously affected by influenza; 250 men ill at one time. Mines at Miami also affected.

LAVELL (Winkelman)—Operation of new mill to be started Jan. 1. Development includes 1000 ft. of tunnel.

Mohave County

EMERALD ISLE (Chloride)—Driving inclined shaft to prove ground.

GOLDEN CROSS METALS (Chloride)—New shaft started to cut vein at 150 ft. Property formerly known as Jack Pot. Phoenix company developing.

TENNESSEE (Chloride)—Ore followed into Schuylkill ground. New Schuylkill company planning for mill.

TUCKAHOE (Chloride)—Pushing development work with three shifts.

WALKOVER (Kingman)—Taken over by W. L. MacKay and associates, who will unwater and develop.

ARIZONA MOSSBACK (Oatman)—Expect to break ground Jan. 1 for 250-ton crushing and cyaniding plant, to cost $250,000 and to be completed May 1.

Pima County

EMPIRE ZINC (Tucson)—Plant entirely idle.

Yavapai County

CONSOLIDATED ARIZONA (Humboldt)—Smeltery produced 1,200,000 lb. copper in October, receiving 13,300 tons of ore from Blue Bell, Swastika, and De Soto mines. Concentrator handled 9100 tons.

GADSDEN (Jerome)—Heavy flow of water struck in west crosscut on 1200 level, but handled easily by new pumps. Development to be pushed on 1200.

UNITED VERDE EXTENSION (Jerome)—Smeltery handling all ores. Shortage of desirable labor. Tunnel progress slow. Audrey shaft has new hoist and is down 1660 ft. Ore pockets completed from 1300 to 1200 level and skip pockets below the 1400.

ARIZONA BINGHAMPTON (Mayer)—Shortage of miners, who refuse to go underground during influenza epidemic. Began sinking three-compartment 1200-ft. shaft on Nov. 1.

OCTAVE (Octave)—Ample supply of pyritic gold ore blocked out, after three years of development work.

EDWARDS (Prescott)—J. W. Ward, of Helena, Mont., has taken an option on gold-copper claims owned by Clinton Edwards in Blue Tanks district.

Yuma County

PLUMAS (Quartzsite)—Gold quartz discovery reported by George Hudson, Joe Johnson and J. E. Brinley in Plumas Mountains, 11 miles from Quartzsite.

ARKANSAS

Independence County

ADLER (Batesville)—Logan Reeves and associates have taken over Adler property, known as Bill Jim mine, 10 miles northeast of Batesville, and are moving steam shovel to property, which includes a washing plant.

BALL (Batesville)—Shepherd and Wilson, operators, have foundations built for 250-ton washing plant, to be first plant in field to have crushing machinery. By crushing and jigging, silica will be removed and grade raised. Smaller plant in steady operation for nearly a year.

VANCE-MAGNESS (Batesville) — Captain Vance reports rich strike of nugget manganese on the Bayou

Izard County

MARTIN (Anderson)—Earnest D. Martin and associates have purchased machinery for a $32,000 hydraulic washing plant, to be erected on Martin manganese land near Anderson. Contemplate construction of five-mile standard-gage railroad.

Marion County

NORTH STAR (Yellville)—Installation of cable line to be completed Dec. 1. Cost, $1800.

CALIFORNIA

Siskiyou County

HIDDEN CHANNELS (Salmon River District)—Will issue, if approved by Capital Issues Committee, 140,000 shares, par value $1, to F. W. Beardslee, in exchange for assignment of agreements to lease or purchase certain groups of gravel claims and for conveyance of "Beardsley" claims. Will also sell 25,000 shares to finance further prospecting, developing and working claims.

Tuolumne County

CONFIDENCE (Sonora) — Producing good ore. New mill handling ore formerly too low grade to work.

DUTCH (Sonora)—Construction of new mill progressing.

COLORADO

Boulder County

SMUGGLER MINE AND MILLING (Lyons)—Organized to take over and develop Smuggler mine and property of Michigan-Colorado Mining and Milling Co., containing southern extension of Smuggler vein. Capitalization, $500,000. Total area held, 60 acres. Officers: C. F. Lutes, Fredonia, Kan., president; M. Brugger, Columbus, Nebr., vice-president; and G. R. Prunty, Lyons, Colo., secretary-treasurer. Directors: W. B. Scruggs, Harrisonville, Mo.; J. H. Knowles, Fremont, Neb.; and W. G. Bigelow, Denver, Colo. T. W. Clements, Kansas City, Mo., is general manager, and E. E. Warren superintendent at Lyons. Will build mill to treat low-grade ore on dump by Beam process. New plant and equipment thus far provided includes 85-hp. steam hoist, ore-sorting house, machine shop, stables, bunk house, boarding house and office building. Auto truck road built to South St. Vrain highway. Will sink shaft below eighth level and crosscut west to open four veins lying 250 ft. from Smuggler vein. Will reopen old stopes on second and third levels. New compressor and drills ordered, and installation is expected soon. Present crew of 12 to be enlarged as men are obtained.

San Juan County

SHIPMENTS FROM SILVERTON during October were: Sunnyside, 60 cars; Mears-Wilfley, 12; Iowa-Tiger, 9; Genesee, 8; Mayflower Leasing, 6; Pride of the West, 4; S. D. & G. Leasing and King Leasing, 2 each; Barstow, Dives Leasing, Highland Mary, Hamlet, and Little Nations, 1 each; miscellaneous small lots, 15 cars; total, 123 cars.

SPANISH INFLUENZA caused more than 130 deaths in Silverton district in the last three weeks. Mines shut down will have difficulty in resuming normal operations owing to labor shortage, many miners having left camp. Epidemic appears under control. Other camps in San Juan Mountains have also suffered but have not published the facts, because of effect on labor supply.

IOWA-TIGER (Silverton)—Bunk house being remodeled and fumigated after shutdown due to influenza epidemic.

IDAHO

Shoshone County

OLD HICKORY (Mullan)—Crosscut to extension of You Like vein in 600 ft. Expect to cut vein in 250 ft. at depth of 500 ft. Will use compressor and other equipment of Star Mining Company.

CHICAGO-BOSTON (Wallace)—Control purchased by John A. Percival, president of Consolidated Interstate-Callahan Co., on basis of 10c per share. Property formerly under bond and lease to E. R. Day.

INTERSTATE-CALLAHAN (Wallace)—Development work only in mine for several months. Mill retreating dump at profit. Putting on men to resume mining. Has contract for zinc product for next three months.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Copper production in October was 11,929,929 lb. Producers were: Ahmeek, 1,951,655 lb.; Allouez, 529,859; C. & H., 5,859,296; Centennial, 249,200; Isle Royale, 1,461,207; La Salle, 119,857; Osceola, 1,217,910; Superior, 78,715; and White Pine, 462,230 pounds.

MONTANA

Silver Bow County

BUTTE CENTRAL (Butte)—Property bid in at sheriff's sale for $57,950 on Nov. 7 by John Gillie of Anaconda company, for Butte Copper and Zinc Co., operated by Anaconda. Butte Central's Ophir shaft will furnish adjoining Emma mine of Butte Copper with outlet on railroad and permit dumping direct. Sale to satisfy claim by L. Walter Strong for equipping concentrator in early [illegible].

BUTTE & SUPERIOR (Butte)—The U. S. Supreme Court announced Nov. 18 that it will reopen the Minerals Separation case.

DAVIS-DALY (Butte)—Speed increased in driving Belmont crosscut in Colorado mine. Driving for Baltic fissure on 2400 level.

MARGARET (Butte)—Claim adjoining New Era and Mount Moriah claims of Davis Daly sold to interests identified with Beer, Sondheimer & Co., New York.

NEVADA

Lyon County

MASON VALLEY MINES (Thompson)—Building new amusement hall. Coke pile recently caught fire, which spread to railroad trestle; little damage done.

BLUESTONE MINING AND SMELTING (Yerington)—Addition to mill building, to house new steam-heating plant, nearing completion; also 12 new cottages for employees.

MONTANA-YERINGTON (Yerington)—Hoisting equipment recently destroyed by fire replaced. Shipments being made as usual.

Mineral County

SILVERADO (Sweetwater)—All work stopped for winter, except development on contract. Next season, work will be done on larger scale.

Nye County

TONOPAH DISTRICT ore production for week ended Nov. 9 was 8582 tons, of estimated gross milling value of $145,894. Producers were Tonopah Belmont, 2540 tons; Tonopah Mining 2050; Tonopah Extension, 1943; West End, 698; Jim Butler, 336; Montana, 375; Tonopah Divide, 207; MacNamara, 400, and miscellaneous, 33 tons.

UNION AMALGAMATED (Manhattan)—New oreshoot opened by drift on vein recently cut near Pierce fault on 600 level. Vein above unstoped, except for shallow surface workings. Expected to open large tonnage of milling-grade ore.

SOUTH DAKOTA

Custer County

RARE MINERALS (Custer)—Equipping small mill for treating tin, tungsten, and rare minerals. John Bland in charge. Company has option on claims in Oreville district.

Lawrence County

TITANIC (Deadwood)—Progress made in driving 1200-ft. tunnel. Compressor at Iron Hill property in operation, and air piped to portal.

BISMARCK (Lead)—One car tungsten ore shipped to Colorado; part taken from Wasp mine. Cyanide plant closed down.

HOMESTAKE (Lead)—Mineral Point mill, 100 stamps, shut down owing to labor shortage. Remaining plants will continue to run; 920 stamps dropping.

CUSTER PEAKS (Roubaix) — Steam hoist and compressor installed at Jungle mine and shaft sinking begun. Small mill erected.

UTAH

Salt Lake County

ALTA CONSOLIDATED (Alta)—Winze sunk 110 ft. on Braine fissure from Copper Prince tunnel. Drifting from winze recently opened body of lead-silver ore. Limited amount being mined in raise above the main tunnel level.

ALTA TUNNEL AND TRANSPORTATION (Alta)—Another stringer of silver-lead ore followed in the fissure being raised from tunnel. Supplies for winter being hauled.

PRINCE OF WALES (Alta)—Making last shipment of silver-lead ore for season. Foot and a half of snow now in Silver Fork and Honeycomb Fork of Big Cottonwood. Operations to be suspended during winter.

SOUTH HECLA (Alta)—Large tonnage shipped during October from new sulphide stopes on east side. Property in good condition for continued shipments, and November production should equal that of last month if hauling conditions are favorable.

SILVER SHIELD (Bingham)—New lead ore in or near a cave met in clearing up 500-ft. drift. Further development being done. H. S. Joseph, manager.

CARDIFF (Salt Lake City)—Opening new orebody on south drift on main tunnel level.

Summit County

PARK CITY SHIPMENTS for week ended Nov. 8 were 3,399,750 lb. by six shippers, or 55 tons less than week previous. Labor scarce.

NEW QUINCY (Park City)—Ore-bearing fissure being followed in quartzite on 900 level. Work near East Raise No. 1. Winze started on two feet of ore. Operations carried on through 900 level of Daly West.

CANADA

British Columbia

GIBSON (Ainsworth division)—Rushing work to start new plant by Jan. 1. Includes new 3-drill compressor operated by Pelton wheel; also electric power plant. Labor situation easier. Gibson group 12 miles from Kaslo. Manager, D. K. May, 226 Rookery Bldg., Spokane, Washington.

CLARENCE CUNNINGHAM, Slocan City, B. C., building mill at Alamo, B. C., to handle ores of Queen Bess and Idaho-Alamo properties.

DOLLY VARDEN (Alice Arm)—Railway and tram line completion held up by assignment of construction company.

ASPEN GROVE (Kamloops)—Copper property, comprising 70 claims owned by James Irvington, will start operations in a few months, contingent upon engineer's report.

HOMESTAKE (Louis Creek)—La Rose Mines, Ltd., Cobalt, Ont., has option on property in Kamloops district. Ore is silver, with little gold, copper, lead, and zinc, and barite gangue. Readily concentrated by flotation. Work started Nov. 1 will be carried on by hand for present. In spring, if development warrants, will install pipe line and high-pressure water wheel and small compressor plant. A. Hope is superintendent.

UNION (Nelson)—Gold property closed down two years now being reopened by A. W. McCune, of Salt Lake City, under option.

WOOLSEY (Revelstoke)—Development work in progress on silver property by Mining Corporation of Canada.

OLIVINE MOUNTAIN SYNDICATE (Tulameen)—Small shipment made to Faust concentrating plant, Seattle, Wash., to determine whether platinum in the dunite can be extracted profitably.

STEWART has suffered severely from influenza. Medical supplies insufficient and no doctor is available.

BUSH (Stewart)—Property recently acquired by R. K. Neill, of Spokane, Wash., who is arranging to transport ore this winter.

Ontario

BONSALL (Gowganda)—Operations suspended.

ANKERITE (Porcupine)—Under option to Coniagas Mines, Cobalt. Development pushed. Final payment of $110,000 due Dec. 1 will probably be met, as recent development has been satisfactory.

GOLD LAKE (Porcupine)—New company organized to operate nine claims near Gold Lake, in southern part of Deloro Township.

HAYDEN (Porcupine)—Work to be resumed on larger scale. New camp buildings being erected and road graded.

HOLLINGER (Porcupine)—Dividend of 1% payable Dec. 2, to shareholders of record Nov. 20.

IMPERIAL (Porcupine)—Mine being dewatered preparatory to examination by interests identified with the McIntyre.

KENNEDY CLAIMS (Boston Creek)—Mining Corporation of Canada has force of men doing surface work.

KIRKLAND LAKE GOLD (Kirkland Lake)—Mill should be completed and in operation soon after Jan. 1.

TOUGH-OAKES (Kirkland Lake)—Funds forwarded from England to reopen property.

SCHUMACHER (Schumacher)—Issue of 100,000 shares authorized at not more than 55% discount. To raise funds for development.

COBALT SHIPMENTS in October by 12 companies were 64 cars of ore, aggregating 4,750,000 pounds.

O'BRIEN-LA ROSE (Cobalt)—Boundary dispute has resulted in litigation. Action begun in Supreme Court by M. J. O'Brien, Ltd., against La Rose asking for declaration of rights of parties to suit.

KERR LAKE (Cobalt)—October production 200,288 oz. of silver, a decrease of 8000 oz. from preceding month and 50,000 oz. from August.

NIPISSING (Cobalt)—Small vein cut at fourth level at 73 shaft has widened from one inch to three or four inches. At 96 tunnel, two veins about two inches wide encountered. Sinking new shaft near edge of Cobalt Lake, where there is large area of undeveloped conglomerate.

TEMISKAMING & HUDSON BAY (Cobalt)—F. L. Bapst, of Buffalo, elected president at annual meeting, succeeding George Taylor.

The Market Report

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver		Nov.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
14	4.7600	101⅛	48¾	18	4.7600	101⅛	48¾
15	4.7600	101⅛	48¾	19	4.7580	101⅛	48¾
16	4.7600	101⅛	48¾	20	4.7575	101⅛	48¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Nov.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
14	*26	†	8.05	7.75	7.95@8.15
15	*26	†	8.05	7.75	7.95@8.10
16	*26	†	8.05	7.75	7.90@8.00
18	*26	†	8.05	7.75	7.80@7.90
19	*26	†	8.05	7.75	7.80@7.85
20	*26	†	8.05	7.75	7.75@7.85

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Nov.	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
14	122	122	137	327	317	29½	28½	54
15	122	122	137	330	324	29½	28½	54
16	...	...	...			...		
18	122	122	137	(a)	(a)	29½	28½	54
19	122	122	137	325	310	29½	28½	54
20	122	122	137	(a)	(a)	29½	28½	54

(a) Quotations not received at time of going to press.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Nov. 20, 1918

The features of this week were the utter demoralization in antimony, the sharp decline in zinc, the weaker tone of tin, and the formulation of an official program with respect to copper and iron and steel.

It seems to be the desire of Washington to maintain prices at high levels for the sake of maintaining wages.

The British Metal Corporation, Ltd., has been organized with a capital of £5,000,000, to promote and develop British trade in non-ferrous metals and regain the control of the markets usurped in late years by the German metal interests. The following gentlemen are closely identified with the new enterprises: Charles Vincent Sale, of Messrs. Sale & Co., who is deputy governor of the Hudson's Bay Co.; Sir Charles Fielding, chairman of the Rio Tinto company; Andrew Wilson Tait, chairman of the British Aluminum Co. and the Otis Steel Co.; Cecil Budd, of Vivian, Younger & Bond; A. Hugh Smith, managing director of Cookson & Co.; and C. W. Tennant, of Charles Tennant, Sons & Co. It is probable that Mr. Sale will be chairman.

Copper—An agreement between the producers and the War Industries Board was made on Nov. 15 (Messrs. Kelley, Jackling, Agassiz, and D. Guggenheim representing the producers), which embodied the following: (a) Present rate of production to be maintained; (b) present prices and rates of wages to be maintained; (c) the War Industries Board, or such other governmental agency as may be designated, to continue regulation of prices and allocation of the material; (d) this agreement subject to renewal and revision Jan. 1, 1919.

Copper producers met in New York on Nov. 19, at which time their representatives in the conference at Washington made report, and it was agreed to maintain the price at 26 cents.

These arrangements have a certain vagueness. Our interpretation of them is that the Government will continue to take in the copper for which it has contracted and pay 26c. for it, that it sanctions continuation of the understanding previously prevailing among the producers, and that the latter may concertedly ask 26c. per lb., and get it if they can.

In the meanwhile, there have been no intimations respecting the cancellations of contracts, nor is anything of that sort anticipated. Insofar as the producers are concerned, the copper that has been booked is sold. A more interesting problem pertains to what may happen to copper in the hands of manufacturers for Government account.

The talk about a pending inquiry for 200,000 tons for export is regarded as moonshine.

Copper Sheets—The base price of copper sheets is 35½c. per lb. Copper wire is quoted at 28¾@29½c. per lb. f.o.b. mill, carload lots.

Tin—The broad phases of this market are treated editorially in this issue. In the meanwhile, a domestic market shows more and more signs of developing through the reselling by consumers of stocks that in numerous cases are presumably superfluous. In the early part of this week business was done in Chinese No. 1 on the New York Metal Exchange at 72¼@72⅜c. At the close of the week, both Banka and metal of 99% grade were available. Banka was offered at 71½c. and Chinese No. 1 at 71 cents.

Lead—The producers are still doing business only upon allocations by the Lead Committee, and are billing the orders at unchanged prices. There have been some cancellations, but not very many, either as reported by producers or by manufacturers. Producers therefore continue to be very well sold ahead.

Zinc—The weakness that was in evidence at the time of our last report continued, the market declining further. On Nov. 16 it received a shock through governmental notices to producers to suspend operations, this being interpreted as meaning to suspend production for the filling of governmental contracts previously entered into. It was not an actual cancellation, which would automatically relieve the tightness in metal for prompt shipment that was previously, supposedly, existing; but, as is often the case, metal for early delivery, with no strings to it, turned up. The Zinc Producers' Committee sent a representative to Washington to discuss matters. Another factor in the situation was the postponement of shipments for export, foodstuffs being given the preference. This also relieved the prompt situation. At the close November-December spelter was at 7.75@ 7.85 cents.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of February 4.

Other Metals

Aluminum—Unchanged at 33c. per pound.

Antimony—This market was chaotic during the week. Our closing quotation of last week was at 9c. In the early part of this week business was done at 8½c. Then there were sales at 7½c., and on Nov. 18 business was done at 7c. On the following day there were sales at 8c. For today, we quote 7¾c. On any day business may have been done at different, and considerably different, prices from those which we have mentioned. For statistical purposes, our judgment is that 7¾c. is probably a fair average for the week.

The volume of business was not large, but some small holders were trying to get out of the market at any price. While they were hysterical, large holders held aloof. Although business in antimony metal was relatively small, there was some large business in antimonial lead on antimony basis.

The Magnolia Metal Co., of New York, having completed its new smelting plans, has entered the market as a buyer of antimony ore, and hopes especially to promote the domestic antimony mining industry.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@$1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—We quote New York unchanged at $125, but that price was more or less nominal and would likely be shaded if actual business were offered. San Francisco reports, by telegraph, $120, weak.

Gold, Silver and Platinum

Gold—Stricter regulations have been adopted by the War Trade Board governing the exportation of manufactures containing gold. Exportation of manufactured articles may be made freely when the exporter agrees to import from any foreign country gold equivalent to the bullion value of the gold contained in the commodities exported. The import agreement is not required when the bullion value of the gold does not exceed 5% of the total value of the article exported. Under certain conditions, the gold contained in the article exported may be 45% of its whole value when the destination is Cuba, the West Indies, Mexico, or Central or South America

The War Industries Board announced on Nov. 16, that the restriction heretofore imposed on the domestic uses of gold and silver for industrial purposes has been terminated.

Silver—Owing to the decline in the war insurance marine rates, London price has receded to 48¾d. The official price in New York remains unchanged. Shipments to London for the week ended Nov. 16 were 465,000 ounces.

Mexican dollars at New York: Nov. 14, 77½; Nov. 15, 77½; Nov. 16, 77½; Nov. 18, 77½; Nov. 19, 77½; Nov. 20, 77½.

Platinum—Some of the restrictions of the War Industries Board have been removed, although the commandeering order is still on. However, jewelers and electrical manufacturers are now able to obtain platinum, and refiners report a big demand from the jewelers especially. The price remains unchanged at $105.

The general stock of money in the United States on Nov. 1 totaled $7,590,173,171; of this, $3,079,784,766 was in gold coin and bullion, $429,846,930 in standard silver dollars and $235,004,206 in subsidiary silver. The money in circulation on Nov. 1 was $5,943,801,171, or $55.84 per capita. On Nov. 1, 1917, the per-capita circulation was $47.03

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 16—Blende, per ton, high, $77.40; basis 60% zinc, premium, $75; Class B, $65@60; Prime Western, $55.48@52.03; outside schedule, $47.50; calamine basis 40% zinc, $40@38. Average selling prices, all zinc ores, $54.70.

Lead, high, $105.10; basis 80% lead, $100. Average selling price, all grades of lead, $98.38 per ton.

Shipments the week: Blende, 7612; calamine, 386; lead, 1485 tons. Value, all ores the week, $579,500.

Buyers have dropped to 4000 tons demand, and sellers can make no disposition of approximately 4000 tons produced in excess of that demand. But for the epidemic of influenza, the production would reach 10,000 to 11,000 tons each week. As it is, a reserve stock is accumulating rapidly.

Platteville, Wis., Nov. 16—Blende, basis 60% zinc, highest settlement price reported, $75.55; base price for premium grade, $75; base price for high-lead blende, $52 per ton. Lead ore, basis 80% lead, $96 to $100 per ton. Shipments reported for the week were 1793 tons blende, 224 tons galena, and 220 tons sulphur ore. For the year to date the totals are 111,742 tons blende, 7301 tons galena, and 38,594 tons sulphur ore. During the week 1899 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—Buyers are well supplied, and no new business is reported.

Manganese Ore—No buying reported.

Molybdenum Ore—No business.

Pyrites—Unchanged. Domestic Southern pyrites is selling for 30@34c. per unit. There is to be an important meeting in Washington between the Chemical Alliance and the War Industries Board within the next two or three days. Whether the present embargo will be continued or another substituted for it will probably be the question at issue.

Tungsten Ore—The depression continues in this market; no business is being done, and prices are nominal.

Iron Trade Review

PITTSBURGH—Nov. 19

The policy of the Government, as to cancellation of contracts for war material, is to the effect that cancellation of contracts is to be avoided when idleness of plant facilities or workmen would result. All this has been plainly stated by representatives of various Government activities, and the matter was even referred to plainly in a letter by the Secretary of the Treasury to the chairmen of the Senate and House committees having to do with tax legislation, the Secretary stating that war expenditures should not be stopped when industrial disorganization would result.

The adoption of the policy contemplates, of course, the early development of peace orders to replace war orders, and the question before the trade is whether this will occur. Thus far, there has been no rush to buy either pig iron or steel products, but, on the other hand, commercial buyers have sought cancellation of orders long on books. Producers have refused such cancellation.

The present prices are in operation up to Dec. 31, and the signing of the armistice does not affect this matter. The regulations as to distribution remain in force, but are being modified almost from day to day. The ban on much building was removed immediately. The jobbers remain under the modified regulations as to distributing their product, but the restriction as to their buying from mills only for replacement of stocks has been entirely removed.

Pig Iron—Deliveries of pig iron are being made much the same as formerly. A few allocations are understood to have been cancelled. If the iron and steel market declines generally in future, or is readjusted, pig iron is likely to come down less than finished steel, except as the cost of coke comes down. Consumers are showing no interest in the market, which remains quotable at the set limits: Bessemer, $35.20; basic, $33; No. 2 foundry (1.75 to 2.25% silicon), $34; malleable, $34.50; forge, $32, f.o.b. furnace, freight to Pittsburgh from the Valleys being $1.40 and from six detached furnaces somewhat less.

Steel—Odd lots of steel are appearing in the market in a limited way, but there are no offerings of regular soft steel. The ban on middlemen's operations, which are now limited to brokerage transactions, will doubtless be removed. The market remains at the set limits: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys—The market is stagnant in ferromanganese and spiegeleisen, and former market quotations of $250, delivered, for 70% ferromanganese, and $75, furnace, for 16% spiegeleisen, have become altogether nominal. Consumers would not buy, even at material cuts from these figures.

Coke—The coke market remains steady, with scarcely any offerings, and is quotable at the set limits. If production had not been so restricted by the influenza epidemic, there might be cut-price offerings.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept.	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	101.125	32.361	44.324	49.500
Nov.	71.604	85.891	......	34.192	43.584	......
Dec.	75.765	85.960	......	36.410	43.052	......
Year	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	......	110.000	......	125.000	......
Dec.	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	(a)	244.038	343.905
October	61.851	(a)	247.467	335.543
November	74.740	......	274.943	......
December	87.120	......	298.556	......
Av. year	61.802	......	237.563	......

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	8.050	6.650	7.750	30.500	29.50
November	6.249	......	6.187	......	30.500	.....
December	6.375	......	6.312	......	30.500	.....
Year	8.787	......	8.721	......	30.500	.....

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8. 73	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	......	7.672	......	54.000	......
December	7.685	......	7.510	......	54.000	......
Year	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	......	33.95	......	33.95	......
December	37.25	......	33.95	......	33.95	......
Year	$43.57	......	$39.62	......	$40.83	......

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Nov. 19
Alaska Gold M.	4
Alaska Juneau	2⅜
Am.Sm.&Ref.,com.	87⅝
Am. Sm. & Ref., pf.	108
Am. Sm. Sec., pf., A.	93
Am. Zinc	13½
Am. Zinc, pf.	46½
Anaconda	68½
Batopilas Min.	2
Bethlehem Steel	62½
Butte & Superior	22⅞
Butte Cop. & Zinc.	8⅛
Cerro de Pasco	37¾
Chile Cop.	21
Chino	40⅛
Colo.Fuel & Iron	39
Crucible Steel	55⅞
Crucible Steel, pf.	91
Dome Mines	14
Federal M. & S.	11¼
Federal M. & S., pf.	42
Great Nor., ore ctf.	33½
Greene Cananea	52
Gulf States Steel	68½
Homestake	91
Inspiration Con.	52¼
International Nickel	32½
Kennecott	38½
Lackawanna Steel	72¾
Mexican Petrol	155¼
Miami Copper	27
Nat'l Lead, com.	61
National Lead, pf.	105
Nev. Consol	20
Ontario Min.	7¾
Ray Con.	23⅜
Republic I.&S., com.	77¾
Republic I. & S., pf.	99¾
Sloss-Sheffield	47⅜
Tennessee C. & C.	16
U. S. Steel, com.	100¼
U. S. Steel, pf.	111
Utah Copper	82½
Va. Iron C. & C.	60

BOSTON CURB*	Nov. 19
Alaska Mines Corp.	‡.12
Boston Ely	.90
Boston & Mont.	.48
Butte & Lon'n Dev.	.15
Calaveras	1
Chief Con.	3½
Contact	‡.15
Corbin	.25
Cortez	.17
Crown Reserve	.23
Crystal Cop.	.39
Eagle & Blue Bell	2¼
First Nat. Cop.	2
Houghton Copper	.40
Intermountain	‡.05
Iron Blossom	.45
Iron Cap	17
Majestic	.27
Mexican Metals	.25
Mines of America	1⅞
Mojave Tungsten	.08
Nat. Zinc & Lead	.12
Nevada-Douglas	.35
New Baltic	1
New Cornelia	17
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.05
Yukon Gold	1

SAN FRAN.*	Nov. 18
Alta	.02
Andes	.05
Best & Belcher	.02
Caledonia	.02
Challenge Con.	.03
Confidence	.08
Con. Virginia	.12
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt.	.03
Mexican	.05
Occidental	.40
Ophir	.03
Overman	.01
Savage	‡.02
Sierra Nevada	.01
Union Con.	.11
Utah Con.	.01
Belmont	3.00
Jim Butler	.45
MacNamara	.45
Midway	.10
Mont.-Tonopah	.11
North Star	.07
Rescue Eula	.08
West End Con.	1.20
Atlanta	.04
Booth	.05
Comb. Frac.	‡.02
Florence	.11
Jumbo Extension	.10
Kewanas	.03
Nevada Hills	‡.02
Nevada Packard	.28
Round Mountain	.10
Silver Pick	.03
White Caps	.16

COLO. SPRINGS*	Nov. 18
Cresson Con.	5.06¼
Doctor Jack Pot	.04¼
Elkton Con.	.06¾
El Paso	.10
Gold Sovereign	‡.02
Golden Cycle	1.75
Granite	.17¼
Isabella	.06¾
Mary McKinney	.07¼
Portland	1.01
United Gold M.	.15
Vindicator	.39

BOSTON EXCH.†	Nov. 19
Adventure	‡.60
Ahmeek	81
Algomah	‡.25
Allouez	49
Ariz. Com., ctfs.	15
Arnold	‡.20
Bingham Mines	‡ 10
Bonanza	‡.16
Butte-Balaklava	‡.35
Calumet & Ariz.	69
Calumet & Hecla	460
Centennial	13½
Copper Range	49
Daly West	‡2⅝
Davis-Daly	5⅛
East Butte	11¼
Franklin	4⅝
Granby	‡79
Hancock	7⅛
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	26¼
Keweenaw	1
Lake	5½
La Salle	3
Mason Valley	‡3½
Mass	5
Mayflower	3½
Michigan	3¾
Mohawk	57
New Arcadian	2
New Idria	‡13
North Butte	13½
North Lake	‡.40
Ojibway	‡.75
Old Dominion	40½
Osceola	57
Quincy	68
St. Mary's M. L.	‡49
Santa Fe	.50
Seneca	14
Shannon	3¾
Shattuck-Ariz.	16½
So. Lake	1¾
So. Utah	.13
Superior	8½
Superior & Bost.	3½
Trinity	3½
Tuolumne	.90
U. S. Smelting	48
U. S. Smelt'g, pf.	47½
Utah Apex	3¾
Utah Con.	9¾
Utah Metal	2½
Victoria	‡3
Winona	.75
Wolverine	22
Wyandot	‡.50

N. Y. CURB†	Nov. 19
Big Ledge	1⅛
Butte & N. Y.	.50
Butte Detroit	.03
Caledonia	.41
Calumet & Jerome	3/16
Can. Cop. Corpn.	2 3/16
Carlisle	‡2
Cashboy	.06½
Con. Ariz. Sm.	1 11/16
Con. Coppermines	5⅛
Emma Con.	‡.03½
Goldfield Con.	.22
Goldfield Merger	.02½
Greenmonster	‡7/16
Hecla Min.	5⅝
Howe Sound	4
Jerome Verde	.50
Louisiana	‡3/16
Magma	‡35
Marsh	.04
McKinley-Dar-Sa.	.48
Milford	‡.75
Mother Lode	.35
Nixon Nevada	.35
Ohio Cop.	‡½
Rawley	‡2¼
Ray Hercules	4
Richmond	‡.56
Rochester Mines	.33
St. Joseph Lead	14
Standard S. L.	5/16
Stewart	.16
Success	‡.11
Tonopah	3¼
Tonopah Ex.	1 7/16
Tribullion	‡⅛
Troy Arizona	‡.09
United Eastern	4½
United Verde Ext.	‡37
United Zinc	‡⅞
Utica Mines	‡.08

TORONTO*	Nov. 19
Adanac	.10
Bailey	.03
Beaver Con.	.33
Chambers Ferland	.10
Coniagas	‡3.00
Hargraves	.03
Kerr Lake	5.87½
La Rose	.31¾
Min. Corp. of Can.	2.50
Nipissing	8.50
Peterson Lake	.08
Temiskaming	.32
Wettlaufer-Lor.	‡.02
Davidson	.60
Dome Exten.	.28
Dome Lake	.16
Hollinger	6.00
McIntyre	1.75
Newray	.12½
Porcu. Crown	.24
Teck-Hughes	.30
Vipond	.22
West Dome	.13

* Bid prices. † Closing prices. ‡ Last quotations.

Engineering and Mining Journal

McGraw-Hill Co., Inc. Price, 20c. New York, November 30, 1918

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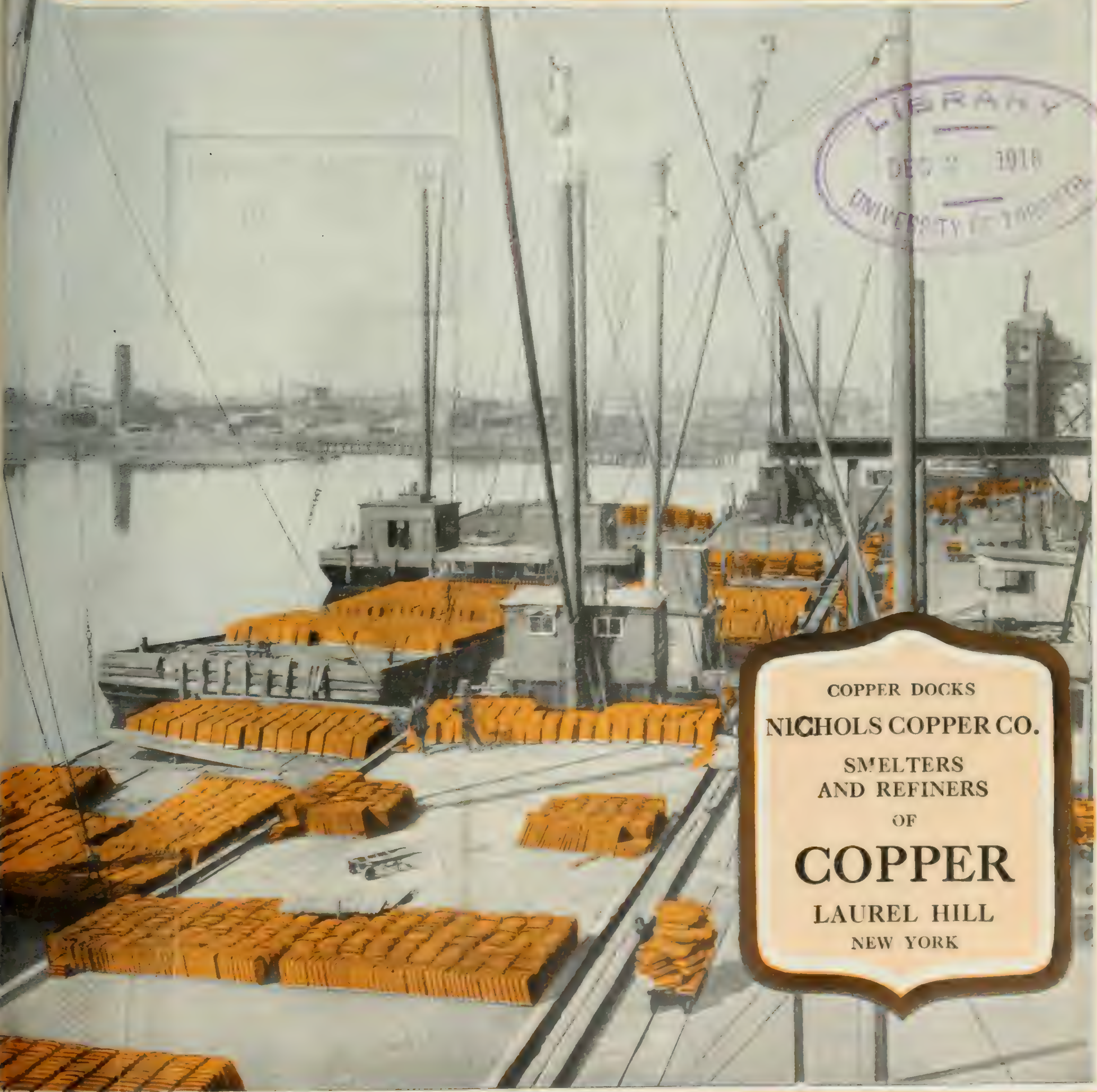

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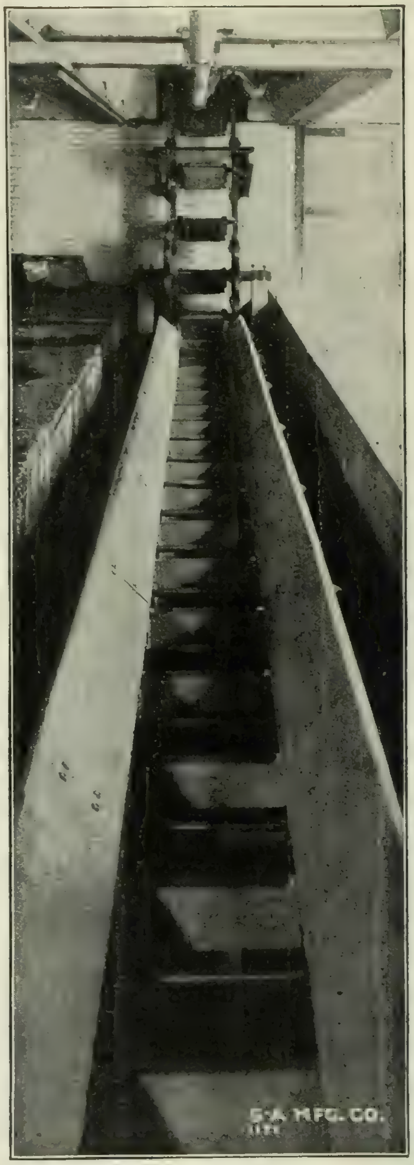

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Engineering and Mining Journal

November 30, 1918

olume 106

Number 22

SORTING TIN-SILVER ORE AT ORURO, BOLIVIA

Sorting Ore for Metallurgical Treatment

BY A. W. ALLEN

An analysis of the factors influencing the question of the feasibility of hand sorting the ore going to a mill, and a consideration of the various advantages resulting, in comparison with the cost involved. Sorting is easy in some cases, difficult in others. It is obviously beneficial in many instances, although of doubtful value with certain ores. No invariable rule, to cover all the different conditions encountered in ore treatment, or applicable to the numerous classes of metallic minerals, could be logically formulated. An exact knowledge of conditions is an essential prerequisite toward determining the applicability of ore sorting and the forecasting of results.

ORE sorting is the term applied to the separation, by hand labor, of a metallic ore into grades, usually according to values. It is preceded by the mining of the vein or deposit; it is followed by concentration—both elaborations of the practice of sorting, but both outside the purview of this paper.

Sorting may produce a high-grade product, or a waste product, or both; or two products of value, but with different characteristics; or two products whose collective value would be lowered if they were shipped mixed together. The purpose of sorting is to avoid the expense of complex treatment—crushing, concentration, classifying, and similar processes—by producing a concentrated product by direct and simple means; or it may be adopted to reduce the amount of waste or low-grade material associated with the ore, for the purpose of lessening the work of subsequent reduction, or in order to obviate the ill effects which might arise from the crushing of some undesirable barren or mineralized material, and its admixture with the ore.

The complexity of the purpose of sorting tends to cloud the issue, and often prevents a clear conception of the subject. Rich portions of an ore can sometimes be picked out and sent to the smeltery, yielding a higher return per ton than the final concentrate produced after considerable expense. In such cases there are obvious advantages in favor of sorting, especially as a greater net realization of metallic content is made by shipping direct rather than by intervening a complicated milling and concentrating process, where the rich mineral must first be intimately mixed with poor mineral and valueless rock before again being isolated into shipping form.

When the grade of material produced is lower than the grade of the concentrate that it is possible to obtain by metallurgical treatment, the advantages of hand sorting may be determined only after a study of the comparative results of both methods.

REMOVAL OF WASTE BY HAND SORTING

With regard to the removal of waste rock from ore, and obviously worthless ore from valuable mineral, the advisability of the operation is less open to argument; and, other than under conditions where the cost would be prohibitive, it is difficult to ignore the logic in the statement that there are obvious advantages to be gained by sorting out and rejecting the worthless material before milling is begun. In certain instances, however, the difficulty of separation is great—there may be no definite line of demarcation between the two substances, and the cost of labor may be so high that there is no apparent advantage in interfering with the mechanical progress of the ore and its associated waste as it passes through the various processes of reduction and concentration.

APPLICABILITY OF HAND SORTING

Sorting is applicable to a wide variety of conditions in which gravitational or levitational[1] concentration is practiced. It is especially suitable if the mineral to be saved is friable, and, to use a common phrase, "slimes" easily. Under such conditions practically the whole of the sortable proportion can be recovered by hand separation, whereas, if sent to the mill, there would probably be a considerable loss by dissemination of the finely divided material through the larger mass of low-grade gangue. As in other phases of metallurgical work, it is usually advisable to extract, before final crushing, and by simple and direct means if possible, what may be easily removed in concentrated form; and not to rely on a subsequent process, even if highly efficient theoretically, to make the separation which exists before the mineral is finely ground and intimately mixed with the low-grade gangue during the various phases of milling and conveying.

PERSONAL ELEMENT AFFECTS QUESTION OF APPLICABILITY OF SORTING

When there is no clear line of demarcation between what should be sorted for discard and what should go to the mill—between the appearance of high-grade and medium-grade ore—it is best to be less decisive as to the advantage of hand sorting. The personal element must be taken into consideration. Will the separation be made strictly in accordance with predetermined decisions as to exact metallic content of the various products, or must a variable factor, depending on the efficiency of the sampler in charge, be used in preparing all estimates?

A concentrating mill, when in regular operation and under competent supervision, is, to some extent, "fool proof" as regards metallurgical results. The personal element, although a potent influence in the first place, when the design is being decided and comparative processes or methods of reduction and treatment are under consideration, is more or less an indirect influence; and the mill crew is there to see that everything goes as the designer of the mill planned that it should go. This may be considered an extreme statement, but its purpose is to show that efficient concentration is the logical result of a properly developed scheme of mechanical and metallurgical treatment. Ore sorting by hand is an idea put into practice.

ORE SORTING DEMANDS CONTINUOUS PERSONAL ATTENTION

In the ore-sorting department personal attention is continuous requirement. Perhaps in no other phase o mill work is it possible for a stupid workman to appea to do so much, and at the same time effect so small total economy. The inefficiency of sorting, coupled wit the real difficulty of making an efficient separation i many instances, is responsible for the fact that th alternative policy of milling sortable waste has ofte resulted in a net saving, it being cheaper to mill valueless material than to attempt to pick it out. O the other hand, the abolition of sorting may wisely b decided upon in a case where the method had bee carried out in a highly efficient manner, as far as practicable, but where it was entirely unsuitable and shoul never have been adopted in the first instance.

SORTING PREVIOUS TO CHEMICAL RECOVERY METHODS

In wet chemical methods of ore treatment there ar factors in favor of sorting which are not in evidenc with simple concentration. Chemical processes of meta recovery are usually delicate operations, although th fact is not always realized; and expensive solvents ar often used to a large extent in neutralizing refractory elements, besides being absorbed by colloidal an other retentive particles. Ore sorting under such conditions may result in important economies in th subsequent chemical treatment. A worthless clay can b removed by simple washing methods, and this may result in a higher milling duty, better classification, an less chemical consumption of solvent when the solven acts in conjunction with an alkali to neutralize acidit and effect coagulation and settlement.

Many ores are harder and more dense than the incasing rocks, and, if a large quantity of the latte is included in the material going to the mill, one resul will be the production of an unnecessary proportio of slime, with the concomitant ill-effects of hindere settlement, ineffectual separation, and difficulty of fina filtering or drainage.

WASTE OFTEN DELETERIOUS

Colloidal clays—in common with numerous other materials in a similar physical condition—exhibit highl absorbent properties when brought in contact with liquid, besides requiring an electrolyte to settle the effectively in the water or solution used. Such colloid may have a selective preference for a certain componen of a solution which will effect coagulation and settlement, and this often results in the adsorption of th metallic ion of the electrolyte. As regards absorptio however, colloids will exhibit less preference unde normal circumstances. If the solution is merely alkaline water, then alkaline water will be absorbed. If th solution is gold potassium (or sodium) cyanide—forme by milling a gold ore in cyanide solution—there is littl doubt that this will be abstracted without material a teration, and in much the same way that a sponge wi suck up water. Experience has shown that solution absorbed into the structure of colloids is removed only with considerable difficulty. Consequently, with methods of recovery of metals from ores in which a chemical solvent is used, it should be realized that the presence of an absorptive colloid is likely to occasion serious loss. If the colloid can be removed by prior sorting or washing, there is every reason to advocate such a course.

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[1] Term adopted to refer to flotation and similar methods of concentration.

DIFFICULTIES ENCOUNTERED WITH CLAYEY ORES

If, as frequently happens, the colloidal clay associated with or forming part of the ore contains metal to be recovered, in sufficient quantity to justify treatment, or in amount that would make it poor practice to disregard, then every effort should be made to see that full and complete absorption by all colloidal matter occurs in the first place with an electrolytic solution containing no metal of value. Thus a clayey gold ore may be milled in lime water and will, later, absorb less gold (to be retained in the residue after complete displacement treatment) than if milled in a cyanide solution containing gold, or in which metallic gold is immediately dissolved.

SORTING GOLD AND SILVER ORE

With gold and silver ore there are few instances in which sorting can result in the shipping of a product of so high a grade as is obtainable after complete metallurgical treatment. It is practiced more for the purpose of removing waste, although under unusual conditions a high-grade product, suitable for shipment or special treatment, may be made.

The fundamental idea underlying the removal of waste by sorting is that the method concentrates the ore for treatment. By reducing the bulk of the material going through the mill, the wear and tear will be lessened, and a greater net ore tonnage can be handled. From the mechanical standpoint there are obvious advantages in favor of the removal of waste before milling.

ECONOMIC RESULTS FROM SORTING

From an economic point of view, the question is more complicated. If the total milling and treatment costs in a particular installation are $5 per ton, then it is unreasonable to argue, as has been done, that $20 a day will be saved by reducing the amount of material going to the mill by four tons, i. e. by sorting out this amount of waste. Unless the amount of waste removed is a considerable proportion of the total tonnage being treated, little comparative effect will be made on working costs by the reduction in tonnage handled. Costs per ton are usually in inverse proportion to the magnitude of operations in the first instance; they can nearly always be reduced by an increase of tonnage—thus indicating a net rise in the total costs, but not in strict proportion to the added duty. Conversely, a small reduction in tonnage will usually be accompanied by only a slight lowering in total working cost and an increase in cost per ton. This point should be taken into consideration when the economic effect of hand sorting is under discussion.

EFFECT OF SORTING ON METALLURGICAL RESULTS

From the metallurgical standpoint there are obvious advantages in reducing the amount of worthless gangue that enters the mill. In concentrating plants, most of the equipment has an operating efficiency governed strictly by the quantity handled. Surprising results can sometimes be obtained from certain concentrating tables if the tonnage is reduced far below the generally accepted minimum. On the other hand, it is difficult to obtain consistently satisfactory results from machines which are continuously or periodically overloaded. In most mills the plant is operating at full capacity, and any scheme which insures a reduction in tonnage treated, without lowering the grade or amount of output, should be encouraged. It is undesirable to place too much support on theoretical considerations as to the cost of sorting as compared with the cost of milling. Practical operations usually disclose factors which seriously affect conclusions based on such data. The safest way is to operate by both methods, under conditions as nearly parallel as possible and for an ample length of time, and compare results.

EFFECT OF SORTING IN CHEMICO-METALLURGICAL OPERATIONS

The concentration of ores by sorting, as a preliminary to treatment by some chemico-metallurgical process, results in a higher grade of solution being circulated than would otherwise be the case. Practical results have shown that the dissolving of the metal is the easiest phase of the process, and that the complete or nearly complete isolation of the metal-bearing solution presents the greatest difficulty.

When a solution containing a metal to be recovered is brought into contact with valueless gangue or waste —especially when the latter is of an absorbent nature, such as colloidal clay—there is liability of loss due to absorption and adsorption. Of the two it is probable that absorption figures more largely in actual effect; and experimental investigations and the results from large-scale operations tend to show that such absorption, as regards metal of value, is more or less proportional to the concentration of the solution, thus indicating a distinction between absorption and adsorption, where the amount removed does not increase in arithmetical progression, although the increase is regular. The main abstraction—by absorption—is therefore usually proportional to the grade of the ore. To avoid the high residue which may, and usually does, result from the direct chemical treatment of a high-grade ore by solution methods, it is advisable, wherever possible, to reduce the original amount of metal contained by some simple process such as amalgamation. This is done with gold ore with conspicuous success.

After such preliminary treatment, the tailing is, comparatively speaking, low grade; the subsequent wet process is invariably as successful, as regards final residue loss, as if it had been carried out on an ore of similar value. A preliminary treatment by amalgamation often recovers metal which is not in a condition to be effectively dissolved without an unjustifiable expense in preparing it, as well as the accompanying gangue. A lower residue is therefore obtained after (1) sorting to remove waste and so raise the grade; (2) efficient preliminary treatment to extract as much metal as possible, followed by (3) dissolution of the remainder by a chemical process, and final recovery by means of the usual methods of precipitation and realization.

An additional and important factor in favor of hand sorting of mill feed is that it affords ample opportunity for the removal of foreign matter which, if sent to the mill, might cause damage, loss of time in effecting repairs, and other troubles.

SORTING OF TRAMP STEEL AND DYNAMITE NECESSARY IN MANY INSTANCES

It is difficult to prevent an occasional stick of dynamite from reaching the crushing plant, where it may do no harm; but if it is not removed before it comes to the mill a serious accident may happen. Short pieces of drill steel, known as "tramp" metal, accidentally left by miners, may pass through the primary crusher without ill effect, but will certainly cause damage with secondary crushers designed with comparatively small discharge apertures. Metal of this description may be removed by means of electro-magnetic devices, or by hand. The sorter, if the latter system is employed, will also be available for the removal of high-grade ore, waste, or other débris.

The ill-effects of the passage of tramp metal through crushing machinery may be minimized by the provision of shearing pins on shaft couplings, or other connecting parts, or by constructing the toggle plates of swinging-jaw crushers in two parts, with a lap joint held together with shearing pins. In common with all safeguards, such provisions are well worth while. Prevention is, however, better than cure; and by adopting the precaution of primary sorting, the result will be that less time will be lost in effecting repairs, carelessness will be discouraged, and the shearing provision or other safeguard adopted will act as a safety measure in emergency only, leaving the operator with a sense of security and a freedom to concentrate his supervisory efforts in other directions.

REMOVAL OF DÉBRIS FROM ROCK

The advantages claimed to result from the practice of sorting tramp metal and dynamite from ore are equally pertinent with regard to débris. Such material comprises pieces of timber planking, paper, half-burned fuse, sacking, and, occasionally, organic matter and charcoal found in old stopes, or associated with surface deposits subsequently used for filling purposes. Débris of the sort mentioned can cause a vast amount of trouble in milling operations by choking screens and so causing delayed discharge and uneconomical reduction. Its inclusion with the ore results in an unnecessary and wasteful consumption of neutralizing alkali, and so hinders effective settlement and classification.

In chemico-metallurgical operations an element of instability is added to the process when foreign matter is not previously sorted out. High chemical consumption is likely to occur when an unstable solvent like cyanide is used, and foul solution will result, from which the valuable metals are precipitated only with difficulty. When charcoal is included with the débris, it often acts as an adsorbent of gold solution, thus occasioning serious and unrecoverable loss.

Sorting is a logical policy under such circumstances; and when the question of the removal of waste by hand is under discussion in the first instance, the fact that sorting of débris is highly advisable, in any case, should be taken into consideration.

Subterranean Noises in Australia*

BY W. H. FERGUSON

Sounds resembling explosions which could not be traced to any mining or quarrying operation are heard at intervals in the Daylesford district of Victoria, Australia. When at Shepherd's Flat, Yandoit, and the Pickpocket Diggings, between Clydesdale and Newstead, I made inquiries as to whether the sounds were heard at these places, and, being assured that they were, I asked several people to point out the direction from which the sounds appeared to come. Compass bearings were then taken to the points indicated. One bearing was taken at Shepherd's Flat, one at the village of Yandoit, five miles to the north, and one at the Pickpocket Diggings, about three miles further north.

The sounds are described as resembling thunder, or the explosions made in blasting rocks. They may occur singly, or two may be heard in rapid succession, and more frequently in wet than in fine weather. The noises are said to come from a portion of the Yandoit hills known as the Stony Rises, near a branch of the Green Gully Creek. The residents are of the opinion that they are caused by explosions of gas, and state that birds and rabbits which were supposed to have been suffocated by gas have been found dead in hollows of the ground.

This part of the parish of Campbelltown was not visited, but an inspection of the geological map of the parish shows that basalt has flowed down a branch of the Green Gully Creek, and remnants of the flow exist as a series of low hills. These trend down the creek, which may have been eroded along the strike of the Ordovician rocks, or possibly along a fissure. Noises like those described by the residents of the district have been heard in many places in other countries, and are generally known as brontidi (like thunder); in India they are known as barisal (guns), in Mexico as bramidos (bellowings), in Italy as marina (sea shore). In some instances they precede earthquake shocks or volcanic eruptions; in others they increase in frequency and then gradually die out without any earthquake or volcanic disturbance.

It is not certain that the Yandoit noises are really brontidi, but it is not at all improbable that they are. The bearings taken indicate that the noises proceed from a part of the parish through which there apparently passes a line of weakness, the surface indications of which are a series of mineral springs, and on the southern extension of this line is a line of fissure eruption. It is possible that the noises originate along a fault line, that movements are yet taking place, and that these cause the sounds.

There is another possible explanation, in that the locality where the sounds are heard is volcanic, and the part indicated by the bearings is within five miles of Smeaton Hill, or Mount Kooroocheang, an extinct volcano where faults are known. About 10 miles south of the place where the supposed brontidi emanate, three extinct volcanoes, Eastern Hill, Mount Prospect, and Langdon's Hill, indicate a line of fracture of the earth's crust. If this line be produced northward, it would pass close to where the sounds are supposed to originate.

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*Excerpt from the records of the Geological Survey of Victoria.

Standardization of Mining Methods III—Ventilation of Metal Mines*

BY CHARLES A. MITKE†

The need for mechanical ventilation of metal mines, the various systems employed, and the benefits derived in lessened costs and increased output are discussed, with particular reference to mines of the Southwest. In general, there is no standard as to what constitutes a good working atmosphere. A ventilation system is best planned when developing new orebodies, and should be kept up to date as such work progresses. Prospect and development work may require auxiliary systems. Equipment and practice should be standardized to such extent as is possible.

IN THE early stages of the development of metal mines, all prospect work is necessarily directed toward finding ore, and little or no consideration is given to the subject of ventilation until the orebodies are discovered. In prosecuting this work, natural ventilation is utilized to its fullest extent until all its possibilities are exhausted. It is then generally supplemented by the installation of a few small blowers. These answer the purpose temporarily, until the prospect develops into a mine, when, in the course of time, the natural ventilation frequently proves insufficient, and a scheme of mechanical ventilation must be worked out.

Much has been accomplished in solving the ventilation problems in coal mines, but it is only recently that this subject has received serious consideration by metal miners. In the past, practically all mines were ventilated by natural means, and the miners were expected to do their best under the varying conditions, which are always poorest during the summer, as is evidenced by the decreased labor efficiency in the summer months.

It became inceasingly apparent in recent years that conditions of natural ventilation were inadequate to meet the needs of the metal mines of the Southwest, and the question arose as to what extent improvements could be made in ventilation by mechanical means in order to bring about the desired change in the temperature, humidity, velocity and volume, and as to what should constitute a "good working atmosphere." No readings had been made to determine the volume of air entering or leaving a mine; the necessary quantity of air per man per minute; to what extent the humidity would be increased from the time the air entered the mine until it reached the different outlets; the amount of air needed to clear away the smoke during ordinary blasting in the average mine workings; or the total friction losses, due to the extreme irregularities of the workings, which may be termed "the mine resistance."

In some states standard requirements for ventilation in mines are prescribed by law, but, in general, this is left to the discretion of the operators. The Arizona mining law says that "the total quantity of carbon dioxide present in the air shall not exceed 0.25% by volume, except that at any place where firing of explosives has been done a higher percentage of carbon dioxide shall be permissible for a reasonable length of time after the last explosion. . . ." The Anthracite Mine Law of Pennsylvania specifies a minimum quantity of 200 cu.ft. of air per man per min., and the law further stipulates that the amount of air in circulation shall be sufficient "to dilute, render harmless, and sweep away, smoke and noxious or dangerous gases," proving that even in coal mines, where the problems of ventilation have not the intricacies found in metal mines, no fixed standard has been adopted upon which to base figures for a "good working atmosphere." This, then, was the problem that confronted the ventilating engineer.

There are two methods by which the degree of ventilation may be determined: (a) According to the quantity of pure air per man per min. entering the mine; (b) by determining the amount of impurity present by making a chemical analysis of the air. The quantity standard is less expensive and more practicable, and is the method most generally used. The quality standard is expensive, and its application is necessary only in exceptional cases. It has only a remote bearing on the efficiency of the men, but occasionally it is found advisable to have accurate determinations made on several samples of mine air.

HUMIDITY CAUSES MANY MINES TO SEEM HOT

After a large number of readings had been taken, it was found that in many mines, though the temperature was not high, the humidity was excessive, the velocity low and the volume small. A stope having a temperature of 80° F. and a humidity of 99% seemed excessively hot, though another stope with the same temperature and a humidity of 75% was comparatively cool. This was affected somewhat by the velocity and volume of the air in the working places. The greater the velocity and volume (provided the temperature and humidity were constant), the cooler the stope appeared to be. For example, the following readings were taken in a stope that was evidently in need of better ventilation: Velocity, 10 ft. per min. (approximately); volume, 50 cu.ft. per min. (approximately); temperature, 84° F., and humidity, 96 per cent.

A small 5-hp. blower was forcing air into this stope. The miners were uncomfortable and complained of the excessive heat. Five months later, after a new ventilating system had ben installed, the following readings were made in the same stope: Velocity, 100 ft. per min.; volume, 500 cu.ft. per min.; temperature, 84° F., and humidity, 90%. The miners mentioned happened to be working in this stope on that date, and one miner remarked, "The stope is not nearly as hot as it used to be, and we can work much better." The men did not sweat excessively in this atmosphere, and the greater comfort that they experienced was due to the increase in velocity, which also means an increase in volume, with lower humidity, and not to the temperature, as it was the same in both cases.

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*The third of the series of articles which began in the Nov. 9 issue

†Mining engineer, Bisbee, Arizona.

After a number of experiments had been made, the following specifications were decided upon as constituting a "good working atmosphere": Temperature, 78° F.; humidity, 80%; velocity, 125 ft. per min., and volume, 350 cu.ft. per man per min. Though there were some places in the mines where the velocity and volume were much higher than this, there were others in which they were lower; consequently, this was taken as an average of all the velocities and volumes in working places in the mines in which the tests were made. It was found that in an atmosphere of this character men could be expected to perform a fair day's work, and that smoke and gases from the mine were diluted and finally carried off. This working atmosphere has been found to be particularly suitable for mines in the Southwest.

CAREFUL STUDY MUST PRECEDE INSTALLATION OF MECHANICAL VENTILATION EQUIPMENT

In mines where mechanical ventilation is required painstaking consideration should be given as to the kind of atmosphere which it is advisable to establish. When this has been determined, a thorough study of the mine and workings should be made in order to obtain definite information concerning underground conditions. In order, therefore, to estimate the amount of air which will be necessary for the desired working atmosphere, the following factors should be taken into account: Number of men and animals in each district, the production of CO_2 or other gases, relative humidity, temperature, amount of explosives used, the distance from currents of good air, the number of lights, air leakage, friction of the air currents, number of splits of the air current, and method of distribution.

In mines where there is considerable square-setting in ores containing much sulphur, and where a large amount of timber is used for doubling up, bulkheading and similar work, a greater volume of air will be required to maintain the same good working atmosphere than in mines where the cut-and-fill system is used, with its usual limited amount of timber. The same may be said of top-slice stopes. In top-slicing, there is a large timbered mat directly over the men, which usually cuts off any outlet to surface. Stopes of this character are more difficult to ventilate, and take more air, than shrinkage stopes, which have practically no timber and where the ground is so firm that connections above the usual workings are easily maintained as outlets for the air. In caving methods using the incline-raise system and extensive grizzly levels, it is necessary to do a large amount of blasting, first in drawing the ore down to the grizzly level, and, second, in breaking boulders on the grizzly. This naturally results in a large amount of powder smoke, and it is consequently necessary to provide for an unusual quantity of air in order to maintain a good working atmosphere.

VENTILATING SYSTEMS MAY AID FIRE FIGHTING

Ventilating systems have been planned in a few mines and installed primarily as safety measures to permit immediate attack being made on possible mine fires, and only secondarily as aids to ventilation, the natural air currents having proved fairly satisfactory. In most cases, however, the direct object for which a mechanical ventilating system is installed is to improve the atmosphere, and its use in fire-fighting is given only secondary consideration.

By far the most economical method of installing a ventilating system is to work out a comprehensive scheme of mechanical ventilation (using the natural air currents wherever possible), in connection with the development of new orebodies, so that, when the orebodies have reached the producing stage the necessary air connections will have been made. Ventilation should go hand in hand with stoping, both being planned simultaneously, so that, when the latter is begun, the ventilating system will also be in operation, making it possible for the men to perform their duties in good air.

One of the objections to installing a ventilating system as the orebody is developed is that, if the installation is delayed, it may be found possible to get along with the natural ventilation. However, in the majority of cases this can easily be foreseen, and in practically all deep mines mechanical ventilation is a necessity. It always costs more to put in such a system afterward, when many new connections must be driven, than it does if planned right in the first place with the development of the workings.

SEPARATE SYSTEM FOR DEVELOPMENT WORK

Frequently, after a ventilating system has been installed, the necessity for its expansion, coincident with the stoping, is overlooked, and, while the stoping continues, nothing is done toward the ventilation, so that in course of time, as the workings increase, it loses its effect and fails to serve the purpose for which it was designed. It is therefore highly important that the ventilating system be expanded to meet the constant changes and progress in stoping.

There are two systems of mine ventilation, the exhaust and pressure. In the exhaust system, the fan is usually on the surface, and exhausts the vitiated air from the mine while the fresh air enters through the working shafts and flows in to take its place. The pressure system usually has the fan placed underground, near the main downcast shafts, which should also be the working shafts, and forces the air through the workings by putting the entire mine under pressure, the air finding its way out through shafts, raises, or ground caved and broken to the surface. Most installations in the Southwest are of this latter type, because shafts at many of the largest mines are all operating shafts and cannot be spared for ventilation purposes only. It is, therefore, impracticable to put a suction fan on the surface at an operating shaft. The placing of fans underground has given satisfaction, nevertheless, as, owing to the use of double doors, there has been practically no short-circuiting of the air.

CORRECT DISTRIBUTION OF AIR PRINCIPAL OBJECT

The mere installation of mine fans, however, does not constitute a complete system of mechanical ventilation. The proper coursing and distribution of air through the workings is the only effective test of the efficiency of a ventilating system. In a few mines large fans have been installed without much attention being given to this important consideration, and a thorough study of the workings would show that better ventilation in general could be obtained with half the number of fans, provided the mining features that are involved received proper attention. This would not only improve the ventilation but would materially reduce the cost of the ventilating system.

The capacity of fans which have been installed varies from about 10,000 to 200,000 cu.ft. of air per min., the pressure or suction being from 1 in. to 5 in. The large-capacity fans of from 250,000 to 400,000 cu.ft. of air per min., which are found in coal mines, are impracticable in metal mines, except in a few instances, because the total intake or outlet areas of shafts in metal mines are not nearly equal to those in coal mines.

Some mining companies have installed reversible fans, the idea being to reverse the fan in case of fire in a downcast shaft. However, after consideration of the 35 mine fires which have occurred in the Southwest during the last seven years, I find that in no case was it necessary to reverse the fan. In fact, in nearly every instance the danger would have been increased, because the men expect the air to keep moving in a certain direction, and, if the air currents should be changed without their knowledge, there would be danger of the miners being caught in gas.

SIMPLEST SYSTEM USES ONE CENTRAL INSTALLATION

The most inexpensive ventilating system, using pressure, consists of one central installation (either on surface or underground) with large intake and a discharge into diverging drifts, from which the air is further discharged into still larger areas. In the suction system, the blower is usually on the surface, and all drifts from the workings should converge to the central intake at the fan, through which the air is drawn to the surface and discharged. One central installation, however, using either pressure or suction, ordinarily could not supply adequately the scattered workings, which require in most mines from one to four additional installations to be satisfactorily ventilated. Occasionally, "booster" fans are used as an aid to the general ventilating system. Two or three mines are sometimes so intimately connected that, in order to work out a ventilating system for one, it is necessary to work it out for all. In some instances a combination of both the pressure and exhaust systems is adopted.

The installation of the mine fans is the smallest part of the cost of putting in a ventilating system. By far the greater expense is incurred in the necessary changes in the mine, such as cutting a blower station for mine fans (in case they are underground); driving drifts and raises to allow sufficient air to pass to ventilate the stopes; erecting doors in suitable drifts and crosscuts and putting in stoppings to cut off old workings and leaks which would impair the efficiency of the ventilating system, and making other similar and necessary alterations.

DEVELOPMENT AND OTHER WORKINGS MUST ALSO BE VENTILATED

The systems described above are for the purpose of ventilating the major portion of the workings, which comprise about 80% of the mine; the remaining 20% must be taken care of in some other way. This 20% generally consists of the prospect and development work, such as drifts, raises and winzes, and must be done in advance of the usual stoping operations. For this work it is necessary to use an auxiliary ventilating system, which should be standardized wherever possible.

When the headings are being driven in such work the exhaust air from machine drills is used to furnish the necessary ventilation. No compressed air is required when machines are running. The exhaust of the average machine gives approximately 100 cu.ft. of ventilating air per minute. However, it is well known that this is not the purest air, as it is vitiated somewhat by the oil which vaporizes in the machine and comes out with the exhaust. After blasting, the full head of compressed air is usually turned on to clear out the heading.

After drifts, raises, or winzes have been driven a certain distance, a point is reached at which the compressed air is insufficient, and it then becomes necessary to install artificial ventilation. An air jet, for example the Koerting-nozzle type, which uses a small amount of compressed air, at the same time having a strong suction so as to draw a large amount of fresh air around the nozzle and force it through the ventilating pipe, is generally found sufficient. (One cu.ft. of compressed air will furnish approximately 18 cu.ft. of ventilating air.) As raises and occasional winzes are driven only about 100 ft., an air jet supplying air for 10-in. pipe should provide ample ventilation under average conditions. Drifts are usually driven longer distances, and should be provided with electric blowers. In general, a 10-in. blower, designed by standard manufacturers, using a 2½-hp. motor (both blower and motor mounted on one base) is suitable.

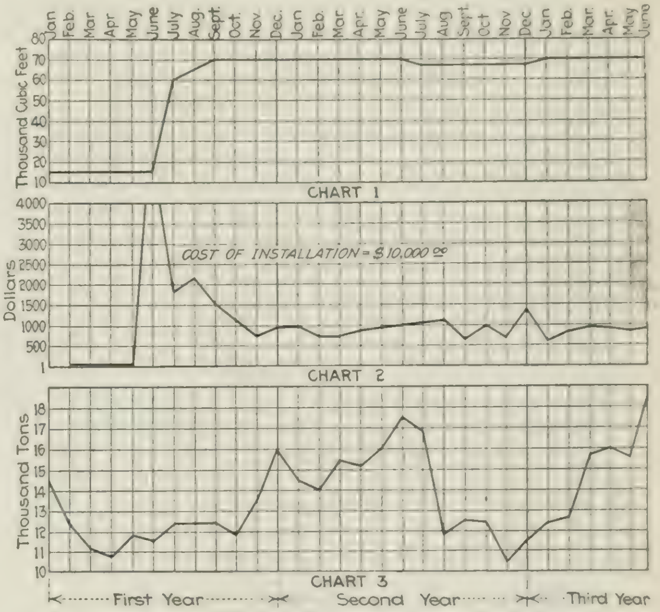


FIG. 1. CHART 1 ILLUSTRATES TOTAL VOLUME OF AIR MOVED PER MINUTE. CHART 2, TOTAL COST OF VENTILATION. CHART 3, TONNAGE PRODUCED

JETS AND BLOWERS MUST BE PROPERLY PLACED

The position of air jets and blowers is important. If they are placed within the drift or raise to be ventilated, air will merely circulate between the blower and the end of the pipe. They should be situated outside or have the intake outside of the drifts and raises. The pipe should reach to the working face, so that it will not be necessary to use compressed air. Before blasting, the sections near the face should be taken down and put where they will not be injured.

After the drift has progressed about 3000 ft., the blower should be provided with a reversing attachment in order that it may be reversed to clear the smoke away, and after that be run as a pressure fan, to furnish good air at the heading. In exceptional cases, principally in tunnel work, where speed is important, two blowers should be used, one for pressure and the other for suction. This permits almost continuous work at the heading.

VENTILATION MAY BE STANDARDIZED

With the introduction of mechanical ventilation, it has been found that the atmosphere in mines can be standardized instead of having shifting and uncertain currents of natural ventilation. It has also been demonstrated that this standard atmosphere is well within the economic limit and that it pays to ventilate a mine by increasing the amount of air until such standard conditions are reached.

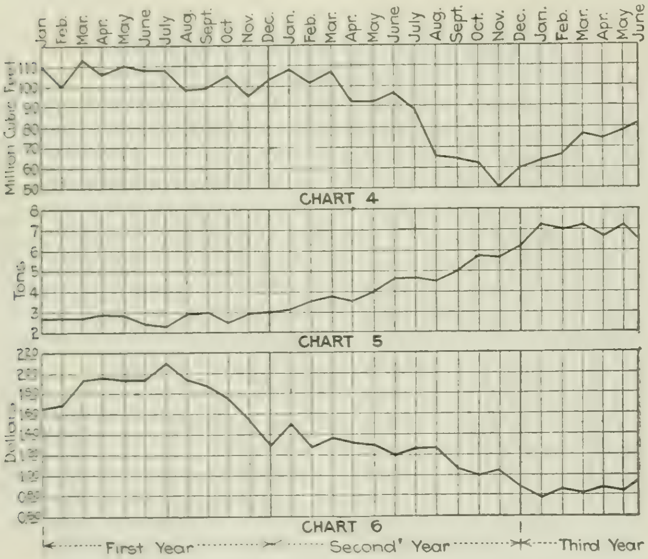


FIG. 2. CHART 4 ILLUSTRATES DECREASE IN COMPRESSED AIR USED AFTER INSTALLATION OF VENTILATION SYSTEM. CHART 5, INCREASE IN TONS PER MAN PER SHIFT. CHART 6, DECREASE IN COST OF MINING

The velocity of air currents in working drifts has been brought up to 1200 cu.ft. per min., and in exceptional cases to 2000 cu.ft. The former figure approaches the economic limit at most mines where power cost is a large item, and the latter should be set as a maximum for safety. The "good working atmosphere" mentioned previously has been tried out in a number of mines in the Southwest for a period of over five years and has proved entirely satisfactory as a standard for conditions existing in this part of the country.

COST SHEETS PROVE VALUE OF GOOD AIR

Actual figures showing a reduction in costs and a decrease in consumption of compressed air prove the value of such an installation, and point to the results that might possibly be obtained were the standard made still higher by securing a lower humidity, lower temperature and greater volume of air per man per minute. The accompanying charts show the results obtained by installing a well-planned mechanical ventilating system, and cover a period of two and a half years.

Chart No. 1 shows the total volume of air moved per minute, and Chart No. 2 the total cost of ventilation. In chart No. 3 it will be seen that after the date of the installation of the mechanical ventilating system there was a marked increase in tonnage until the latter part of the second year, when, owing to unusual conditions, production was much curtailed. However, in the early part of the third year the tonnage again increased, and in June there was an increase of 4000 tons over that in January of the first year.

Chart No. 4 illustrates the decrease in the quantity of compressed air used, owing to the installation of the ventilating system. The curve shows the total amount of compressed air needed both for ventilation and machine drills. This accounts for the rise in the curve from November of the second year to June following, as the tonnage increased from 10,500 per month to 18,500 tons. Consequently more machines were used to break the ore represented in this added tonnage.

Chart No. 5 shows the increase in tons per man per shift. This is obtained by dividing the daily tonnage by the total number of men employed in the mine. The mining method used in this particular mine was practically all square setting, and all the ore had to be sorted. Only one stope in the entire mine was worked by the cut-and-fill method. The increase after the new ventilating system was installed was from about 2½ tons to 7 tons, or approximately 180 per cent.

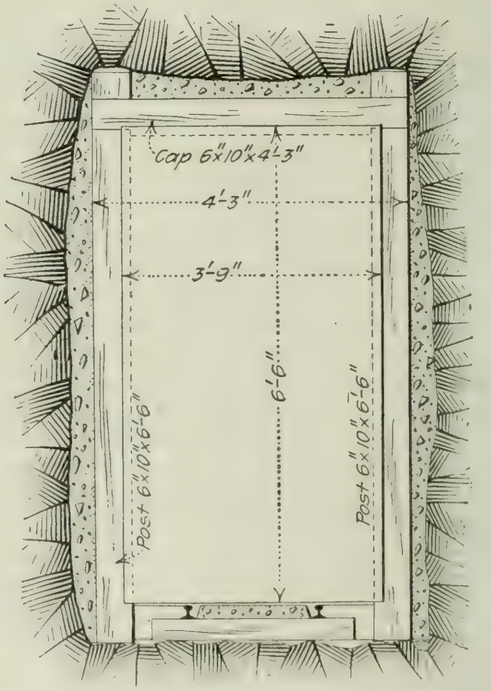


FIG. 3. DOOR FOR BOTH HAND AND MULE TRAM

Chart No. 6 illustrates the decrease in the cost of mining the ore, and an average for the first seven months of the first year, compared with an average of the seven months preceding June of the third year, shows a drop of from $1.57 to $0.85, or a decrease of $1.02 per ton.

Large fans are designed for the capacity, pressure or suction, as well as for the elevation where they are to be operated. Regarding small blowers, however, a standard size and design of electric motor, blower and ventilating pipe should be decided upon. A 2½-hp. motor, connected to a 10-in. blower and 10-in. ventilating pipe, is usually sufficient. It is important that a standard be selected, as, for example, the one mentioned above, as there are many mines where 8-in., 10-in. and 12-in. ventilating pipe, with different types of blowers and complementary apparatus, may be found in use at the same time. This is likely to cause confusion and delay because of attempts to attach pipe of the wrong size to blowers, and in other ways.

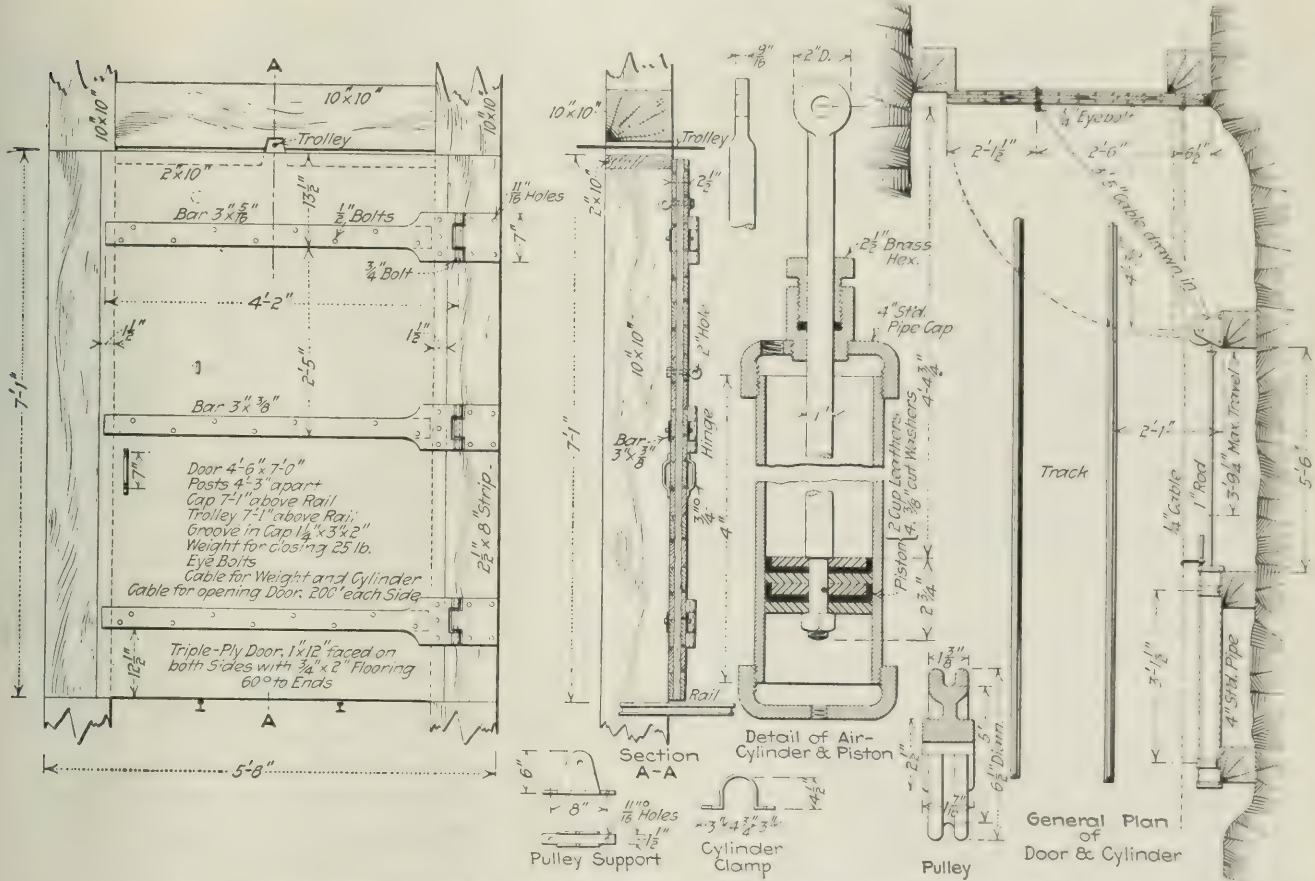


FIG. 4. DOOR FOR USE IN MOTOR HAULAGE DRIFTS, WITH AIR-CONTROLLING DEVICE

Either metal pipe or canvas tubing may be used for ventilating purposes. Metal pipe has been found satisfactory and is in general use in mines throughout the Southwest. When properly put up, with joints that are carefully sealed with burlap and tar, it requires no further attention, as joints of this character prevent leakage, and the angle at which the pipe is hung prevents water lodging in it. It stands up well under mining conditions, and when the usual precautions are taken to remove the lengths near the face before blasting, the pipe is usually not materially damaged by the small rocks which occasionally strike it.

Canvas tubing has the advantage of being more easily handled, as it can be taken down the shaft and hung in less time and at less expense than iron piping, and it is also more flexible in rounding curves, as iron pipe needs an elbow at every turn. There is, however, a question as to how its durability will compare with that of iron tubing under ordinary mining conditions. The difficulty arising through water gathering in it is also generally experienced, making frequent attention necessary. In some of my experiments underground, when the miners were ready to blast they would take down the canvas tubing, coil it up along the drift, and move it back a reasonable distance. At times some of the smaller pieces from the blast flew back and cut holes in the canvas, which damaged it considerably, and in addition, the tubing was subjected to the ordinary wear and tear of rolling it along the drift and coiling it up in places where there was frequently mud and water.

Some time ago experiments with small blowers and different kinds and sizes of ventilating pipe in 100 and 200-ft. lengths were made under my supervision. It was found that the velocity and volume delivered at the end of 200 ft. of 10-in. canvas tubing were considerably less than when delivered, under similar conditions, at the end of 200 ft. of 10-in. iron pipe. This made it evident that in order to deliver the same volume of air at the working face through canvas tubing that it is possible to deliver through the iron pipe, it is necessary to have a much larger size of canvas tubing, or else, if the same size tubing be used, the blower must be speeded up or a larger blower be installed. In places where the cost of power must be considered, the extra expense is important. Metal rings inserted in the canvas tubing at frequent intervals restore more nearly the condition effected through the use of the iron pipe, as they help to support the canvas, which otherwise would have only the air pressure as support. However, all these improvements add to the cost of the tubing, and there is some question, when all is considered, whether, even under these circumstances, it would prove as efficient as iron piping.

In the mines in some districts stoppings are called bulkheads. These are used to seal off dead workings, air leaks, or drifts and raises leading to stopes which are not in operation. A stopping which may be adopted as standard should be constructed as follows: Suppose a drift is to be bulkheaded. The ground is first cut out around the drift where the stopping is to be placed. After that, 4 x 6-in. posts are set up, three feet apart, across the drift. Then 1 x 12-in. boards are nailed to the posts, making a partition. Metal lath is tacked on to the boards. In case metal lath is not available, double wire netting with small-diameter openings may be used. A fine coating of cement, ⅜-in. thick, put on either by hand or with the cement gun, is then applied. If only old workings are to be sealed off, and it is desired that some air should be allowed to pass through them, the cement and boards in the stopping, near the center, should be omitted. For example, a space 2 x 2 ft. should be left, but the wire netting should cover the entire surface. Should it be found desirable to seal up this space later, a cement coating may be put over the wire netting.

Standardized Doors Should Be Used

All doors should be of standard size. In general, two standards are necessary. They are illustrated in Fig. 3 and Fig. 4. In Fig. 3 is shown the design of a door for both hand and mule tram. Fig. 4 shows a door for use in motor-haulage drifts. In the latter sketch details such as handles, hinges, weights, cable, pulleys and canvas are given. Fig. 4 also illustrates an air-controlled arrangement to be attached to the same door, so that motor trains may pass through without stopping.

The Canton automatic door has been installed in many mines and has given satisfaction when used against low pressures. Double doors should be placed in all important drifts where it is necessary to keep up either a high pressure or suction in order to force the air from the drift into more distant mine workings.

Regulator doors are constructed as are the doors, already mentioned, except that openings are cut in them and slides built in to regulate the flow of air. In this manner the volume of air to any area can be regulated so that all workings may receive their proportion of the air supply.

The necessary equipment in a mechanical ventilating system, such as doors, frames, hinges, weights, automatic arrangements, small motors, small blowers, and ventilating pipe, should all be standardized. Standard-size manways, timber compartments and chutes in raises should also be designed as an aid to the ventilating system.

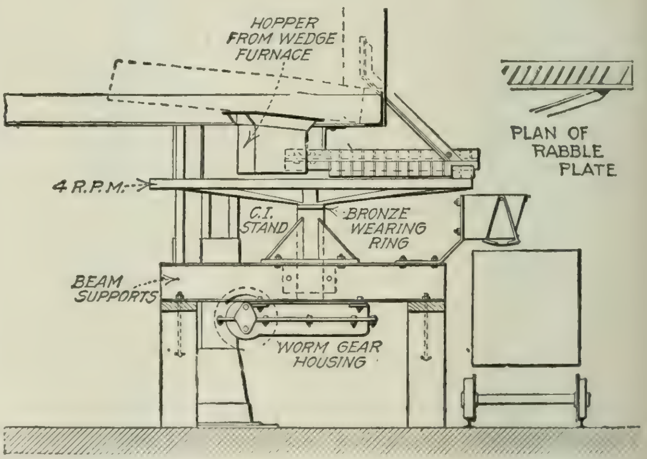
In order to maintain the maximum production, with a corresponding high standard in the quality of the work, it is absolutely necessary that every working place should have a good working atmosphere, and that the ventilation should be so kept up with the progress of the work that the men may continue to perform their duties in health and comfort. Mechanical ventilating systems which have been designed with careful study and are now in operation have fully justified the cost of their installation, as evidenced by the increase in tons per man per shift and the decrease in cost. In mines where such a system has been carefully worked out and conditions have been standardized as much as possible, there has always been a great saving in the amount of compressed air used. In fact, in some cases the economy in this item alone has more than balanced the cost of installation.

Conditions can be made standard in mines only where a complete mechanical ventilating system is in operation. Fewer men will be gassed in headings when standard equipments are available and installed before the atmosphere becomes dangerous. There will also be less decay of mine timber. Further experimental work may suggest the advisability of raising the standard of mine atmosphere.

Cooling Table for Roaster Product

By C. T. Rice

There are many ways of cooling the roast from a Wedge or other type of furnace. At smelteries where it is highly desirable, because of agricultural interests in the immediate vicinity, to avoid the discharge of all sulphur smoke except through the stack, the furnace product is sometimes cooled by means of a water spray on the bottom hearth, but at many smelteries such refinement in dealing with the smoke problem is not necessary. Under such circumstances the simple cooling table shown in the accompanying drawing, designed by Bradley, Bruff & Labarthe for use at the Bunker Hill smeltery, has much to recommend it.



COOLING TABLE FOR WEDGE FURNACE PRODUCT

This device consists of a rotating circular cast-iron table, driven by belt and worm gear from the same line shaft as the furnace. The roasted product falls on this, and is slowly worked over to the edge by a series of fixed rabble plates, and discharged into a hopper. From this hopper the product goes to a car, is weighed, sampled, and trammed to the steel bin which takes the Wedge roast. Water is sprayed on the roast in front of the fixed rabbles, in quantity necessary to cool it enough to permit mixture with the Dwight & Lloyd feed without injury to the belt conveyors used in making up the charge and in taking it to the different sintering machines.

Utilization of Mine-Accident Reports

BY D. E. CHARLTON

Economy in the operation of a mine should include low accident costs, which are obtained only by means of preventive measures. A suggestive scheme is presented for the graphic expression of injuries that makes practical use of data already collected and incorporated in the standard mine-accident report. Some of the essential points in the study of accident prevention are considered, as well as the results that may be secured by a careful study of accident occurrence.

THE standardization of mine-accident statistics has frequently been discussed, and through the excellent work of the Bureau of Mines most mining companies have followed a general form in the classification of accidents. Compensation laws of various states have made it compulsory that records of casualties be carefully kept, and mining companies in general have adhered to some plan or other which has enabled the public to know the manner in which their operations have been conducted and what efforts they have made toward providing safe working conditions for their men.

COMPILATION OF STATISTICS IS OF VALUE IN SAFETY WORK

Filling out accident reports involves considerable labor, regardless of whether the information is secured in a careful or a careless fashion, but, assuming that average care is used in compiling an accident report, it is certain that the information could be used to more advantage than as a mere history of a specific accident, and that a careful analysis of the data secured would show that a number of reports, covering various accidents and carefully compiled, would constitute a basis for systematic accident prevention. Many operators adopt too much of the attitude taken by the man who bought a pulmotor "not because we really need it or think it is a good thing, but because the public demand it and it is good advertising." Records are sometimes kept merely to satisfy public opinion and the state or Federal authorities, and little thought is given to the possibilities of the report after due acknowledgment has been made to the authorities.

ECONOMY IN UTILIZING MINE REPORTS

There is no doubt whatever that accident prevention pays, and that its cost must necessarily be a part of the total operating expense, and the same care and study should be applied to the curtailment of accident cost as to economy in other branches of mine operation. It is seldom that new drilling or pumping equipment is purchased and then discarded without sufficient reason; in every case an effort is made to realize the fullest capacity from the material on hand, and the same principle may well be applied to the collection and compilation of accident data.

I recollect that while talking to a safety inspector for one of the large mining companies he made the remarkable statement that for that particular month 90% of their accidents had been caused by the men getting dirt in their eyes. Upon investigation I found that this was not a fact. The man had known merely that a number of accidents had resulted from that cause. Nevertheless, he realized that here was a prolific source of accidents, and, aside from the inaccuracy of his remark, he appreciated the necessity of efforts to prevent that type of accident. But the practice of singling out only the frequent and the major accidents cannot be considered to afford reliable data for a study of accidents, of their cause and of means for preventing them. The operator does not base his cost of production on the prorated price of the articles which he uses most, nor on the ones which require the greater outlay of capital. And in making use of accident reports in building up a safety campaign, all the data which in any way relate to safety are of value.

STANDARD ACCIDENT REPORTS AID IN SECURING ACCURATE DATA

A careful study of a standard accident report will disclose latent possibilities. To many operators, a complexity of statistics is an abhorrence, and doubtless an overdoing in this direction will lead to indifference, but, with discretion, there is no reason why carefully prepared data cannot be classified in such a way as to be of great value to the mine manager and to those intrusted with the safety of the men.

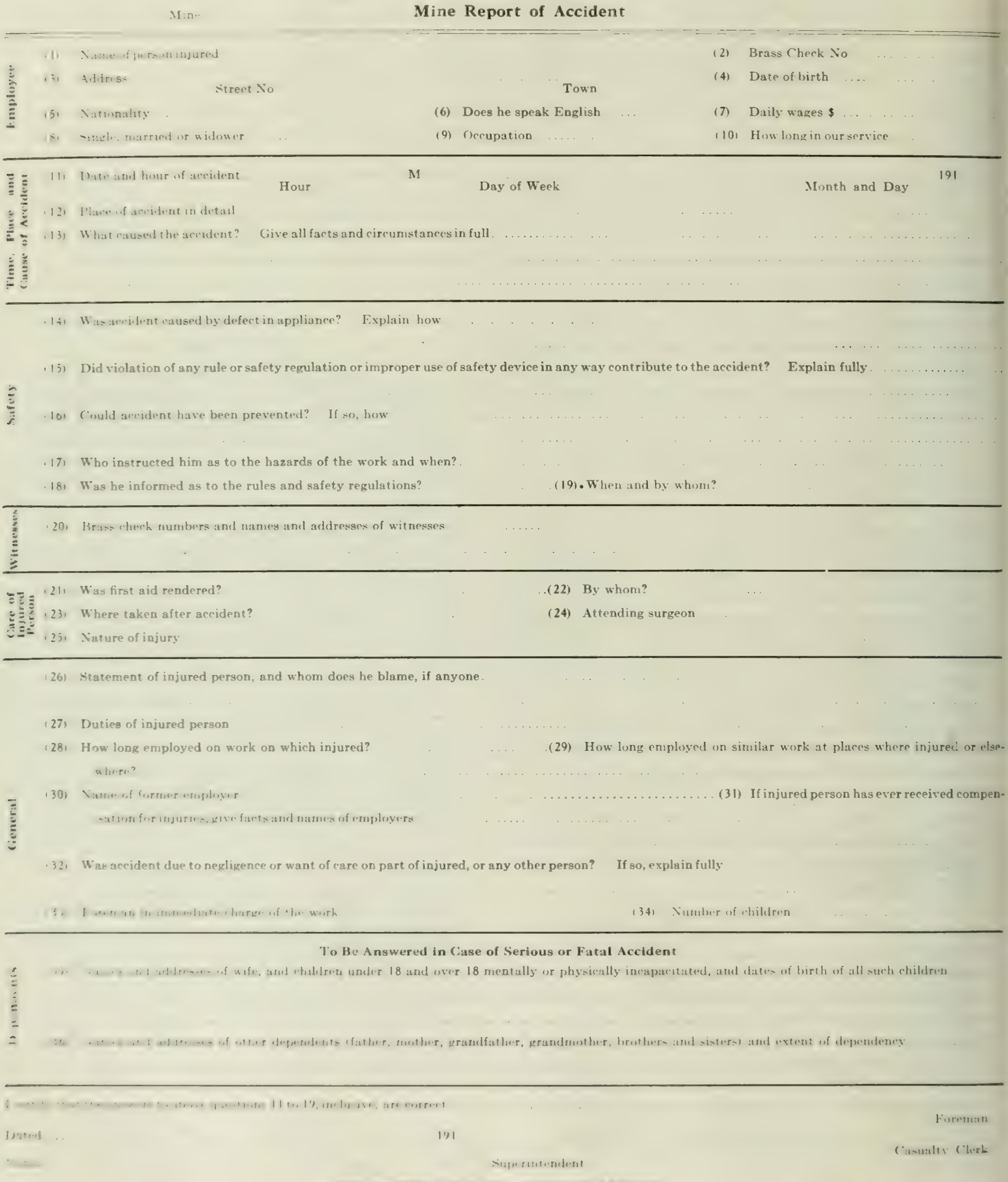
The modern idea of having professional medical attendance for all accidents, no matter how trivial, is generally accepted as good policy, not only because it insures a complete understanding of the nature of the injury, but for the additional reason that it often prevents developments which may result seriously. Further, it offers an excellent medium for the collection of accurate data, as most of the information required can be secured at the time of injury. All accidents should be reported, regardless of the extent of injury, for, unless this is done, certain occurrences which appear trivial may go unrecorded, frequently developing complications long after there is apparent reason to look for them, and because lack of continuity in the records will be an obstacle to the institution of a safety campaign.

KEEPING THE MEN IN TOUCH WITH SAFETY PROGRESS

A further argument in favor of carefully kept statistics is the psychological effect upon the men. No conscientious miner is content merely to blast his holes and then maintain indifference as to the manner in which the round has broken. He usually finds out what the results are, and not infrequently determines his plans for the next round or for future work by the manner of breaking. Assuming that safety and accident prevention have been given prominence, the men will naturally show interest in the progress which is being made, and the mine safety bulletin board may be supplemented to excellent advantage by the posting of plats and charts showing the progress or retardation of safety work. The manner of preparing charts and diagrams is limitless and lies entirely with the man in charge of the work, who can use his judgment in presenting those phases which he considers as best fitted to bring out the points he wishes to emphasize.

In suggesting various ways in which the compiled accident statistics may be made of value, I have made use of an accident report, shown in Fig. 1, which has been adopted as a standard by one of the larger iron-mining companies and embodies a mass of information which, if properly secured, constitutes not only a valuable record but a means of presenting the particular accident to the safety engineer or safety committee in such a way as to facilitate a study of the case and suggest a remedy. In common with most accident reports, its adoption was not agreed upon until it was found to embrace all necessary points.

A study of the report in Fig. 1 will show that some



Mine

Mine Report of Accident

Employee

(1) Name of person injured (2) Brass Check No
(3) Address Street No Town (4) Date of birth
(5) Nationality (6) Does he speak English (7) Daily wages $
(8) Single, married or widower (9) Occupation (10) How long in our service

Time, Place and Cause of Accident

(11) Date and hour of accident Hour M Day of Week Month and Day 191
(12) Place of accident in detail
(13) What caused the accident? Give all facts and circumstances in full

Safety

(14) Was accident caused by defect in appliance? Explain how
(15) Did violation of any rule or safety regulation or improper use of safety device in any way contribute to the accident? Explain fully
(16) Could accident have been prevented? If so, how
(17) Who instructed him as to the hazards of the work and when?
(18) Was he informed as to the rules and safety regulations? (19) When and by whom?

Witnesses

(20) Brass check numbers and names and addresses of witnesses

Care of Injured Person

(21) Was first aid rendered? (22) By whom?
(23) Where taken after accident? (24) Attending surgeon
(25) Nature of injury

General

(26) Statement of injured person, and whom does he blame, if anyone
(27) Duties of injured person
(28) How long employed on work on which injured? (29) How long employed on similar work at places where injured or elsewhere?
(30) Name of former employer (31) If injured person has ever received compensation for injuries, give facts and names of employers
(32) Was accident due to negligence or want of care on part of injured, or any other person? If so, explain fully
(33) Foreman in immediate charge of the work (34) Number of children

To Be Answered in Case of Serious or Fatal Accident

Dependents

(35) Names and addresses of wife, and children under 18 and over 18 mentally or physically incapacitated, and dates of birth of all such children
(36) Names and addresses of other dependents (father, mother, grandfather, grandmother, brothers and sisters) and extent of dependency

I certify that the answers to above questions 11 to 19, inclusive, are correct

Foreman

Dated 191

Casualty Clerk

Superintendent

FIG. 1—FORM OF MINE-ACCIDENT REPORT

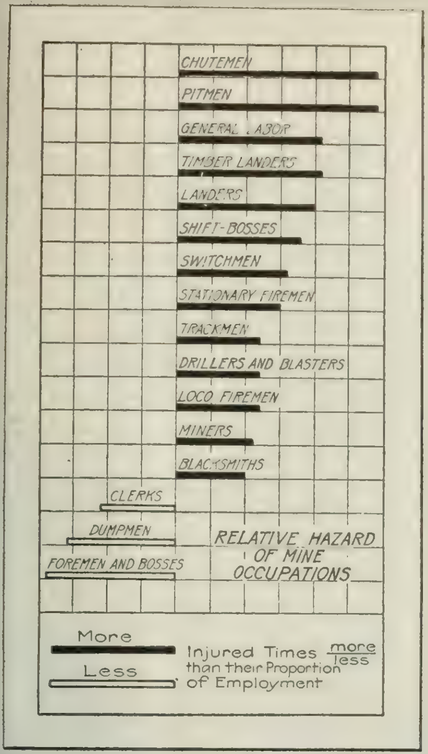


FIG. 2

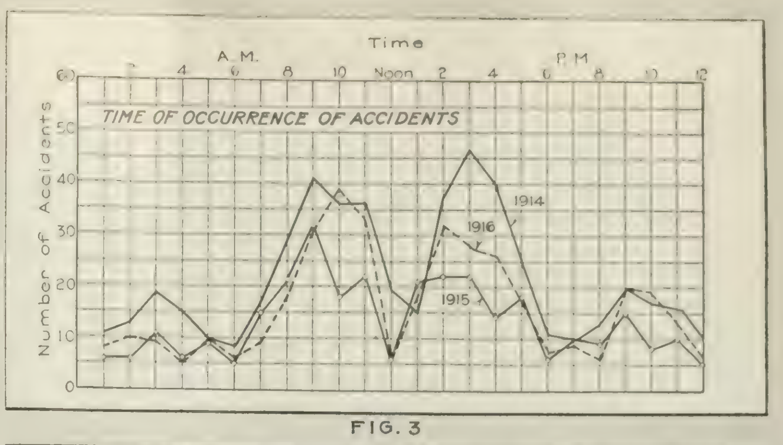


FIG. 3

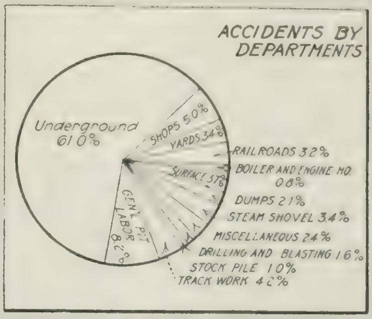


FIG. 4

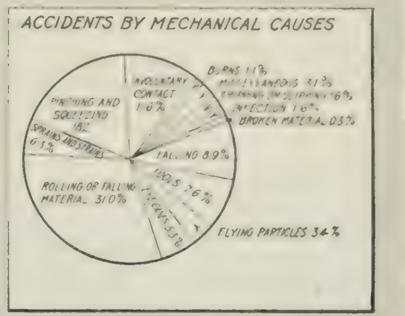


FIG. 5

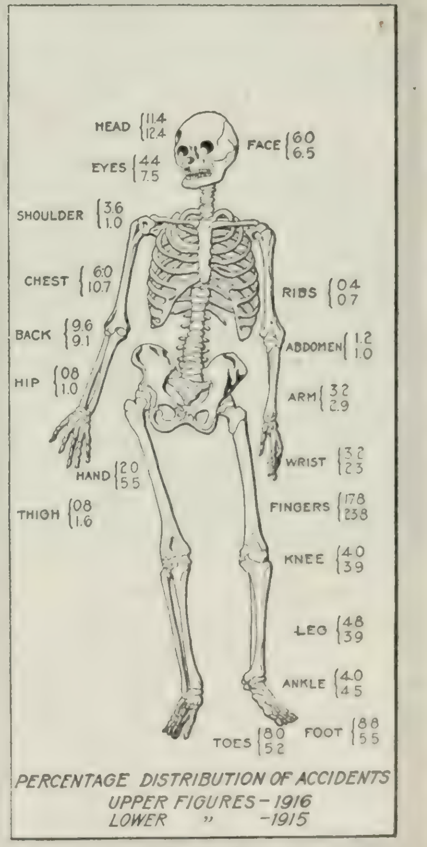


FIG. 6

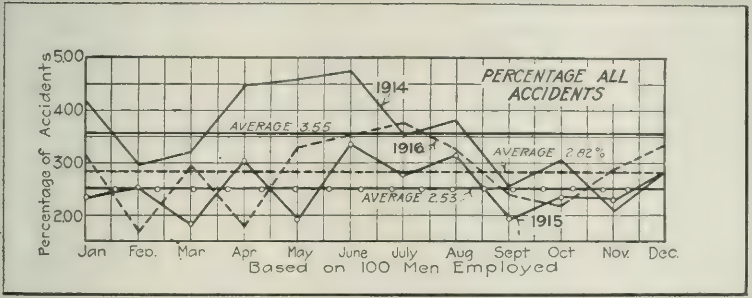


FIG. 7

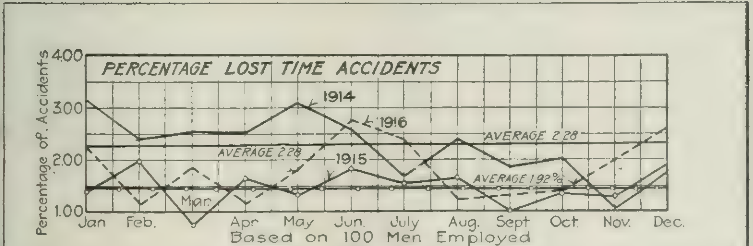


FIG. 8

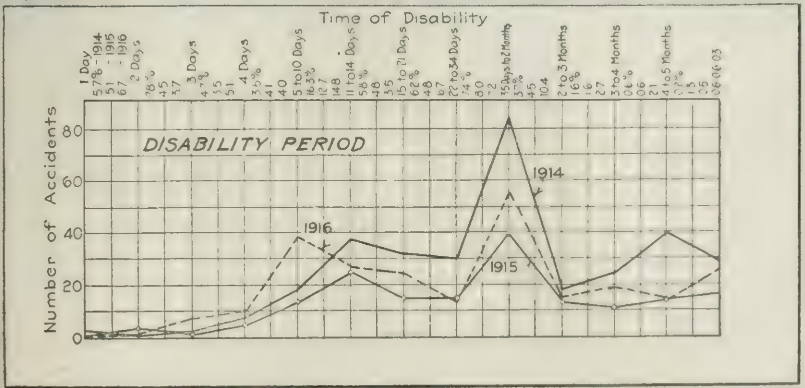


FIG. 9

FIGS. 2 TO 9. GRAPHIC METHODS OF REPRESENTING MINE-ACCIDENT STATISTICS of the data are not necessary for consideration from the safety standpoint, although of unquestioned value as a history of the injured man. Just how much of the report may be of local value in the compiling of statistics depends largely on the judgment of those in charge of the work. Figures to show the occupations, periods of service and ages as relating to employees are of interest in collective quantities. Fig. 2 shows a "relative hazard" chart, based on the number of serious accidents which occurred during a two-year period, and considers only the occupations which were affected by those accidents. In preparing the chart, the total number of men in each occupation was used in comparison with the number injured in that occupation. The graph represents the number of times greater or less than their proportion of employment that the men in each division were injured. In view of the fact that a comparatively short period is represented, and that the number of accidents is small, the graph cannot be said to be representative or conclusive, but nevertheless it is an argument for the continuance of accident statistics, as each additional year will show a better average of the figures represented.

OTHER GRAPHIC METHODS OF PRESENTING ACCIDENTS

The time, place and cause of accident are subjects that should receive special study, not only in the individual case but as covering a number of accidents as well. Fig. 3 represents the hours at which accidents occur and is based on a three-year period. It may be mentioned, however, that the results obtained in a graph of this sort may be scattered unless some attempt is made at a separation of the two- and three-shift basis. That the graph maintains such continuity is accounted for by the fact that the ratio of the two-shift to the three-shift phase remains fairly constant during the three-year period and that the relation of the underground accidents to those occurring on the surface was approximately the same. Fig. 4 shows another method of comparing accidents, and the varying percentages of different departments are expressed. Only a one-year period is considered, and the percentage is based on the total number of accidents occurring. The mechanical causes, as found in the answers to question 13 of the report, expressed in a chart similar to the one used in Fig. 4, are shown in Fig. 5.

It has been my experience that the answers to the questions in the group relating to "safety" are subject to doubt as to their reliability, because not infrequently too much personal opinion is likely to be recorded. The report is usually made out by a foreman, a shift boss or a timekeeper, and though the intention, in making the report, may be good, judgment is sometimes made in haste and without taking account of all the circumstances involved. However, this part of the report may be changed, if necessary, in making up the figures to show comparative results in this group.

It may not be amiss at this time to emphasize an important factor that is worth consideration in accident prevention. That is the interpretation of the division which it is possible to make between "preventable" and "unpreventable" accidents. This is a matter which is dependent largely on the degree of thoroughness with which accidents and their causes are studied. If it be assumed that all accidents, barring of course those due to natural occurrences, are preventable, there is then afforded a tangible basis on which to build up the manner of prevention, whereas if all accidents be attributed to "hazards of the industry," and are assumed to be unpreventable, further research, frequently of value, will be discouraged. Each accident should be made a special object of study, and a practical method of preventing its recurrence should be suggested and put into application. Several companies have adopted the practice of making a periodical examination of all accident reports, preparing a record of their conclusions and carrying out the suggestions made. This policy, supplemented by other preventive methods, has attained excellent results in cutting down the number of accidents.

The value of the diagram presented in Fig. 6 may be questioned, but the figures show comparatives, and the representation is such as to draw attention on the mine bulletin board. In this figure the percentages of accidents are presented as to their distribution in various parts of the body and represent the comparison of injuries for two years, the information being secured from a compilation of the answers given to question 25 of the report.

Figs. 7 and 8 were plotted from calculated percentages based on accidents and the number of men employed. In Fig. 7, all accidents were considered, whereas in Fig. 8 only those which entailed the loss of time. The percentages shown in Fig. 9 were computed on periods of lost time which resulted from accidents, and, necessarily, only those involving loss of time were set down. The total percentage for any one year, as expressed in the graph, will equal the percentage represented by the lost-time accidents as compared to all accidents which occurred during that year. The mine report does not provide for a statement of the time lost on each accident, but this is always kept as a supplementary record, and should be available.

Primarily, the solution of the safety problem is education, and the suggestions included in this paper form only part of a general scheme that must be adopted if accidents are to decrease in number and in serious results. Statistics are of value only when showing a result attained or one to be attained, and the information gathered from mine-accident reports may be made of value in determining methods of preventing accidents.

Injury to Trespassers

BY A. L. H. STREET*

A path, leading between nearby mining towns and constantly used by the public as a footway for years, extended over defendant mining company's premises and within a few feet of a building in which defendant kept dynamite caps in an open box within plain view of passers-by. Plaintiff, an eight-year-old child, in passing stepped into the building, procured a cap and was injured in its accidental explosion.

Under these circumstances, the Michigan Supreme Court holds in the case of Anderson *vs.* Newport Mining Co. (168 *Northwestern Reporter*, 523), that defendant was properly held liable in damages on the theory of negligent failure to adequately guard against the natural tendency of children to do just what plaintiff did.

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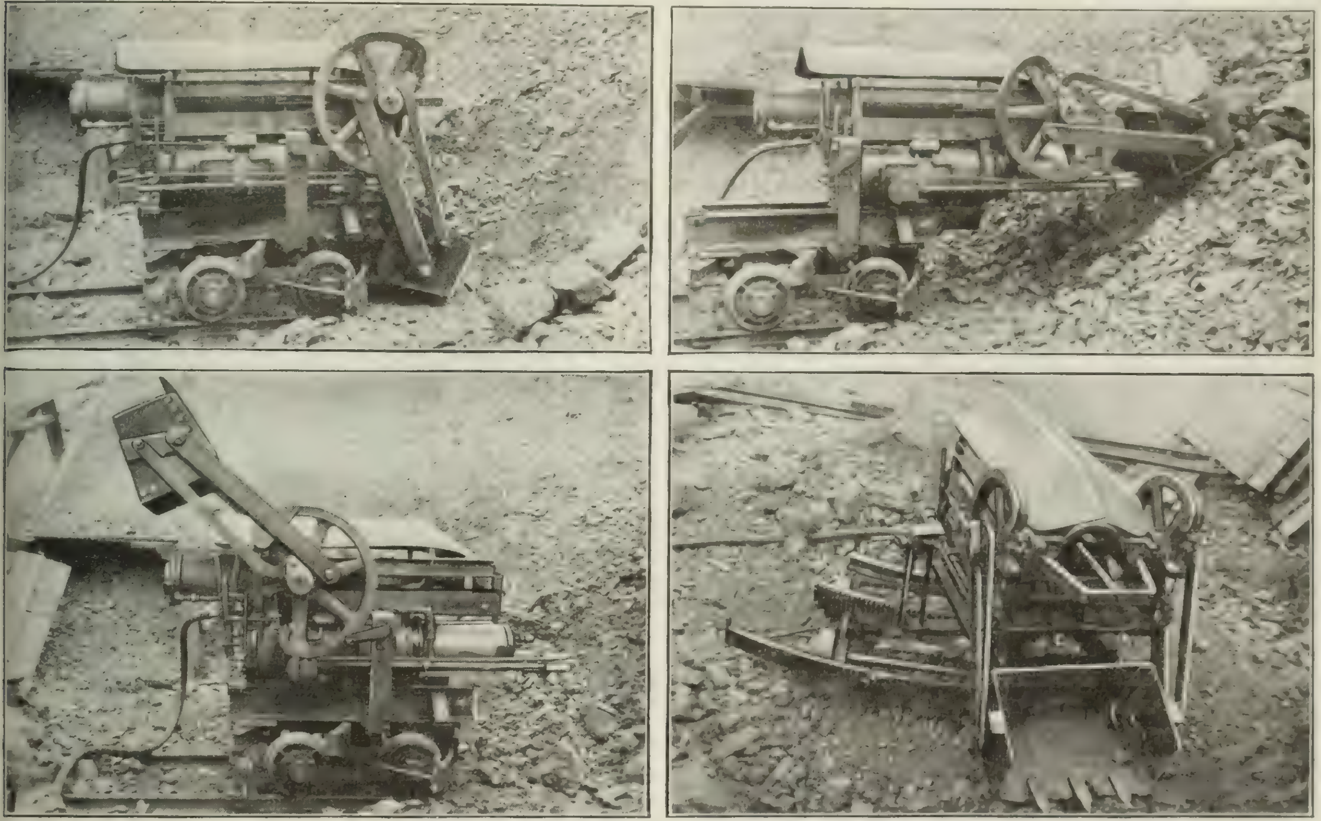
Armstrong Mechanical Shovel

THE demand for ore-shovelling machines for underground work has of late increased materially, and this condition will doubtless continue, as it has already been demonstrated that mechanical shovelling produces a greater tonnage than is possible by hand labor. In open-cut mining where the deposits are of sufficient extent, large-capacity steam shovels of standard types have been adopted, but in underground operations varying conditions have presented many problems for the designers of ore loaders.


ARMSTRONG MECHANICAL ORE-LOADING SHOVEL

In the design of the Armstrong shovel, which is shown in the accompanying cuts, several special requirements have been met successfully, and the type, as now developed, combines simplicity, small size, flexibility and portability, which, together with a moderate first cost and low upkeep, makes the machine desirable for underground use. The shovel consists of three principal parts: A truck suitable to the gage of the mine track; a platform that permits lateral swing, and a body-piece that rolls forward and back on a track provided by the platform. The body-piece consists of four cast-iron cylinders and a crosshead, which travels in horizontal guides and carries rope sheaves, the dipper arms, and the dipper.

In operation, the swinging of the shovel is done by hand, and the shovelling motion is obtained by the cylinders, which use direct air and require no gears, clutches, belts, or conveyors. The bottom cylinder pushes the body-piece forward, the center cylinders turn the dipper through 90°, and the top cylinder pulls back the crosshead. This carries the dipper up and over, where it is discharged into a car at the rear of the shovel. Simultaneously, the bottom cylinder pulls the body-piece to the rear, and this reversal brings the dipper back to the starting position in the front of the shovel. Each of the center cylinders is provided with a plunger piston, the center of which is bored and contains a stationary piston anchored by a rod to the back head, the space inside this latter piston being partly filled with oil. The effect of this arrangement is to limit the speed of the digging part of the stroke. This is necessary when the dipper strikes a solid piece of rock and the resistance causes a temporary building up of air pressure behind the piston. Without this provision the dipper, in sliding to one side of the obstruction, would be thrust suddenly forward, causing all the dirt to be thrown out.

The bottom cylinder which crowds the body-piece forward and pulls it back is smaller than the center cylinders and exerts a forward push at the point of the dipper-lip of about 1200 lb. The pressure given by the center cylinders is 3600 lb., so that if the dipper catches on solid ground, the push of the center cylinders will overcome the forward thrust of the bottom cylinder and thus force the body-piece back until the dipper clears the obstruction. Then, owing to the oil control, the dipper will move up slowly, while the bottom cylinder, with no oil control, shoves the body-piece ahead quickly, burying the dipper in the dirt after clearing the obstruction.

The shovel is 6 ft. long, 4 ft. wide and 4 ft. high, and on the upper extension allows headroom of 6 ft. 8 in. above the top of the rail. The swing allows a clean-up of 9 ft. The daily capacity depends on the speed with which cars are supplied, but it is claimed that a small shovel loaded 105 tons in seven hours at the plant of the American Zinc Co., Mascot, Tenn. The Armstrong Shovel Co., Vulcan, Mich., are the manufacturers, and F. H. Armstrong is president and general manager, and William Kelly, secretary and treasurer.

The Corrosion of Iron Piping*

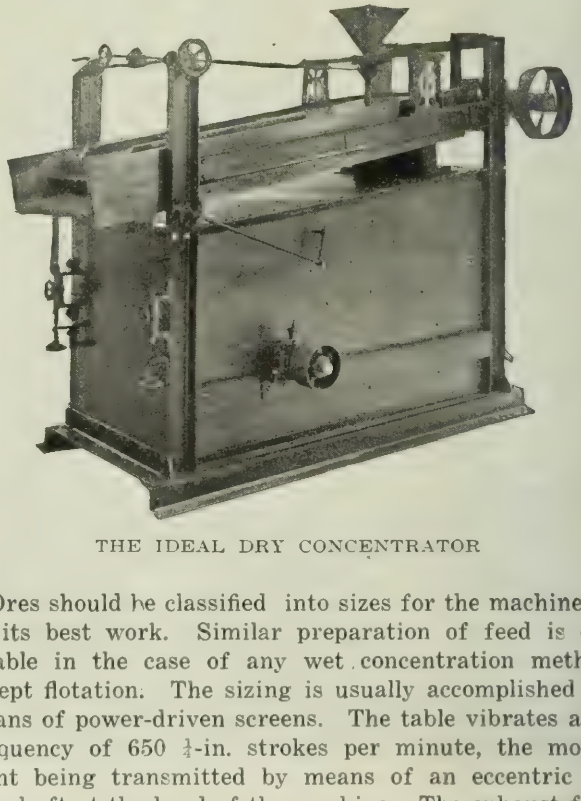
With reference to the corrosion of iron or steel piping by water, it is possible to classify the latter under one or two types, which may be distinguished by the terms "active" or "inactive." The quality of activity is not primarily dependent upon the acid, alkaline, or neutral condition of water, but, rather, is contingent on certain dissolved substances which exert a modifying influence upon the universal tendency of even the purest water to cause corrosion. This characteristic will be increased in those cases where dissolved gases exist in the liquid; and, under such conditions, the term "active" typifies its corrosive qualities. An inactive water is one that cannot promote, in any marked degree, the corrosion of iron. The sharp boundary between the behavior of these two types of water furnishes a sufficient reason for thus distinctively classifying them. It is a simple matter to demonstrate the fact that an inactive water, after a few minutes' aëration, becomes capable of great damage to iron.

Every metal, when placed in water, is subjected to a fixed tendency to go into solution. This effect is wholly a matter of electrochemical activity, and varies to a definite extent with each metal. The initial reaction in the process of corrosion of iron by water is exactly analogous to its solution in acid. Water exists in the liquid state not only in the form of its molecule, but also as ions. These are formed by the breaking up or dissociation of the molecule, and are called the hydrogen and hydroxyl ions, the former bearing a charge of positive electricity, and the latter a negative charge. All water is broken up in this way, although the proportion actually so dissociated is extremely minute. Acids, like water, are ionized, but to a far greater extent, into hydrogen ions and those formed from the remainder of the acid molecule. The net result of the presence of an acid in water is, therefore, to increase the amount of positively charged hydrogen ions present. It is the concentration of these hydrogen ions in water that determines its ability to attack iron; indeed, the initial speed of attack is proportional to the number of hydrogen ions in the water. It is thus easily understood that, though pure water, with its low concentration of acid ions, is capable of inducing the corrosion of iron, water containing an acid will be proportionally more ruinous to the metal. It is, therefore, a fact that the tendency of iron to corrode depends to a certain degree upon the amount of acid present in the surrounding water. Corrosion, however, may be arrested even in a distinctly acid water. With this in view, too much emphasis cannot be laid upon the fact that two definite conditions must be recognized, under one of which water acts as a corrosive liquid, though harmless under the other.

In broad terms it may be stated that corrosion is purely an electrochemical phenomenon, due to the fundamental nature of water itself, but aided by even a minute acidity. Also that corrosion is promoted, and made progressive and continuous, by the action of dissolved oxygen in water, the gas acting as a depolarizer, and thereby carrying on the activity of the corrosion process.

Ideal Dry Concentrator

A dry concentrator recently placed on the market by the Ideal Concentrator Co., of 140 Nassau St., New York, has a number of novel features. Separation of mineral from gangue is made by means of a current of air drawn through the machine by an exhaust fan. This current lifts and carries away the particles of lighter specific gravity; and suitable controlling apparatus makes it possible to regulate the distance between the bottom of the suction plate and the top of the ore-distributing plate, thus insuring satisfactory separation under a wide range of conditions.



THE IDEAL DRY CONCENTRATOR

Ores should be classified into sizes for the machine to do its best work. Similar preparation of feed is desirable in the case of any wet concentration method except flotation. The sizing is usually accomplished by means of power-driven screens. The table vibrates at a frequency of 650 ½-in. strokes per minute, the movement being transmitted by means of an eccentric on the shaft at the head of the machine. The exhaust fan, which operates at a speed of 1300 r.p.m., is inclosed in the machine, and is driven by means of belt connection with the pulley shown in the accompanying cut.

The ore, crushed to proper size to liberate the mineral from its associated gangue, and classified, is fed into the ore feed hopper *A*. It passes through the feed valve *B* and through the flexible feed pipe *C*, settling on the distributing plate *D*. The table *HH* is mounted on spring supports, *KK*, and is vibrated by means of an eccentric, *I*. The ore is fed between riffles *E* on the inclined table. As the ore travels downward, the lighter material is lifted and carried away through perforations in the suction plate *F* by the air which is drawn in at the lower end at *R*. The heavier mineral remaining on the table continues its downward course, and discharges at the lower end, at *R*, as a concentrate.

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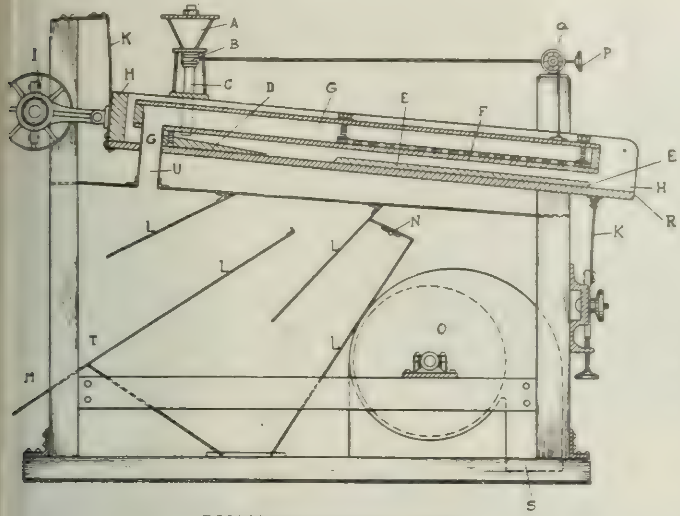
*Excerpt from a paper by F. N. Speller and R. G. Knowland in Journal of the American Society of Heating and Ventilating Engineers.

As the ore passes over the surface of the table, air is drawn into the lower end at *R* by the action of the fan *O*, which exhausts through regulation valve *N* around the baffles *L*, along the channels *GG* and through the openings in the perforated plate *F*; thus drawing the lighter gangue or mineral, as the case may be, from the ore being treated, and carrying it along to be deposited, by contact with baffles *LL*, in the lower compartment *T* as a tailing. This tailing is automatically discharged through the self-acting valve at *M*. The air drawn by the exhaust fan, after being freed of the tailing by means of the baffles, continues through an air-regulating valve *N*, then through the fan, and is finally discharged through *S* into the outer air, or, where necessary, into a dust chamber.



CONCENTRATOR PARTS

A, feed hopper; *B*, ore feed valve; *C*, flexible feed tube; *D*, ore distributing plate; *EE*, riffles; *F*, perforated plate (bottom of suction box); *GG*, passage for air and tailing; *HH*, vibrating table; *I*, eccentric; *J*, drive pulley; *KK*, supporting steel springs; *L*, baffles; *M*, tailing discharge; *N*, air-regulating valve; *O*, exhaust fan; *P*, feed valve handle; *Q*, suction-box adjustment; *R*, concentrate discharge; *S*, exhaust air discharge.

This machine is designed to treat any material suitable for concentration if the metal to be recovered is in the mineral and the associated gangue is lighter than the mineral to be saved. In the treatment of complex ores associated with a gangue of lower specific gravity than the mineral, the gangue is first removed by preliminary dry concentration on one of the machines described, and the minerals contained in the concentrate are separated in a subsequent operation.

All controlling mechanisms are conveniently situated and can be easily and quickly adjusted while the machine is in operation, thus making it possible to treat all sizes of material consecutively on one machine. The discharge of concentrate is always in sight of the millman, and the product can be readily kept up to the required standard. The ease of adjustment makes it possible for one millman to operate a number of machines. The product, which is dry, is immediately ready for shipment.

The concentrating machine, with the exception of the vibrating table, which is of wood, is constructed of steel, iron and aluminum. Its capacity is from five to eight tons per day, depending upon the character of the ore. The capacity can be increased by using the machine first as a rougher producing no middling product, and then again to clean the concentrate, if expedient. Material dry enough to be screened can be treated satisfactorily. The machine does not require more than ½ hp. for operation, occupies only 7 x 3½ ft. of floor space, and is 5 ft. high at its highest point. Its total weight is 1200 lb. The heaviest section weighs 200 lb. The machine can be shipped whole or knocked down.

Diamond Cutting for Disabled Men

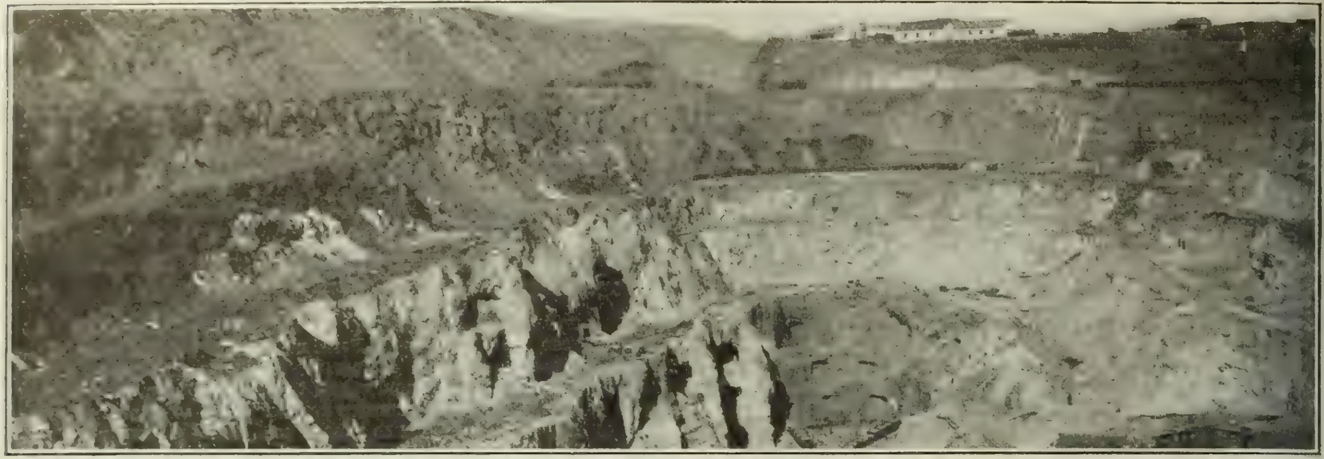
At the fifth annual meeting of the South African Diamond Corporation, the chairman, Bernard Oppenheimer, drew attention to the fact that he had personally instituted a plan for finding employment for legless sailors and soldiers, and a diamond-cutting factory is now in operation at Brighton. Mr. Oppenheimer, in explaining the objects of the project, said:

> As an entirely private enterprise I purposed training up to 2000 disabled men, the Ministry of Pensions merely paying them their training allowance of 27s. 6d per week for six months, as under all training schemes. I undertook to pay the men a minimum of £2 per week after six months' training, and to guarantee continuous employment for three years; and, though I bound myself to the men, the men are not bound to me, but can leave me at a moment's notice if they can earn higher wages elsewhere.
>
> Ninety-nine per cent. of the diamonds produced come from British dominions; yet all this wealth was previously exported in the raw state to the Continent to be polished, and the wages were, consequently, lost to the British workman. Any number of fairy stories were circulated by interested parties, when I started the scheme, that diamond cutting could not be learned or acquired except by long years of practice, and even then it was said the British workman would prove incompetent. I was always, long before the war, of a different opinion, but could not find adherents; but the old idea took hold of me again to start a diamond-cutting factory to keep, anyhow, part of the wages in the country, but to start it with men who were broken in the war. In short, I conceived the idea that, being too old myself to fight in the trenches, I could oppose the enemy commercially, and could find work—and remunerative work, not charity—for men who were prepared to lay down their lives for you and for me so that here we could live in peace.
>
> The world, to my mind, is big enough for everyone. It would be foolish to say that I want to create a monopoly for cutting and polishing diamonds in England. In my attempts to establish an industry I do not intend, and never have intended, to go against our ally, gallant Belgium; but I do say we here are entitled to do some of the work, and I maintain that by doing it we are not only not competing with Belgium, but an interchange of workmen at a later date will make the industry more stable in both countries, and will not make it easy for the enemy, after peace is declared, to foster another industry on which he had an eager eye. It is a well-known fact that before the war Germany had begun on a big scale to polish diamonds, and most of these diamonds were sold to them in the raw state by Belgian and Dutch merchants, who bought more raw material in England than they manufactured. This I aim at stopping. The raw article, or, as we term it in the trade, the rough diamond, which was traded in Germany before the war, must be manufactured in this country and the wages must go to the British working man.

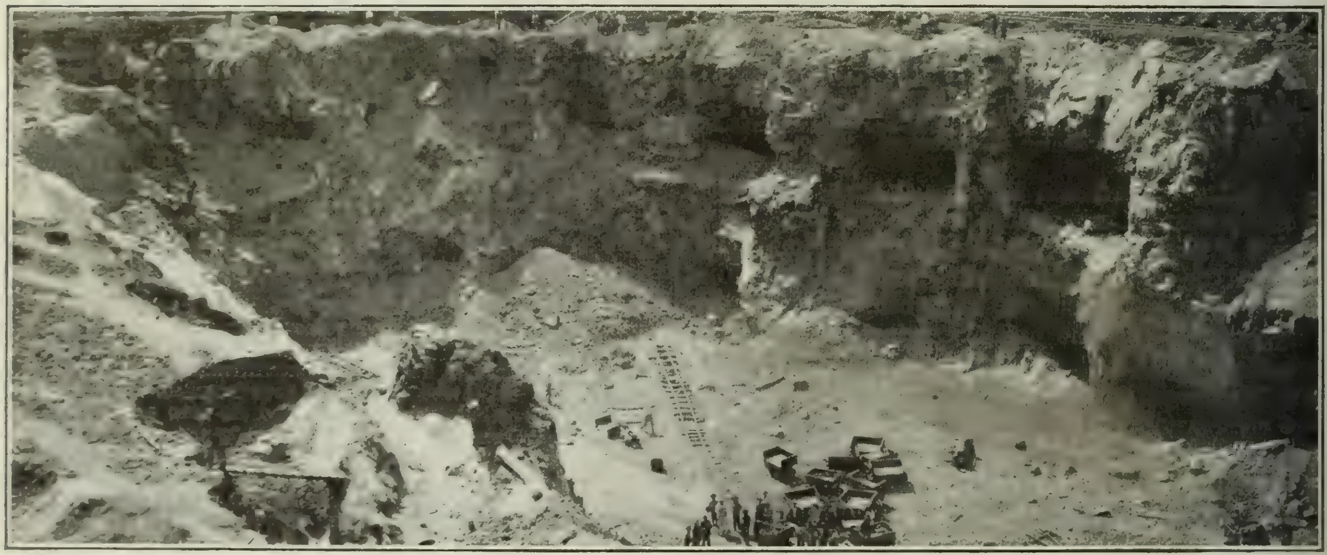
The chairman said that the results, after 12 months of experimental effort, were proving successful. The company has been accorded the privilege of joining in the enterprise as soon as it had reached the productive stage; and it was expected that conditions would justify this step in the near future.

At the Turf Shaft of the Village Deep mine, on the Rand, it was found that the slotted steel guides in use were wearing badly on one side. The unevenness was found to be due to the spin of the winding rope; and in order to make the guides last as long as possible, new winding ropes needed were ordered with the lay in the opposite direction to those used formerly. This proved satisfactory, and further wear on the thinner side was eliminated.

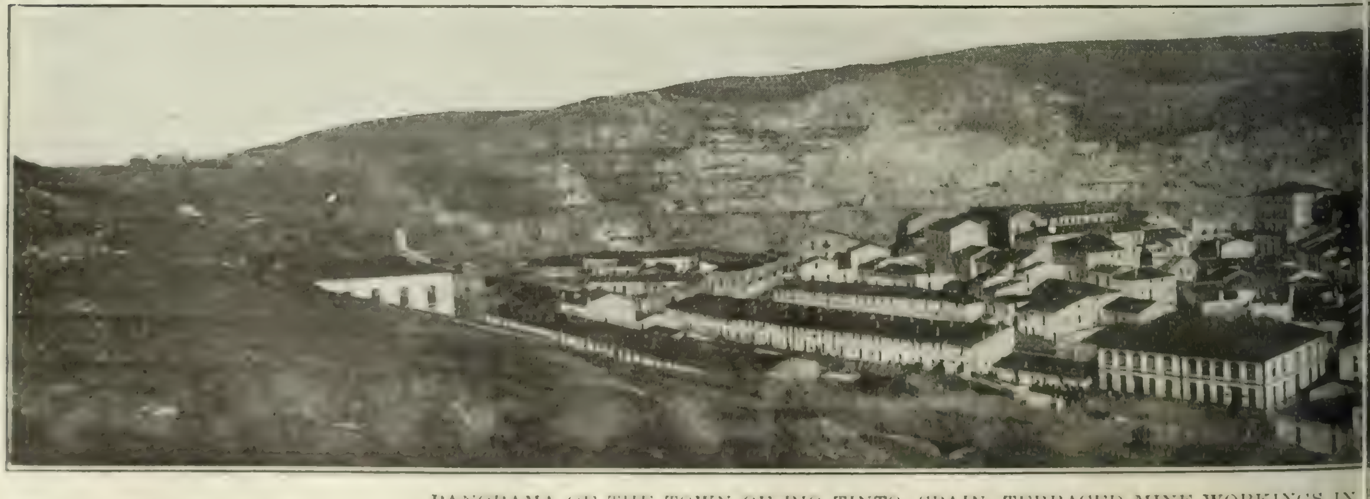
The Rio Tinto Copper Mine, in Spain



CORTA DEL LAGO, AT RIO TINTO



CORTA DEL LAGO (PIGUERA), SHOWING LOWER WORKINGS OF CUT



PANORAMA OF THE TOWN OF RIO TINTO, SPAIN. TERRACED MINE WORKINGS IN

THE SAN DIONISIO MINE IS THE DEEPEST OF THE RIO TINTO GROUP

CORTA DEHESA, AT RIO TINTO, SHOWING TERRACED WORKINGS

GROUND. THE SMELTERY IS AT THE RIGHT, BUT IS NOT SHOWN IN THE PHOTOGRAPH

Wages, Working Costs, and Ore Reserves Of the Rand

BY A. COOPER KEY

The Rand gold field is the most important gold-producing area of the world, and the question of ore reserves and output will materially affect future international economics. The writing off of a vast tonnage of ore reserves as unprofitable rock, containing insufficient gold to warrant the expense of extraction under existing conditions, is due to abnormal increases in operating costs and to the stationary value of the product.

AT SHORT notice, the engineers of the Johannesburg municipality power station struck for a wage of £8 2s. per week, the men to receive, also, a fortnight's holiday on pay, and pension privileges. The council offered £7 10s., and agreed to arbitrate, but the engine drivers would not accept the proposal; and, after they had held up traction and lighting for three and a half days, the municipality surrendered. The actual resolution also gave a rise of 25% to artisan and unskilled employees who were not earning the £8 2s. per week. This general advance has involved the municipality in a deficit of £205,000; and the amount of revenue to be raised is equal to £15 per head of its by no means large population, 130,000.

The engineers did not base their demands on the rise in cost of living, which is determined monthly by a specially appointed commission, but on the simple and brutal argument that they were entitled to sell their labor at the highest possible price, as the shopkeepers sold their goods at the maximum profit. The commission has estimated the rise in cost of commodities to an average family at 35% on pre-war prices; but if rent, which forms a large item in the budget, be taken into account, it is only 25%. In point of fact, the rise in the cost of living varies with every individual circumstance. The single man is as well off as ever he was. Board and lodging have gone up 10s., to £9 or £10 per month, for high-class accommodation. The man with a family, however, is hard hit, owing to the high cost of clothing and other necessaries.

The railways of South Africa, which are state owned, and the mining companies, have met the position by means of a graduated war bonus to married men and single men with dependents, compensating for the greater part of the increased living costs. There are salary limits on the principle that the higher paid men are able to bear the whole of the increased cost themselves, as their share of the burden of the war.

Mine and Municipal Mechanics

As soon as the municipality employees were given the basic wage of £8 2s. per week, the mechanics employed in the mines, who receive 2s. 6d. per hour plus 3d. war bonus, equal to £6 12s. per 48-hour week, naturally thought that they should do equally as well. The Federation of Trades deplores the sectional action of the A. S. E., and realizes the dangers attendant on the demand for equal treatment.

Gold is one of the few things which has not increased in price; indeed, it is really lower, owing to the higher cost of realization, 25s., against a pre-war charge of 7s. 7d. per £100. Before the war the average Rand profit was about 9s. per ton, several mines making only about 6s. The latter figure is now the average. Working costs have risen from 17s. to 20s. 8d., and if this rise of 3s. 8d. (not so far short of a pennyweight per ton) be accompanied by a drop of only 1s. per ton in grade, the effect will be to wipe off the profit of the lower-grade mines. The blunt fact is that 20 out of the 50 producing mines of the Rand

RAND ORE RESERVES—REVISED FIGURES

Producing Companies	December, 1916(*a*) Tons	Dwt.	In.	December, 1917(*a*) Tons	Dwt.	In.
Aurora West.......	502,320	5 6	41 7	(*m*) 399,275	5 54	41
(*m*)	68,500	5 2	42	(*m*) 38,500	5 54	42
Bantjes Con. .... (*b*)	412,000	5 6	42	(*b*) 470,100	6 0	44
Brakpan ..	3,054,000	9 2	62	3,268,000	9 2	67
City Deep .... (*b*)	3,676,087	9 0	60	(*b*) 3,326,900	9.0	55
City and Suburban.	602,200	8.8	51	511,900	7.7	58
Con. Langlaagte.... (*c*)	2,174,536	6.2	49	(*c*) 2,132,778	6.0	53
Cons. Main Reef....	856,740	7.51	48.2	1,002,740	7.66	50
Crown Mines......(*b*)	11,429,000	5.9	66	(*b*) 8,988,000	6.3	64
Durban Rood Deep(*b*)	1,259,300	6 3	48	(*b*) 1,174,200	6 5	50
East Rand Prop...	4,200,000	6 1	56	2,732,000	6 2	59
Ferreira Deep. .	1,854,100	8 3	70	1,632,609	8.3	
Geduld Proprietary	2,150,000	7 4	60	2,200,000	7.5	61
Geldenhuis Deep.. (*b*)	1,616,000	5 9	55	1,811,000	5 8	53
Ginsberg (*c*)	270,504	5 6	51	(*c*) 169,722	5 6	50
Glencairn . . (*c*)	76,560	4 6	90	(*c*) 11,600	4.63	50
Govt. Areas (Modder).............(*c*)	4,930,000	7.2	75	(*c*) 7,016,000	7.5	79
Jupiter	829,500	5 0	.	858,000	5.24	.
(*m*)	157,800	5.5	..	(*m*) 122,000	4.80	
Knights Central....	296,800	5.35	63	(*b*) 280,800	5.86	68
Knights Deep......	2,614,000	4.4	..	2,301,000	4.4	
(*m*)	71,000	4.1		(*m*) 37,000	4.32	..
Langlaagte Estate...	1,161,119	6.08	50	1,315,813	5 58	54
Luipaards Vlei Estate	826,138	5.67	..	792,400	5.48	..
Main Reef West....	386,960	5.73	50	487,030	5.92	50
Meyer & Charlton..	512,787	14.5	51	493,194	17.66	49
(*m*)	161,410	17 1	47	(*m*) 59,750	13.34	49
Modder B . .	3,371,950	9 2	59	3,523,810	9.2	616
Modder Deep......	3,320,000	8.4	78	3,320,000	8.7	782
New Goch.........	404,185	5.32	77	214,877	5.27	802
(*m*)	48,100	4.76	..	(*m*) 23,701	4.93	.
New Heriot........	477,767	7.6	..	335,000	7.14	.
New Kleinfontein . (*c*)	2,943,994	5.4	61	2,214,000	5.64	61
New Modderfontein(*b*)	8,013,370	8 4	61 5	(*b*) 8,914,400	8.5	66
New Primrose . (*c*)	205,311	5.2	54	(*c*) 167,900	5.2	53
New Unified (*c*)	377,264	5 9	46	(*c*) 247,843	6.4	47
Nourse Mines ... (*b*)	2,169,300	6 2	5 6	(*b*) 2,160,400	6 4	54
Princess Estate. ..	476,000	7 1	27	503,000	7.1	35
Randfontein Central(*i*)	4,944,302	7.8	..	5,185,000	6.8	53
(*j*)	3,486,917	4 6			.	
Robinson, MRL&SR	490,000	...	..	443,000		
Robinson Main R...	500,000	...	..	500,000	...	..
Rose Deep.........(*b*)	3,267,280	5.3	62	(*b*) 3,219,700	5.4	62
Robinson Deep.....	1,814,000	6.16	..	1,725,000	6.43	
(*m*)	178,000	6.7	..	(*m*) 131,000	6.52	
Roodepoort United.	677,273	6 03	46	526,256	6 85	45
(*m*)	110,776	6 87	45	(*m*) 109,557	6 16	49
Simmer & Jack.....	1,935,000	5.2	..	1,862,000	5.3	
	(*n*)	...	..	401,000 (*n*)	4.78	
Simmer Deep......	1,246,000	4.56	..	1,097,000	4.83	
(*m*)	173,000	4.55	..	(*m*) 146,000	4.59	
Springs Mines....	1,784,000	9 86	56	2,567,000	9 8	58
Sub-Nigel.........	214,000	9.1	41.8	359,000	10.4	44.2
(*m*)	24,000	9.6	..	(*m*) 31,000	9.4	..
Van Ryn..........	1,950,191	6.69	53	1,730,772	6.57	50
Van Ryn Deep... (*c*)	2,168,851	8 7	68	(*c*) 2,258,600	8 9	67
Village Deep . (*b*)	2,378,100(*l*)	6 8	60	(*b*) 1,874,000	6 6	61
West Rand Cons.	1,600,000	6 1	50	1,269,918	5 3	54
(*m*)	404,000	8 3				
Witwatersrand. (*c*)	1,462,100	6 4	67	(*c*) 1,317,900	6 4	69
Witwatersrand Deep	1,571,300	5 79	59	(*b*) 1,383,000	5 66	61
Wolhuter..........	1,263,320	5.8	53.2	1,302,160	6.0	53.6
Non-Crushing Company						
Cinderella Cons....(*k*)	1,024,800	7	..	(*k*) 1,024,800	7	.
(*o*)	436,000	...	..	(*o*) 436,000	...	..

(*a*) Or latest date in respective years, Cons. Main Reef, Luipaards Vlei, Main Reef West, New Modder, Nourse, Sub-Nigel, Simmer and Jack, Knights Deep and Van Ryn Estate, June 30th. (*b*) Includes shaft and boundary pillars. (*c*) Mining tons. (*i*) Payable. (*j*) Unpayable at present costs. (*k*) Mr. Denny's report. (*l*) Plus 649,000 tons developed but not valued, Springfield area. *m*) Partial. (*n*) Plus reclamation. (*o*) Suspense.

are working at a profit of less than half a dollar per ton. That means that they cannot pay dividends, because the working profit is not debited with head office charges, realization claim licenses, directors' fees and similar disbursements.

The Mayor of Johannesburg recently said that the town was on the brink of a volcano. After the municipal strike, the government promptly appointed a commission of inquiry. E. A. Wallers, the president of the Chamber of Mines, who has a fine reputation for fairness and has always endeavored to see the viewpoint of the working man, gave evidence. He said that were the wages of mine mechanics increased in the same manner as those of the municipal mechanics, the addition would be 42% on pre-war standards, and 23% above present rates. A similar increase to all employees would involve an expenditure of £1,840,000, equal to 1s. 4d. per ton. He established, further, that 17 mines made a smaller profit than that. They employ over 8000 white persons, who receive £2,850,000 in wages yearly, and the companies spend, altogether, £9,250,000. Moreover, this rise of 1s. 4d. per ton, would bring "many other mines not at present in danger of closure to the verge of it; and it is no exaggeration to say that the prosperity of the Witwatersrand would be destroyed, while the credit and stability of South Africa would be seriously jeopardized."

I do not altogether endorse Mr. Wallers' opinion, as he includes certain mines which it is the declared policy to close down, *e.g.*, the East Rand Proprietory mines, employing 1660 white persons and spending £1,700,000 yearly, and Knight Central, with 295 employees and spending £425,000; the Robinson, which is practically exhausted of ore, and the Randfontein, whose profits were only occasionally down as low as 1s. 4d. per ton, employing 1700 white men and spending over £2,000,000 a year, which has no intention of closing. But the position is serious enough even if one discounts the president's figures by 40%. It looks as though the mine employees will realize the danger of the position, and that, if they strike, the occupations of many of them will be gone forever, or at least until the time that it is again possible to work mines at 17s. per ton.

Working costs have an intimate bearing on ore reserves. A compilation of figures for the 50 mines shows an aggregate of 95¾ million tons, which is about eight millions less than the estimate of a year previous. This is due to cutting down, or economic elimination, at several low-grade mines. It is specially noticeable in the case of two of the three great consolidations. The East Rand Proprietary has cut out 1½ million tons; the Crown Mines, 2½ million tons. Randfontein Central in 1916 included 3½ million tons declared as unpayable on the then current basis of working costs. No notice is now taken of such tonnage.

	Companies	Tonnage
Below 5 dwt.	4	4,139,300
Between 5 and 6 dwt.	17	19,073,100
Between 6 and 6½ dwt.	7	18,246,900
Between 6½ and 7 dwt.	6	11,532,400
Between 7 and 7½ dwt.	4	10,054,000
Between 7½ and 8 dwt.	2	1,514,600
Between 8 and 8½ dwt.	2	10,547,000
Between 8½ and 9 dwt.	3	8,905,500
Between 9 and 10 dwt.	3	9,389,800
Over 10 dwt.	2	911,900

A classification of ore reserves may be made as is shown in the preceding tabulation.

Over 40 million tons, say 45% of the Rand ore reserves, have a value of 6½ dwt. or less. This is 27s. 6d. per ton, and there is little margin with costs at 20s. 6d., the present figure, when allowance is made for inevitable mining and metallurgical losses. The Meyer & Charlton, with 17½ dwt. rock, is twice as rich as any Far Eastern Rand mine; but there are only two other high-grade concerns in the Central Rand—the City Deep and Foreign Deep—with reserves at 9 and 8 dwt., respectively. Assay values in the Far East, however, are much better. With the exception of two old mines, all go over 7 dwt. Nine mines in this group have 33½ million tons developed. All of these, with the exception of two—Government Areas and Geduld—record over 8 dwt. New Modder's reserve contains over £14,000,000 in gold, after making allowance for mining and metallurgical loss, whereas the Government Areas has doubled its reserve in two years. This policy of expansion is being checked by restriction of explosives, owing to the demand of the British government for glycerin.

THE INDEX OF PENNYWEIGHT-INCHES

The best showing on the whole Rand is (combining value with width) the 865 pennyweight-inches of the Meyer & Charlton. In the Far East tract, Modder Deep is conspicuous with 679 pennyweight-inches. Brakpan, in this district, and City Deep, in the central section, are the only mines with over 600 each, recording 616 pennyweight-inches. Government Areas and Van Ryn Deep are of equal value—593 pennyweight-inches; also New Modder and Modder B at 561. Intercalated is the Springs Mines' 568 pennyweight-inches. Geduld and Sub-Nigel come at the bottom of the district, at about 460 pennyweight-inches. Certain of the Western Rand companies' deposits have proved disappointing in recent development. For example, the West Rand Consolidated's reserve of commercial ore has dropped 330,000 tons, and by 0.8 dwt. in value, to the disconcerting figure of 5.3 pennyweight.

El Oro Mining and Railway Co., Ltd.

Speaking at the annual meeting of the El Oro Mining and Railway Co., Ltd., the chairman, R. T. Bayliss, referred with regret to the fact that, for the third consecutive year, the publication of the usual statement of account and balance sheet would be withheld, in the interests of the company and the stockholders.

Progress has been made in increasing the output to about 30,000 tons per month, in an effort to reduce costs per ton, which have risen from an average of $3.50 per ton in pre-revolutionary times to $7 per ton during the last 12 months. The estimate of ore reserves has been reduced by the exclusion of all material having a combined gold and silver content valued at less than $7 per ton, and eliminates from consideration large quantities of low-grade ore which, prior to the revolution, it was possible to treat at a profit.

The ultimate success of the El Oro property is assured, according to Mr. Bayliss, if the Mexican government will only display a sympathetic concern for the mining industry and the company is permitted to work the mines without interference.

The Lilly Hoist Controller

The Lilly hoist controller consists of three parts, the controller, the brake and throttle operator, and the brake regulator. The controller has for its purpose the prevention of overspeeding and overwinding in hoisting or lowering. The horizontal shaft of the controller is driven from the hoist by means of shaft and gears or sprockets and chain. By means of the small upper gear wheel (driven by the large gear shown in the front view) the vertical shaft from which the governor balls are suspended is driven. A worm gear, attached to the horizontal shaft, drives the dial shown in front view. The speed reduction is such that only a part revolution of the dial is completed for a "shaft trip" or for any part of a trip.

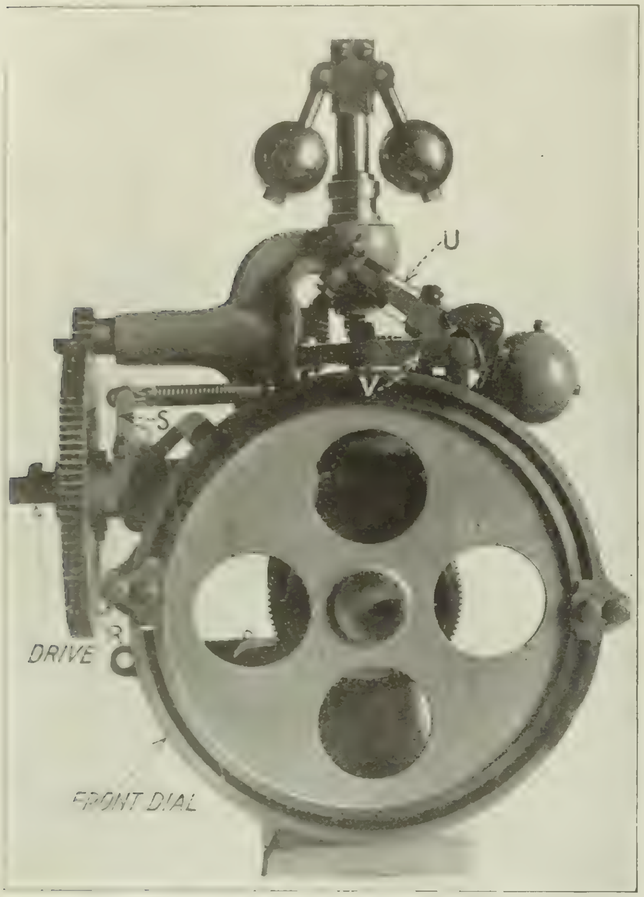


FIG. 1. FRONT VIEW HOIST CONTROLLER

Between the parts of the shaft trip, at top and bottom, the hoist under normal conditions is operated at full speed. Between the two points, which might be called the slowing-down points, the lower contact arm *V*, shown above the dial in the front view, remains in the position shown. The upper arm, *U*, however, is brought down by the action of the governor as the speed increases. This arm carries two contacts, each on a flexible spring. When the lower moving contact touches the stationary or bottom arm, it closes a bell circuit and rings an alarm bell. A further increase in speed causes the second contact to be made, and this closes the knock-out circuit, which operates a solenoid shown at *C*, Fig. 3. The solenoid operates a trip which releases the weight *W*. The falling weight closes the throttle and applies the brakes. A gag-pot *D* cushions the falling weight *W*.

In hoisting or lowering, when the slowing-down point is reached, a contact is made by the small arm *N* on the dial *Q*, at the rear of the machine, and the alarm is rung, regardless of speed. If the hoist does not then begin to slow down, the cam *R* on the large dial, raising the lower arm, makes contact as above described, and unless the speed continues to decrease at an accelerated rate, determined by the cam, the lower contact will take action, first with the alarm, and then the knock-out.

On the last turn of the horizontal shaft in either direction, the compound levers shown at the left of the front view, *S*, are forced outward toward the gear wheel, by a cam on the back of the large dial, and a small fraction of a turn in the wrong direction at the end of the travel causes this quick action to take effect and makes contact quicker than it could by direct action from the large dial.

At the rear of the machine is an arm or lever, operated by cams and roller, and it is also shown diagrammatically, *T*, on the brake-regulating unit. When the controller trips with the hoist at maximum speed, the arm that operates the brake auxiliary would only be allowed to fall to the long point of the notched rest, which sets the brake at its slowest rate, just as an engineer should under such conditions. As the end of the trip is approached, and the hoist starts slowing down, the brake action is increased, so that at the end it acts at the highest speed in case the engineer fails to stop after slowing down, or if he should fail to reverse and

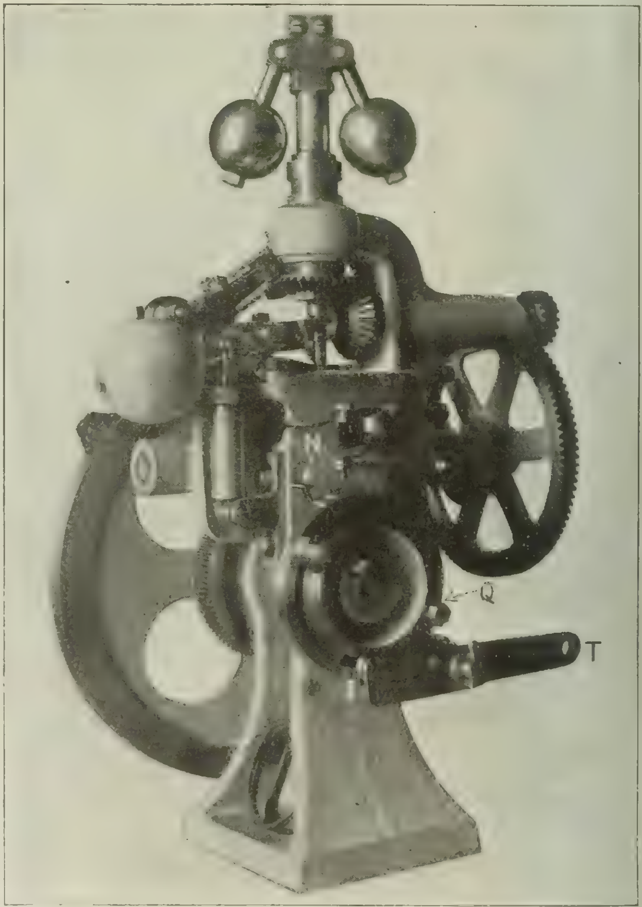


FIG. 2. REAR VIEW HOIST CONTROLLER

start the hoist in the wrong direction after the stop. All points between are graduated to suit speeds and distances from landing.

As the bell rings at each trip to warn for slowing down, and is rung from the same current that operates the solenoid, it furnishes a guide for the strength of batteries, and having resistance greater than the solenoid, there is assurance that the solenoid will operate even after the bell fails to ring, and if the bell becomes weak it is warning to attend to the batteries. It is easy to test the apparatus by raising the lower arm to make contact at any time.

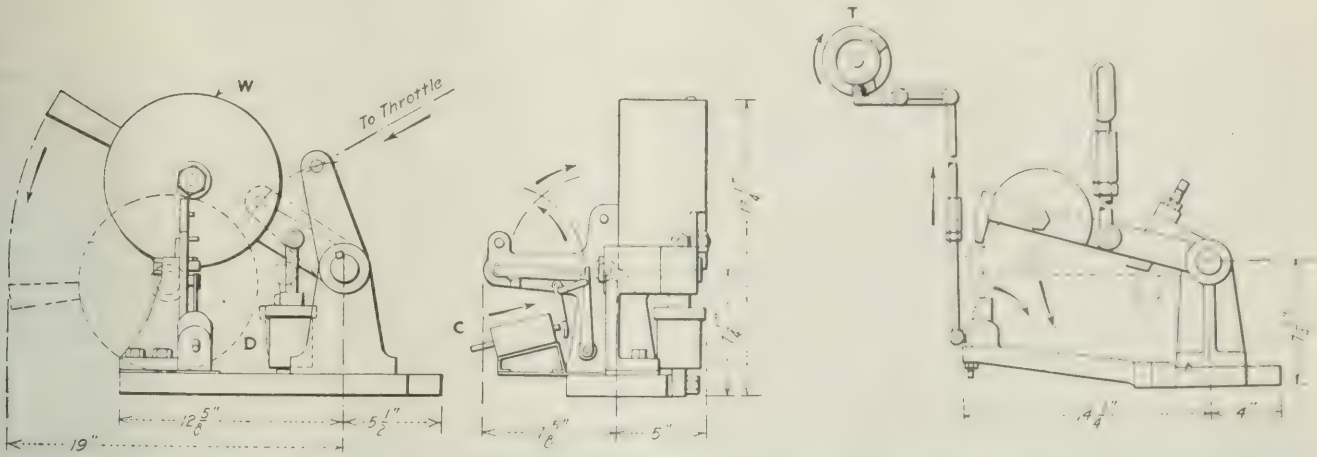


FIG. 3. BRAKE AND THROTTLE OPERATOR AND BRAKE REGULATOR

The original type of Lilly controller, which was a radical departure from any device of the kind hitherto produced, has been in successful operation in many of the large Western mines since early in 1914, and the new model is simply a more highly developed machine, retaining most of the features of its predecessor and introducing a number of others entirely new. It has the advantage of occupying a small amount of space, and, like the former machine, requires no piping, or power of any kind outside of itself, and gravity, for operating.

All the machines are supplied with guards for gears and contacts, which are not shown on the cuts. The conroller is one of the few effective inventions of its kind. An automatic device should be used upon every hoist, and particularly upon hoists by which men are handled. Its use is an insurance against accident, delay and damage to the hoisting system.

The Roberts Amalgamator*

The Roberts amalgamating machine consists of a revolving screen, with its lower part immersed in a trough filled with water and supplied with mercury to amalgamate the gold. On the outside of the screen are lugs attached in spiral form which agitate the water and mercury in the receiving box. The gravel passes through the screen, which is in the form of a trommel.

It is claimed that the revolution of the trommel in water facilitates the separation of the gold; and the constant agitation of the water and mercury by the lugs on the trommel as it revolves promotes effective amalgamation of the fine or float gold, which might otherwise be lost.

It has been stated that two of these machines will treat 100 cu.yd. per hour, of gravel mined by steam shovel, scrapers, or elevators. Cost of installation may be estimated at $5000 per machine, and it will handle average river gravel at a cost of 6c. per cu.yd. The machine has the advantage over a dredge in that its cost of installation is a mere fraction of the cost of a dredge, and it is capable of giving relatively good results in the amount of gravel handled, with effective saving of the gold.

Remote Motor Control

There has always been a demand for a device for starting small induction motors from remote points. The General Electric Co. has recently developed and placed on the market a starter, known as the CR-7006 remote control switch, and arranged for push-button control. This starter is applicable for use with motors up to and including 5 hp., 110 volts, and 7½ hp., 220, 440 and 550 volts. In addition to its starting function and overload, the starter also protects against undervoltage.

The device consists of a 25-ampere three-pole contactor, with two inverse time-limit gravity reset overload relays mounted on a slate base totally inclosed in a sheet-iron case. A small "start-and-stop" push button station is used as a remote control switch. Completion of the starting circuit by pressing the button energizes the coil of the magnetically operated switch, closing the contacts, which throw the motor directly on the line. Interruption of the circuit or a radical decrease in voltage permits the contacts to reopen by gravity, thus stopping the motor, which cannot start again until the button is pressed.

The overload relays can be adjusted for various degrees, ranging from normal up to 50% above normal. They can also be adjusted over a wide range of time values. The relay trips automatically and resets by gravity. The cover of the inclosing case is furnished with a hasp so that, if desired, it can be locked in a closed position by a padlock.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

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*Abstracted from an article by E. A. Haggen in *Mining and Engineering Record*.

Las Vacas Gold Mine, Chile

BY E. DAVID POPE[*]

Unsuspected orebodies were discovered at Las Vacas mine, in Chile, by a new management working on a different geological theory from the one formerly held. The ore is hand picked, and the gold, which occurs in pyrites, is extracted by amalgamation and cyaniding, a 90% recovery being thus attained. The account deals with conditions of the mine up to the middle of 1915.

THE gold mine worked by the Compañia Minera Las Vacas is the only gold-producing property now in operation in Chile. The mine is at the extreme southern end of the large coastal gold field existing between Latitude 30° 30′ S and 32° 00′ S. Near by there are many other gold-bearing deposits, among which are the Casuto, Magui, Cueca, and Talco properties, all of which are of practically slight importance. The Vacas mine, the only important property, is entirely in granite, which is unaltered, hard and compact, even in the vein walls. Lying over the granite, and forming the high country behind the mine, is a recent quartz porphyry, which is barren. Crossing both granite and porphyry are a large number of andesite dikes, which fault the veins slightly. Some rhyolitic flows are found, which appear to be relatively recent. Pegmatitic quartz veins are common throughout the granite and have occasionally carried enough gold to invite prospecting, which in no case has continued long.

LAS VACAS MILL

The property of the Las Vacas company, about 150 hectares in extent, is a rectangle, covered in large part with alluvium deposited by the Pupio River, which crosses it. The alluvium obscures the outcrops, but four principal veins are visible, all striking N 80° W and dipping south at an angle of 80° generally. These veins are approximately 100 m. apart. The only one actually worked is the most northerly, or Las Vacas, vein.

Crossing the property in a direction running N 25° W, with easterly dip, are at least six andesite dikes. One outcrops at the eastern boundary; four are found in the mine workings, and the last dike outcrops at the western end of the group of company claims. These dikes show the usual indications of a quickly cooled intrusive body—glassy edges and fine structure passing inward into coarsely crystalline material.

When a new management took control, with instructions to develop and explore the mine, the theory pursued was that the mineralization followed the vertical stringers meeting the vein, and that either the andesite dikes themselves had produced it or the dikes had been thrust through the lines of weakness along which the mineral of value had entered the vein channel. In either case they seemed to indicate the probable zone of enriched vein matter.

The Vacas vein is 3 to 12 m. wide in the upper workings and at the lower levels varies from 5 cm. to 2 m. The walls carry well-marked striæ, and at times considerable kaolin gangue is found. The outcrop has been almost completely removed, but in a few places the original vein is visible. Little oxidation has taken place, and unaltered pyrites is found at the surface. In depth, some chalcopyrite occurs with a little galena and brimstone. The gold is carried in fine grained, very friable pyrites that leaves a black streak; and although 66% is generally recoverable by amalgamation, no free gold is visible even in the richest ore. The pyrites is segregated over short lengths, thus giving a patchy character to the vein. Generally there is a richer band of pure pyrites varying from 4 to 50 cm. wide, which usually occurs in the middle, but sometimes is found in the edges of the ore channel. The quartz is white and extremely hard, and, where of low grade, specular hematite abounds, together with large spotty crystals of pyrites of cubic formation which show the striæ of twinning very highly developed. When the pyrites is 15% of the vein matter, the gold content usually runs 45 gm. per ton. A slight increase in pyrites, accompanied by a green coloration in the quartz, indicates high gold content, which frequently reaches 300 to 500 gm. per ton.

As will be seen from the sectional view of the mine, the oreshoot worked by the old miners had a strong westerly pitch on the eastern end. Its western end was almost vertical for a considerable depth. This was thought to indicate that the entire body of ore was pitching west, but expenditure of much money proved the error of this assumption.

The early owners had concentrated all development work to the westward of the oreshoot as defined. The new work was given a horizontal easterly direction, and four drifts were carried eastward as fast as possible. This policy was promptly rewarded, and a new oreshoot was cut on passing to the east side of the first andesite dike reached (No. 1 in section) on the No. 3 level. The first samples over a width of 60 cm. assayed 230 gm. per ton. The oreshoot was subsequently proved to extend horizontally 160 m. to the east.

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[*] Care of El Soldado, Chagres, Chile.

In the eastern end of the new workings, on the fourth pump level, at 215 m. vertical depth, a cross vein was encountered, nearly vertical, 80 cm. wide and striking north, older than the Vacas vein, which showed indications of widening. This vein carried 40 gm. of gold to the ton, over a length of 30 m., and the face was in good ore. The exact conditions with regard to this vein are not yet understood. The mineralization is distinct from the Vacas vein, in that it carries considerable galena and much bismuthine. The silver content is also higher.

The mine is entered by an inclined shaft sunk in the vein at the western end of the old oreshoot and which reaches the 220 level. Work is in progress to connect this shaft with the 250-m. level. A crosscut adit 300 m. long connects with the shaft 60 m. from the surface. The ore was previously hauled through this adit and dumped on a floor outside, where it was picked to raise the grade before being passed by an elevator to the mill bins. Under the new system, the ore is hoisted to the surface and delivered to the mill by gravity.

FILLING IN OLD STOPES CARRIES GOLD

From the 220-m. level to the surface and for a distance along the latter of 240 m., all the ore has been stoped, and only a few communication ways are open. The oreshoots worked formed a right-angled triangle, 220 by 240 m., with an average width of 2.5 m. Not all the ore was hoisted, however, and it is estimated that at least half the rock broken was left in the stopes. This old filling assays from 12 to 15 gm. in gold per ton, but it is difficult to remove it, as the ground is heavy.

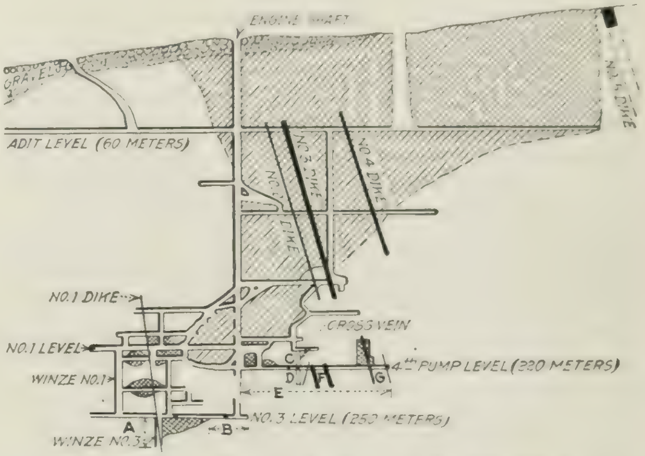
The modern workings are all in the bottom of the mine, and are indicated in the sectional map. Driving and stoping were done (in 1915) by air drills, supplied from the surface by two 10 x 10 Ingersoll Rand straight-line compressors, with air at 90 lb. at the drills. The drills used were butterfly-valve stopers and Jackhamers. All stoping was overhand and done on daily wage.

Driving was on contract, the use of Jackhamers or stopers depending on the nature of the ground. An average price was 70 pesos ($15 U. S. currency) per meter of advance, the company paying for all supplies. Were it not for the compressed air, it would be impossible to work in the damp lower levels, because of the heat and smoke. To make matters worse, it was considered necessary to install a series of steam pumps that would handle about 1000 cu.m. of water per day that came chiefly from the middle levels. When the pumps were in operation the temperature in the workings was high. Little timber is required, fortunately, the more so because local timber is of poor quality.

The hoisting shaft is a poor, crooked affair, sunk in the vein to 220 m. It is not straight in any direction. The measurements inside the timbers are 10 x 4 ft. A double skipway occupies the eastern end and a ladderway and pipe lines occupy the western. When the steam pumps were operating, it was strenuous work to climb out from the bottom with only a hot steam pipe for a hand rail. All workers entered the mine by the ladders, as, owing to the crookedness of the shaft, hoisting ropes have a short life, and a trip in the skip was not considered safe. The one-ton skips dump into a car, in which the ore is transferred to the picking floor. The hoist is a geared two-cylinder winch with 4-ft. drums having hand brakes only, and is uneconomical.

QUARTZ ASSAYING $2.80 REJECTED IN HAND PICKING

The ore as hoisted contained (1915) considerable quartz, with no pyrites, which was picked out and thrown away. The reject assayed about four grams of gold per ton. This low-grade material amounted to a trifle more than 50% of the ore hauled. The picked ore, averaging about 22 gm. of gold, was passed through a crusher set to 1¾ in., and stored in bins. From these it was lowered by gravity to the mill, a distance of 250 m., where it was dumped into a chute leading to the battery bins.



ELEVATION OF LAS VACAS MINE WORKING

The mill is a modern one equipped with five 750-lb. Fraser & Chalmers stamps and five 1200-lb. Allis & Chalmers stamps crushing to 30 mesh with 101 9-in. drops per min. Inside amalgamation was practiced, and an 8 x 4½ ft. apron plate was used in front of each battery. The pulp from the plates ran to a Dorr Simplex classifier. The sand passed to a 28 x 3-ft. pebble mill, which discharged to a 10 x 4-ft. silvered plate. The pulp was then elevated to the classifier again by a 52 x 10-in. Frenier pump. About 66% of the total gold was recovered by amalgamation, most of which came from the inside plates and the first two feet of the battery apron plates.

The classifier discharge contained 3% of plus 200-mesh material, and was run to a 20-ft. Dorr thickener, and thence to three 18' x 6-ft. Pachuca tanks, where individual charge agitation was carried on for about 18 hours with cyanide solution carrying 3 lb. of cyanide per ton. The tank contents were then passed to a 20-ton Moore filter. The tailings, carrying from 2 to 3 gm. per ton, were elevated to the dump. The liquor was settled in 20-ton tanks, passed through zinc boxes, and thrown away, a considerable cyanide loss resulting. No difficulty was experienced in cyaniding the ore beyond the high cyanide consumption; and by the flow sheet outlined a total extraction of 90% was attained. The high cyanide consumption could have been avoided part of the time, but soluble copper salts were sometimes present in the ore.

The amalgam was restored, and the gold sponge obtained was melted, together with gold from the zinc-box precipitates, into a common bar. The treatment given the precipitates consisted of the usual acid wash, drying, and fusion with carbonate of soda and manganese dioxide in a Monarch oil-fired furnace. The gold as shipped was about 780 fine and contained 170 parts of silver. Thus the base-metal contents were rather high.

The following table gives the work done for the six months ended June 30, 1915:

TABLE I. ORE AND CONCENTRATES ANALYSES, LAS VACAS MINE

	Concentrates	No. 1 Ore Samples	No. 2 Ore Samples	No. 3 Ore Samples
Cu, %	1.22	2.2	1.9	2.0
Insoluble:				
SiO₂, %	22.20	57.6	32.8	54.40
Fe, %	33.06	14.17	26.56	18.21
CaO, %	1.91	2.10	1.00	1.20
Al₂O₃, %	2.79	7.76	4.40	3.99
S, %	36.19	14.38	32.35	19.88
Pb, %	0.57	.....	.....	.....
Ag, gm., per ton	172.00	(a)	(a)	(a)
Au, gm., per ton	516.00	66.6	300.00	132.00

(a) Not known

The analyses which are given in Table I were selected from a considerable number and are fairly representative of the ore as hand picked for the mill. There was, however, about 75% more of No. 1 ore than of Nos. 2 and 3. The concentrates referred to were made in a trial run on tables in the mill. Because of their density, they gave difficulties in agitation, but as shipping conditions did not warrant their shipment elsewhere for treatment, straight cyaniding was continued.

TABLE II. MILLING RESULTS OBTAINED ON ORE COMING FROM DEVELOPMENT WORK AT LAS VACAS MINE DURING THE FIRST SIX MONTHS OF 1915

Date	Crushed, Metric Tons	Au, gm., per Ton	Recovery	Total Cost, Dollars U. S. A.
January	268	29	89.77	$7,682
February	425	23	88.92	8,132
March	583	24	89.32	9,043
April	553	21	90.83	8,504
May	615	20	87.91	8,751
June	259	20	87.42	8,400
	2,704	22.43	89.16	$50,512

The totals and averages include all mining and development work. In this period, during which expensive development had to be done, the company managed to pay two-thirds of its total expenses from the gold recovered. At the end of this time, when I left the company, the mine was in much better condition.

War Trade Board To Aid Russia

The War Trade Board, to which the President has intrusted the execution of plans for rendering economic aid to Russia, has now established a corporation to carry out or administer certain details of this economic program in regions and lines of trade where it is not possible to accomplish this through the ordinary channels of trade. Articles of incorporation have been filed for this corporation, to be known as the War Trade Board of the United States Russian Bureau, Inc. The capital of the corporation, which is to be operated in the interest of the Russian people, is placed at $5,000,000, the amount of the revolving fund placed at the disposal of the War Trade Board for the purpose of financing the plans and policies of economic assistance to the Russian people.

Davis-Daly Copper Co.

The Davis-Daly Copper Co. owns mines near Butte, Mont., and operations for the year ended June 30, 1918, were hampered by labor troubles, according to the annual report. The heat in the lower levels has also been considerable; and the work of connecting the Colorado shaft with the Belmont shaft of the Anaconda Copper Co. is proceeding slowly, the average temperature recorded being 100 degrees.

The property has passed into the producing stage, the output for the year being as follows: Colorado mine, 52,996 tons, containing 260,672 oz. silver, and 5,894,396 lb. copper; Hibernia mine, 5724 tons, containing 129,816 oz. silver, 356 oz. gold, 1,316,310 lb. zinc, and 611,907 lb. lead. During the year an initial dividend of 50c. was paid, and extensive improvements are contemplated to facilitate mining and lower costs of production.

Economic Future of North Chosen

The effect of improved railway communication on the economic future of North Chosen was recently discussed by the director of the Korean Department of Agriculture, Commerce, and Industry, who is quoted in a consular report as saying:

> The region of North Chosen—that is, the whole district of North Kankyo Province—was, in the past, regarded as valueless for colonization because of the lack of means of communication. Even where promising openings for commercial and industrial undertakings seemed to exist, this inconvenience made it doubtful whether profits could be realized. On that account North Chosen has lagged behind South Chosen, but today communications are gradually being opened, and now not only can the products of the interior be easily transported to Seishin over the newly opened Seishin-Kainei Ry., but, by the further opening of the route across the Sea of Japan, financial connection between North Chosen and Japan proper has become closer—an excellent thing for the whole of Chosen. For the present the Seishin-Kainei line and the Japan Sea route can probably not show the expected results, but when the Kirin-Kainei Ry. is completed, new industries will spring up in North Chosen.
>
> The Kirin-Kainei Ry. is a line of about 280 miles to connect Kirin, in Manchuria, with Kainei, in Chosen, and is to be laid by Japan and China at an expense of about 40,000,000 yen [roughly $20,000,000 United States currency], in accordance with the Kando agreement, signed between Japan and China in September, 1909, but the details have not yet been settled in a concrete form. The opening of the Kirin-Kainei Ry. is necessary for China, and it is also necessary for Japan; but there is nothing so important as this railway for bringing about the prosperity and development of Chosen, and especially the region of North Chosen.
>
> Changchun is said to absorb annually about 100,000,000 yen worth of merchandise; but it is probable that, when the Kirin-Kainei Ry. is opened, some of these goods will enter Kainei, and, coming over the Seishin-Kainei line, be exported from Seishin. Not only so, but with the opening of this railway the great forests of Kirin, which contain vast supplies of good timber, will be made accessible, especially if a forest railway be laid. If this were done, with the completion of the Kirin-Kainei Ry. the timber from this district could be sent to Seishin by rail, and for the first time supplied to the rest of the world. At the same time, the produce of the districts traversed by the Kirin-Seishin line would be sent to Seishin, and Seishin would become not only a port of Chosen but a port in a real world sense.
>
> Hitherto there has been no special industry in the region of North Chosen except agriculture, but Japanese capitalists now appear to be directing their attention to this section and to be planning the establishment of various industries. As before stated, North Chosen suffered originally from inconvenience of communication, and so its sources of wealth were unknown; but since the opening of the Seishin-Kainei Ry. the development of its resources has gradually become possible, and its rich stores of all kinds of industrial materials have become known. Much attention has recently been paid to mining, especially the working of the iron deposits of the district.

Remember the Comfort Fund of the 27th Engineers.

Correspondence and Discussion

The Gold Question

In a recent editorial in the *Journal* it was suggested that the gold question might best be discussed and solved by economists and financiers, but it was pointed out that there are certain features relative to the economy of its production respecting which the advice of engineers should be sought and accepted, and in all the above I am in entire agreement. Recalling the several articles that have recently appeared in the technical press over the signatures of mining men, some of them very capable engineers, I fail to find any suggestion that is satisfying. The arguments presented are not convincing, and more may be said against them than can be said in their favor. Aside from the suggestion that a commission be appointed to study the situation carefully, and advise upon legislation, if any new legislation appears desirable, the specific remedies offered give little hope of being sufficiently practicable to bring relief.

One paper, however, that you published in May, by a distinguished mining engineer, contains considerable food for thought. It is more illuminating than the writings of any economist that I have chanced to see. I refer to the article by Hennen Jennings, consulting engineer to the Bureau of Mines. In again reading this paper, one paragraph appears to me to be of particular interest. It clarifies in a few words this very cloudy situation: "Our Government securities and Liberty bonds, pledged on a gold basis, take the place of gold coin only as long as the people in this and foreign countries have faith that the Government can make good its promises. When this is seriously doubted by the many, gold will go to a premium. The great gold reserves of the past would not be so necessary if the fundamental necessity of measuring gold value in units of labor necessary to win it were better recognized and insisted upon by governments that pledge their credit on a gold basis."

Units of labor, a day's work, the energy required to produce the gold—that is the valuable thing, not the gold itself, which is only a token of work done and useful to hand around as a medium of exchange.

It is not possible for the lawyer to pay his baker, his milkman, and coal dealer with legal advice. He must get something from where the advice is serviceable, and use that something in exchange for the wherewithal to satisfy his own needs. That something was formerly largely an indestructible rare metal, a small quantity of which required considerable labor to produce. Except as an ornament, the metal has little value. It cannot be eaten. It will not clothe the body and keep it warm, but it has an indirect value in being exchangeable all the world over, for things that one can eat and for things that will keep one warm.

Later, the actual passing of the rare metal has become less and less common. We use paper which, by common consent, we imagine can be exchanged for gold upon demand. That paper is measured by the gold yardstick, but no serious-minded man could think that at any one time all of it could be exchanged for gold. That paper is a measure of labor performed, and, when indorsed by a country whose credit is good, it is exchangeable for labor, or what labor can produce, and only becomes "a scrap of paper" when its author is unable to deliver gold, material, or labor under his contract.

What is it the Allies will demand of Germany? It is not gold, for she has little or no gold with which to pay, and it would take years to accumulate such an amount as will be asked. The indemnity that will be asked will be measured in pounds sterling, francs, or dollars, but it will be paid in labor, or in the products of labor. Perhaps it would be better to say that it will be paid by the expenditure of useful energy, rather than by labor, for the payment will be made by all classes, and not alone by the man who works with his hands.

How would we feel if we had to collect such a debt from Russia, a country of millions of souls and with vastly more gold in its terraine than has Germany? We would probably feel like writing off the indebtedness, and save ourselves the trouble of bookkeeping. Germany has little gold in her banks, and, so far as we know, less in her hills, and yet we all feel confident that Germany can and will pay the bill that is to be handed her, a bill made out in pounds, francs, and dollars. We think of the bill in terms of gold, but we neither expect nor hope for more than a trifle to be paid in gold. It will be paid in units of labor; it will be paid directly or indirectly with useful energy.

Gold is tangible. The "results of useful energy," "a day's work," are something rather intangible. We cannot put our hands upon them, and place them in our pocketbooks, and hence, when there is a large amount of this commodity to be passed from nation to nation in order to satisfy balances, it is difficult to get the idea out of our heads that it will be necessary to have a lot more gold stored up somewhere to render the exchange possible.

If, before the war, gold reserves and the debts of nations were properly proportioned, the amount of gold that should be placed in reserve today would require an additional weight greater by far than all previous production. Indeed, any increased production that may be brought about by artificial stimulation will be so small as compared with the vast obligations that have recently been incurred as to have practically no effect on the situation. In the case of the United States, with her resources developed as they are, with highly trained and efficient men of business and laborers busy in productive occupations, with ample sources for the raising of taxes, there is little reason to expect her to fail to meet all of her obligations, if not another ounce of gold comes into her treasury for years. England

and France may not be in quite so enviable a position, but both will probably make good. It is in Russia and similar countries of inefficiency that we would like to see gold plentiful, and would like to know that they had fifty cents' worth of gold stored away for every dollar of paper money issued. We have a great deal more reason to feel worried about Russia paying her few millions of obligations than we have respecting the ability of France and England to pay their billions, and that is because we have doubts respecting the units of labor in Russia, but know that they exist in England and France.

But all this is cold comfort to the gold miner, now patriotically robbing his mine at a loss; doing his best to furnish the Government what gold he can; doing the best that he can for the community dependent upon him; doing the best that he can for his own mine in a bad situation. For him we can see no hope until the commodities he uses in accomplishing production fall in price, or until some foreign nation, needing the gold badly, offers him more goods, more labor, or more facilities than he can now secure for the ounce of gold that he produces. **F. F. S.**

New York, Nov. 21, 1918.

The Porphyry Coppers

With regard to L. H. Goodwin's interesting article on the resources and achievements of the "porphyry coppers," which appeared in the Nov. 2 issue of the *Journal*, it is to be noted that the average assay contents of the ore reserves in the various mines are taken as a basis of comparison. Such a method appears to me undesirable, as a misleading impression of the comparative worth of each property may be thus conveyed.

Utah Copper, for example, saves about 65% of the copper in the ore, as indicated by assay. Inspiration saves about 75%. It appears to me that, in such estimates as those under discussion, the actual results should be taken as bases for comparison. Utah's present saving of about 16 lb. of copper per ton, in concentrate form, would be a more reasonable figure to use, for comparative purposes, than the 24 lb. or so originally contained in the ore.

What have assays to do with results? It is the amount of copper or other metal saved that counts, not the average content of the ore treated. **WILLIAM TUDOR.**

Temple, Ga., Nov. 7, 1918.

What Is an Engineer?

I note with interest a definition, by A. Krom, appearing in the Nov. 16 issue of the *Journal*, which reads as follows:

> An engineer is one who economically directs man-power, and, by scientific design, utilizes the forces and materials of nature for the benefit of mankind.

A new definition, to be worthy of attention, must be complete. The first point of criticism with that quoted is that it fails to take cognizance of recognized usage. In the United States the operator of a railroad engine or a stationary motive plant is an engineer. The word has been generally accepted in that sense; it is widely used; and no stroke of the pen can summarily displace it. If custom dictates a change, a change will result—but in slow stages. It is illogical to exclude recognized usages in defining the word "engineer." If they are uncommon or secondary, they can be placed in a position which is subordinate to the primary significance.

Mr. Krom's definition appears to me to lack pertinence. Had I seen it by itself, or had I been asked to give a typical example of one who "economically directs man-power, and, by scientific design, utilizes the forces and materials of nature," my mind might have turned to some captain of department-store industry, such as John Wanamaker or Gordon Selfridge. "Science," as Huxley said, "is nothing but trained and organized common sense"; and a scientific mind is an asset in any branch of endeavor.

With regard to the economical direction of man-power, I have encountered many brilliant engineers who were distinctly wasteful of the resources at their command. The history of perhaps the most widely advertised mechanical product of the twentieth century—the Liberty Motor—would seem to indicate that the question of economy was a factor of little or no importance. An engineer who directs man-power economically may be preferable to one who is lavish, but that does not make him any more of an engineer, *per se*. Again, no human effort could be consummated without enlisting the aid of natural forces and materials. The great inventor from whom a brilliant idea may spring surely utilizes them—his own perceptions and his own brains—just as another engineer uses steel and concrete and available water pressure.

The second part of Mr. Krom's definition appears to be unduly altruistic. A few engineers may carry out their duties with no other thought than the resultant benefit to mankind, but they are indeed few. Others, and they constitute the great majority, work primarily for a salary, wage, or bonus; others, again, in the hope that their investigations and inventions will result in ultimate material profit to themselves.

Practically all honest effort results in a benefit to mankind in general, but little of it is performed with this object in view as the primary consideration. These are plain, blunt facts; but, nevertheless, they state conditions as they are. Much engineering effort is beneficial to mankind, but it would be invidious to emphasize this fact in the formulation of a definition of an engineer. German invention of recent years has shown that the subjugation rather than the benefit of mankind was the main object of many devilish, though none the less brilliant, engineering achievements.

Mr. Krom's definition has served to point out the inadequacy of available information; and the great body of professional men will appreciate the initiative in his effort to standardize nomenclature in this direction. The primary need for such a revision arises from the fact that the engineer's work must be emphasized. There are engineers and engineers. The purely mechanical class will not be deprived of their accustomed appellation by a new definition which ignores their existence. A wider recognition of the fundamental meaning of the word will do much good, and the secondary significance will gradually become obsolete.

Engineering, to my mind, is, primarily, creative effort. An engineer may direct man-power or he may work alone. He may utilize the material forces or products of nature in consummating his ideas, but this is of secondary importance. His difference from his fellow lies not in the economical way he can handle labor, or by the science which he may apply to his work. Neither are his efforts undertaken for the benefit of mankind, any more than those in many other groups of human endeavor. His main characteristic is an ability to bring to his work a creative, inventive spirit of initiative, which marks him as distinct from the technician who merely works under his instructions.

I would suggest a complete definition as follows:

> Engineer: 1. A technician who applies creative effort to the solution of a problem, or the operation of an enterprise. 2. One who is skillful, or artful in design. 3. The operator of an engine or other mechanical equipment—an engine driver.

New York, Nov. 20, 1918. A. W. ALLEN.

A Neglected Course in Mining Schools

For 30 years or more, American institutions that have devoted their efforts to the education of mining engineers have followed or improved upon the methods used in colleges and universities offering various courses in engineering. The directors of mining schools soon recognized the necessity of bringing their students into touch with the practical at an early stage in the courses of engineering. Even in the freshman year, or at the end of it, the mining student is at work in the field, underground, or in the shop. The success of this plan has been so marked that one wonders why it has not been carried still further.

The making of men who can mine and recover the merchantable product with the least loss and greatest profit—who can mine and treat ores in the most economical manner—has been and still is the object of mining schools. They have been eminently successful in making men of science, who have used skill in its application. They have taught men how to value and how to determine costs. They have taught them how to make commercial use of geology, and have taught all about the the composition and value of the materials used, and the details of the mechanical appliances that are handled. Yet with all this knowledge, why is it that so many successful managers and superintendents are not technical men, and that so many of our mining school men drift off to other work?

It is because production depends mainly on two factors, materials and labor, and the intelligent use of both. Education respecting the former has been eminently successful. Education respecting the latter has been noticeably absent; not completely so, perhaps, but woefully neglected.

The man who is foreman, superintendent, manager, or director, and who holds his position, generally occupies it because of his ability. If he is a non-technical man, he is holding his position not because of his lack of technical knowledge, but in spite of that handicap.

Success in the production of minerals depends largely on human beings, and no matter how well we know the geology of our formation, the details of our pumps and hoists, the value of our powder and steel, if we do not know our men and how to use them, we are not going to hold a commanding position long.

Those who have been of the laboring class, who have worked with them, who know their minds and angle of observation, their desires and ambitions, are, if leaders, the men whom we often see making successful production where a solely technical man has failed. Where the human element is the largest factor in production, there the humane side in the manager counts for more than scientific training.

Have our mining schools not neglected this side entirely or made too little of it, simply being satisfied that a short time devoted to doing the work of the laborer would suffice for all practical purposes?

Leaders of men, be they managers, bosses, or brigands, are generally born as such. When we see our boy, and the boys of all the neighborhood, going over to Smith's every night after school, and making Smith's their headquarters on Saturdays, we can be pretty sure that there is something magnetic about the Smith boy; and a little later we will see him as captain of the local baseball club, then class president, and still later as leader in some enterprise, good or bad, large or small, as opportunity offers. Such boys will not remain laborers, while many of their companions, though given all opportunity, can never be educated to be anything more than laborers.

But, granting that some men are born leaders and that others are born followers, can we not still further help those whom we are trying to advance from the latter to the former station?

We teach our boys mineralogy, geology, chemistry, mechanics, electricity, mathematics, and we see them become far more useful members of the community than their brothers who were not so educated. We have taught them to use, to the best advantage, the inanimate materials that go to maintain production, but have carefully avoided mentioning the fact that production is largely dependent upon their ability to handle successfully the animate element that enters into it.

We read much of efficiency, scientific management, Americanization, strikes, housing, education, and kindred subjects, all having to do with the human element—all of admitted importance; and it is time for our mining schools to be helping the future engineer to study these questions in a scientific manner, to show him what he must contend with and depend upon, and if it be not possible to make a leader of him, at least to indicate the direction in which his efforts should be directed in securing the coöperation of his men.

New York, Nov. 9, 1918. ENGINEER.

Dust Abatement in Mines

Mr. Borcherdt's paper entitled "Dust Abatement in Mines" in the Nov. 2 issue of the *Journal* prompts the thought that the more generally successful feeding of water through hollow drill steel may still leave serious problems for solution. It is an unpleasant and a disappointing fact that the current models of mounted water-drills atomize both water and lubricant to such extent that a fog of water vapor is now common about these drills when in operation. It is not a wholesome atmosphere, even though measurably better than the old clouds of dust; and the danger should be recognized by those who are leading in the necessary campaign to better the mine atmosphere. CHARLES A. CHASE.

Denver, Colo., Nov. 16, 1918.

The Determination of Tin In High-Grade Wolfram Ores*

BY A. R. POWELL

THE specifications for wolfram used in the manufacture of ferrotungsten require that the ore shall contain not more than 1% of tin; sometimes the stipulated maximum is lower still, namely, 0.75%. A rapid and reliable method for determining tin in wolfram concentrate is, therefore, of the greatest importance for the purpose of controlling the work of the electromagnetic separator and for testing the adaptability of the magnetic separation process to new parcels of tin-wolfram ore, as some varieties of cassiterite show marked magnetic properties.

In the volumetric determination of tin by means of iodine, even a moderate quantity of tungstic acid masks the end point completely by the intense blue color of the lower oxides of tungsten formed in the reduction. Hence the necessity for removing the tungstic acid before titration. Several methods to this effect have been proposed and used, but they are, on the whole, too tedious for rapid work, and not always reliable. Of the four methods described herewith, the first three, though slow, were found to give good results, and are useful as a check. The fourth method is rapid, and has proved satisfactory.

DETERMINATION OF TIN IN WOLFRAM ORES

Tin occurs both as cassiterite and stannine in wolfram ores. The former is insoluble in acids and in fused bisulphate; the latter dissolves in aqua regia, and fusion with bisulphate renders part of the tin soluble. In case cassiterite alone is present, an attack with acids or fusion with bisulphate will dissolve the wolfram and leave the tin oxide unattacked; with stannine, however, the solution must also be examined for tin. In my experience cassiterite is quite insoluble in aqua regia, but, on fusion with bisulphate, a small amount goes into solution when the melt is extracted with dilute sulphuric acid. This rarely exceeds 1 mg. and is often negligible.

Method 1. The ordinary aqua regia attack of the slimed wolfram ore leaves the cassiterite with the tungstic acid; and, when the latter is dissolved out with ammonia, the small residue left may be fused with sodium peroxide and the tin determined as in the well-known Pearce assay. This is the usual method for removing the wolfram, but its great drawbacks are: (a) The ore must be very finely powdered before attack; (b) the complete solution of the wolfram is a long and tedious operation; (c) the extraction of the tungstic acid with ammonia or soda introduces another filtration; (d) if stannine is present, the acid filtrate must be treated with hydrogen sulphide, the precipitate extracted with sodium sulphide to remove copper, and the tin precipitated with acid in the filtrate from the copper sulphide, the washed tin sulphide being ignited with the residue from the ammonia extraction.

Method 2. Fusion of the ore with potassium cyanide was also tried, but, though a much more rapid method, it was not free from objections. Thus, when many assays are being conducted at the same time, the fumes from the hot, strong cyanide solutions are likely to be dangerous. Again, the wear on the porcelain crucibles is great, one crucible rarely surviving more than three fusions. The analysis is conducted as follows: 5 gm. of cyanide is gently fused in a porcelain crucible and allowed to cool again until a crust forms, on to which 1 gm. of ore is gently transferred. The crucible is covered and the temperature raised slowly until vigorous effervescence ceases, after which the contents of the crucible are stirred gently and heated for 5 min. longer. After cooling, the melt is extracted with hot water, and the insoluble residue, consisting mainly of metallic iron and tin, is filtered off, washed free from cyanide with hot water, and dissolved in hydrochloric acid and a little potassium chlorate. The resulting solution is ready for reduction and titration. If the ore contains arsenic, copper, or bismuth, it must be treated with 20 c.c. of nitric acid (sp.gr. 1.2) prior to fusion. The insoluble matter, which contains all the tin, is filtered off, well washed with hot water, ignited, and fused with cyanide. Although the method gave, on the whole, reliable results, inexplicably low figures were obtained at times, so that, though useful as a check, it did not answer well as a control method.

Method 3. The possibility of separating the two metals after getting them into solution as sodium tungstate and stannate was next investigated. Augenat has described a method in which the tungsten is precipitated as blue oxide by means of zinc and hydrochloric acid, but this was found to be slow and the separation imperfect. As in the separation of molybdenum from tungsten, it appeared possible to separate the tin from a tartaric acid solution of the sodium salts by precipitation with hydrogen sulphide. It also seemed probable that boiling the alkaline solution of the two metals with ammonium nitrate would precipitate the tin as metastannic acid. Both the above procedures were found workable, as the following experiment shows: 0.5 gm. of pure tin oxide was fused with 5 gm. of sodium peroxide in an iron crucible, the cold melt extracted with boiling water, the solution cooled, made up to 500 c.c. and filtered through a dry filter. A number of 20 c.c. trials (= 0.0158 gm. Sn) were pipetted into small flasks and treated as follows: (a) The solution was acidified with hydrochloric acid and reduced direct; (b) the solution was acidified with tartaric acid and saturated with hydrogen sulphide, the precipitate was filtered off, washed, dissolved in hydrochloric acid and reduced; (c) the solution was treated with 5 gm. of ammonium nitrate, boiled till free from ammonia, the precipitate filtered off, washed, dissolved in hydrochloric acid and reduced; (d) the solution was treated as under (c) but the precipitate was ignited and fused with peroxide as in Pearce's assay. The amounts of tin found were (a) 0.0157, (b) 0.0154, (c) 0.0153, (d) 0.0158 gm

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*Excerpt from Trans. Soc. Chem. Ind., Vol. 37, No. 18.

The precipitation with hydrogen sulphide generally gave slightly low results, ascribed to loss of colloidal sulphide in washing. The method as applied to ores is as follows: 2.5 gm. of ore is fused with 10 to 12 gm. of sodium peroxide in an iron crucible in the usual manner. The cold melt is extracted with water and a little alcohol, the liquid diluted to 250 c.c. in a graduated flask, and 200 c.c. filtered through a dry filter. The solution is transferred to a beaker and 5 gm. of tartaric acid added, followed by hydrochloric acid to produce a distinctly acid reaction. The hot solution is saturated with hydrogen sulphide, the precipitate filtered off and washed with warm 2% sodium acetate saturated with hydrogen sulphide. If arsenic is absent, the precipitate is dissolved directly in hydrochloric acid; if present, the precipitate is ignited in an iron crucible at a very low temperature and the residue fused with peroxide.

Precipitation with ammonium nitrate is carried out by boiling the alkaline filtrate, obtained as above, with 20 gm. of ammonium nitrate and a little filter pulp until the smell of ammonia is barely perceptible. The precipitate is allowed to settle, filtered off, and well washed with hot 2% ammonium sulphate. It may either be extracted with hydrochloric acid and the filtered solution reduced as usual, or ignited and fused with peroxide. Arsenic, if present, is carried down by the metastannic acid, and may cause trouble in the reduction and titration. It should preferably be removed by a preliminary digestion of the ore with nitric acid. The methods given under (3) work equally well when the tin is present in the form of stannine as when present as cassiterite.

COMPARISON OF RESULTS OF DETERMINING TIN CONTENT IN HIGH-GRADE WOLFRAM ORES BY VARIOUS METHODS

Ore	Composition, Per Cent.	Method 1	Method 2	Method 3 — Fusion with Na_2O_2 —		4. Powell Method Bisulphate Fusion	Separate Determination of Sn	
		Aqua Regia, Per Cent Sn	Fusion With NaCN Per Cent. Sn	Tin Pptd. by H_2S Per Cent Sn	Tin Pptd. by NH_4NO_3 Per Cent Sn	Total Per Cent Sn	Insoluble Residue	Recovered by H_2S
A	WO_3, 70.4; Cu, 0.25; As, 0.16, contained stannine	0.35 0.36	0.37(a) 0.34(a)	0.33 0.30	0.37 0.37	0.37(a) 0.35(a)	0.24 0.24	0.16 0.11
B	WO_3, 72.9; As, 0.08; Bi, 0.07	0.61 0.59	0.59 0.55	0.53 0.57	0.55 0.51	0.60 0.59	0.59 0.59	nil nil
C	WO_3, 65.4; As, 1.19; Cu, 0.24	1.97 1.97	1.90(a) 1.95(a)	1.93 1.92	1.95(a) 1.79(a)	2.00(a) 1.96(a)	1.83 1.89	0.14 0.06
D	WO_3, 63.8; As, 0.22; Bi, 0.96	7.10 7.08	6.97(a) 7.04(a)	7.02 7.07	6.95 7.09	7.05(a) 7.07(a)	6.78 6.82	0.29 0.20
E	WO_3, 74.3; As, nil; Cu, Bi, traces	0.12 0.12	0.08 0.10	0.10	0.12	0.14 0.12	0.12 0.11	nil nil
F	Synthetic mixture	5.48 5.45	5.40 5.47	5.42 5.44	5.45 5.36	5.46 5.46	5.44 5.41	nil trace

(a) The ore was given a preliminary treatment with nitric acid.

POWELL METHOD

After removal of the wolfram by fusion of the ore with bisulphate, as usually carried out, the melt is heated with dilute sulphuric acid, which dissolves iron, manganese, and titanium sulphates, but precipitates the tungstic acid in a white flocculent form which is difficult to filter and wash free from iron salts. Consequently, on leaching the residue with ammonia, ferric hydroxide is formed, which retains tungstic acid, and re-precipitation is impracticable when time is an important factor. Caustic soda readily dissolves tungstic acid; it also precipitates iron, but in the presence of sufficient tartaric acid both metals remain in solution. It was thus found possible to obtain a clean residue in one operation. Further work showed that addition of caustic soda was not necessary, as a solution of hot 5% tartaric acid readily dissolved the fused cake without separation of tungstic acid.

The exact details of this method, which has proved its superiority, after nearly three years' continual use, are as follows: 1 gm. of the sample, crushed to pass a 90-mesh sieve, is mixed with 5 gm. of previously fused bisulphate in a capacious silica crucible, and the mixture heated, gently at first, finally to a red heat. The crucible is cooled by standing it in a shallow basin of cold water (taking care that no water enters the crucible). When nearly cold, it is covered with a watch-glass to avoid loss by the splintering of the melt. The crucible is half filled with hot 5% tartaric acid and gently warmed over a small flame, whereby the melt is readily detached. It is then transferred to a beaker, together with 70 to 80 c.c. of tartaric acid solution, and the whole boiled until the cake has completely disintegrated and all soluble matter dissolved.

Another method of removing the melt from the crucible consists in pouring it on to a cold iron or nickel plate. When cold the mass is boiled with 5% tartaric acid in a beaker, and what remains in the crucible is rinsed out with the same liquor into the main solution. The insoluble material is filtered off on a Whatman No. 1 or 2 filter, well washed with hot water, ignited wet in an iron crucible, and fused with 2 gm. of sodium peroxide. In washing out the crucible and beaker, care should be taken that all the tinstone, which has a great tendency to hang back, is washed out.

It was soon found that some ores give slightly low results by this method, and this was traced to solution of a little tin in the tartaric acid liquor. It may be recovered by a hydrogen sulphide treatment, the tin being precipitated as sulphide and filtered off, together with the insoluble matter. Gentle ignition converts the sulphide to oxide without loss.

Ilmenite, columbite, and monazite, if present, are dissolved by the bisulphate fusion and subsequently dissolve in the tartaric acid liquor. Scheelite dissolves completely, and no separation of calcium sulphate occurs. If much copper, bismuth, or molybdenum is present, the ore should first be treated with 20 c.c. of nitric acid (sp.gr. 1.2), the residue filtered off, washed with hot water, ignited wet, and fused with bisulphate. Arsenic is volatilized on igniting the residue from the fusion, but large quantities of mispickel or iron pyrites cause much effervescence and consequent danger of loss during the fusion, so that it is better, in these cases.

also, to give the ore a preliminary treatment with nitric acid.

SUMMARY OF RESULTS

The table gives a comparison of the results obtained by the method detailed. After the removal of the wolfram, the stannic chloride solution obtained either by fusion or solution was reduced in a round flask with three iron nails for 30 min. after the color of the ferric chloride had disappeared. The reduced solution was cooled in running water after the addition of a piece of clean marble, the nails were removed and washed with air-free water, and the solution was titrated with a weak solution of iodine (1 c.c. = 0.002 gm. Sn, approx.). The iodine was standardized against pure tin, and due allowance made for the amount of iodine consumed by the nails (this correction never amounted to more than 0.3 c.c. of the iodine solution).

The synthetic mixture F was made by sliming together 20 gm. of a pure crystal of wolfram and 1.6 gm. of a pure crystal of tinstone.

France's Iron and Steel Industry

Under the name of Société Corporative des Mines de fer et de la Sidérurgie des régions sinistrées, a company has recently been formed in France for the purpose of conducting commercial or industrial operations useful in bringing about the reconstitution and reorganization of the iron mines and steel works of the invaded regions, says a consular report.

The company is affiliated with the Comptoir Central d'achats industriels pour les régions envahies, and has its offices with that organization at 40 Rue du Colisée, Paris, and is practically a technical commission of the Comptoir Central. For convenience, however, a separate share company has been organized · Its capital stock of 1,000,000f., divided into 2000 shares of 500f. each, is held by iron-mining and steel companies owning properties in the invaded regions of France.

The society is administered by a conseil d'administration (corresponding to the board of directors of an American corporation) composed of not less than 10 and not more than 25 members elected by the shareholders. The present board of directors is composed of Edouard Dreux, civil engineer, No. 35 Boulevard Haussmann, Paris and representatives of the following companies:

La Société Civile de Joudreville, No. 84 Rue de Lille, Paris.

La Société des mines de fer de la Mourière, No. 58 Rue de Provence, Paris.

La Société Anonyme des Forges et Aciéries du Nord et de l'Est, No. 10 Rue Auber, Paris.

La Compagnie des Forges et Aciéries de la Marine et d'Homécourt, à Saint-Chamond (Loire).

La Société Anonyme des Aciéres de Micheville, à Micheville (Meurthe et Moselle).

La Société Anonyme des Hauts Fourneaux et Fonderies de Pont à Mousson, Pont à Mousson (Meurthe et Moselle).

La Société en commandite per actions Schneider & Cie., No. 42 Rue d'Anjou, Paris.

La Société Métallurgique de Senelle-Maubeuge (Société Anonyme) Longwy (Meurthe et Moselle).

MM. de Wendel & Cie., Joeuf (Meurthe et Moselle).

La Société des Mines de Giraument, No. 19 Rue de la Rochefoucauld, Paris.

The new company is making estimates of the raw material and equipment that will be needed to restore the damaged iron mines and steel works in the northern and eastern part of France. Its method is to gather the best information available regarding the extent to which iron mines, blast furnaces, and steel works have been destroyed, and on the basis of this data prepare purchase programs covering the materials needed for replacement.

These programs, when approved by the directors of the Société Corporative des mines de fer et de la Sidérurgie, are turned over to the Comptoir Central d'achats for execution. The Comptoir Central is a quasi-official organization, and is authorized to purchase any and all materials for the reconstruction of the invaded regions out of funds placed at its disposal by the French government.

It will not be possible to gain an accurate idea of the quantity or the value of raw materials and equipment needed to restore the iron and steel industry of the invaded regions until the Germans have completely evacuated the Lorraine sector. The size of the task may be inferred from the following facts: In 1913 France produced 21,714,000 tons of iron ore, of which 19,800,000 (90%) came from the Department of Meurthe et Moselle, in which are the iron bases of Nancy, Longwy, and Briey. The last two regions, which furnished the great bulk of France's iron ore, have been in the control of the enemy since the beginning of the war.

Of the 5,300,000 tons of pig iron produced in French blast furnaces the year before the war began, 86% came out of the blast furnaces of the north and east. Of the 4,600,000 tons of steel ingots cast from French converters and furnaces in the same year, 3,390,000 tons came from the regions which are now being evacuated by the Germans under the pressure of the Allied armies.

Much of the special equipment needed in the restoration of the French iron mines, blast furnaces, and steel works must be furnished by the United States.

Board Rules on Iron-Ore Imports

The War Trade Board announced on Nov. 11, 1918, that, in addition to the general license PBF No. 14, covering the importation of iron ore from Sweden and Spain, when coming as ballast in ships returning from those countries, licenses may be issued for bringing in a total of 70,000 tons of low-phosphorus ore from Spain, Sweden, Norway, and North Africa, provided the ore be imported and entered prior to July 1, 1919. By low-phosphorus iron ore is meant ore which contains phosphorus in the proportion of not more than 0.012% thereof to 50% of metallic iron. The total amount of the ore thus allowed to enter will be allocated by the Bureau of Imports.

Prospecting for Gold in Rhodesia is being encouraged to the extent that the expenses of prospectors may be subsidized at a rate not to exceed $75 per month. The scheme is one that leaves no loophole for fraud, the allowance being in the form of credit notes redeemable for stores. The amount received is sufficient to accelerate a prospector's efforts without furnishing him with anything approaching a competency.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Platinum Licenses Void

The rules and regulations governing the handling of platinum, iridium, and palladium have been suspended by an order approved by the Director of the U. S. Bureau of Mines. That section of the explosives regulations which applies to ingredients which are not to become a part of an explosive has been revoked. The order in this connection reads as follows:

> Because no longer required for the public safety, the Director of the Bureau of Mines in charge of explosives regulation has made the following changes in the general information and rulings under the act of Oct. 6, 1917, and as amended by the Sundry Civil Act of July 1, 1918:
>
> 1. All regulations relating to ingredients not used or intended to be used in the manufacture of explosives are revoked, and no further license of such ingredients will be required.
> 2. All regulations relating to fireworks are revoked, and no further license of fireworks will be required.
> 3. All regulations relating to platinum, iridium, and palladium, and compounds thereof, are revoked, and no further license of platinum, iridium, and palladium will be required.

The order was accompanied by the following statement from C. H. Conner, chief of the platinum section of the War Industries Board:

> The effect of the foregoing order is to render void any licenses heretofore issued to you under the so-called platinum rules and regulations, dated Aug. 17, 1918, to render unnecessary further compliance with said rules and regulations, and to terminate the necessity for securing further licenses thereunder.
>
> The foregoing order shall not operate to relieve any person upon whom an order requisitioning platinum, iridium, and palladium, or compounds thereof may have been served, from any obligation imposed upon him by such order.

Cancellation of requisition 342, covering platinum, is to become effective Dec. 1. In connection with the above, it may also be noted that dental platinum, iridium, and palladium, as well as platinum and rhodium, have been removed from the export conservation list.

War-Minerals Program Developing

Although no complete plan has been formulated at this writing (Nov. 22) by the Secretary of the Interior for administering the War-Minerals Act, such a program is rapidly taking form. Some features of the scheme doubtless will be affected by the conference called for Nov. 27, at which all phases of the chromite situation will be presented. The Executive order conveying the administration of the War-Minerals Act to the Secretary of the Interior reads as follows:

> By virtue of the power and authority vested in me by the act of Congress, providing further for the national security and defense by encouraging the production, conserving the supply, and controlling the distribution of certain ores, metals, and minerals approved Oct. 5, I hereby direct that the Secretary of the Interior shall exercise the powers and authority given under the act to the President, except those relating to duties upon imports.

An unusual and rather amusing feature of the order was the fact that it had already been issued a week before Secretary Lane himself learned the powers granted by the act had been transferred to him. By some slip, the usual notification was not sent out. The Secretary learned of the matter through the correspondent of the *Engineering and Mining Journal*, whose weekly inquiries at the White House regarding such an order finally were rewarded with the information that it had been issued.

The last clause of the order, which excepts the powers referring to duties upon imports, necessarily had to form a part of the order, as such powers may not be delegated by the President. Practically the same power is conveyed, however, with the right to allocate. By failing to allocate any imports which might not be desirable, the effect would be practically the same as that which would be occasioned by a prohibitive tariff.

Preference List No. 2 Eliminated

A long step toward turning the transportation of materials back into normal channels was made on Nov. 20 by a partial cancellation of priority ratings. The purport of the long legally worded order is set forth in the following announcement:

> The priorities division of the War Industries Board announces the formal cancellation of all outstanding priority ratings, whether by certificate or automatic rating, excepting those for the Navy, the Emergency Fleet Corporation, railroads, telegraph, and telephone companies.
>
> The order becomes effective as of Nov. 22, 1918. It in no wise implies cancellation of orders, priority directions, and requests, whatever their form, having been entirely disconnected from the placing of orders; their sole purpose and function being to define the relative importance of orders when placed. Furthermore, the full force and effect of the directions prior to that date are retained and preserved for the protection and benefit of those who have respected and observed them.
>
> The effect of the cancellation will be to divert to civilian needs on an equable basis vast quantities of materials in the obtaining of which the military program of the nation had prior claim.
>
> Applications for priority certificates may still be made, but will be granted only when the need is urgent and where it is clearly in the public interest. Nevertheless, the priorities division, under the new order, not only recognizes the paramount needs of the Navy, Emergency Fleet Corporation, railroads, telegraph, and telephone companies, but urges the industries of the country, without resort to priority assistance, to speed up the production and delivery of orders for the repairing of public utilities, manufacture of farm implements, and equipment for the production and distribution of food, petroleum, and natural gas pipe lines, and other facilities; and the operation, repair, maintenance, or expansion of mines, coke-oven plants, or reduction plants, smelteries, and furnaces employed in the production of fuels, metals, and metal products.
>
> The order further eliminates completely Preference List No. 2, issued by the priorities division for the guidance of all governmental agencies and others interested in the production and supply of fuel and electric energy, the supply of labor, and the supply of transportation. From time to time, however, the priorities division will promulgate such rulings and make such suggestions and requests in connection with priorities in the production and supply of fuel, electric energy, labor, and transportation as changing conditions may require.

All outstanding licenses for the importation of chrome ore, except those covering shipments from Cuba, Canada, and Brazil, have been revoked by the War Trade Board as to shipments from abroad after Nov. 11, 1918. Hereafter, no licenses will be issued for the importation of chrome ore, except licenses covering shipments from Cuba, Canada, and Brazil.

John D. Ryan Resigns

In tendering his resignation as Second Assistant Secretary of War and Director of Air Service, announced on Nov. 22, John D. Ryan made the following statement in his letter to Secretary Baker:

> I feel strongly that, now the war is over, my duty lies in the line of my former work. Labor and industry of the country must be quickly adjusted from a war to a peace basis, and the copper production is one of the most vital to the country's welfare. I believe I can do much in helping to bring about stable conditions, and that I should take up the work immediately.

In his reply, the Secretary of War said:

> Realizing the very great importance of the production and distribution of copper in the reëstablishment of our national civilian industry, and your own intimate relation to this great business, I reluctantly acquiesce in your desire to return to it and to terminate your relations as Second Assistant Secretary of War and Director of Air Service.

Last May President Wilson called upon Mr. Ryan, president of the Anaconda Copper Mining Co., to take charge of aircraft production. Resigning his private connections, Mr. Ryan became Director of Aircraft Production and chairman of the Aircraft Board. Three months later he was appointed to the positions just resigned, in which he had complete charge of aëronautics. Improvement under his administration was commented upon by Charles E. Hughes, in his report on aircraft production.

The November Meeting of the New York Section of the A. I. M. E.

The New York Section of the American Institute of Mining Engineers on Wednesday evening, Nov. 20, held a joint meeting with the American Institute of Electrical Engineers, the American Society of Civil Engineers, and the American Society of Mechanical Engineers, in the auditorium of the Engineering Societies Building, 29 West 39th St., New York. It had been announced that J. Leonard Replogle, director of steel supplies of the United States War Industries Board, would address the meeting on "The Demand for Steel and the Conservation of Steel." Pressure of official business in Washington prevented Mr. Replogle's attendance, and Albert C. Ritchie, counsel for the War Industries Board, addressed the meeting. Owing to the end of European hostilities and the cancellation of war orders—especially by many subcontractors—Mr. Ritchie changed the topic slightly and spoke on "The Demand for Steel and the Maintenance of Production." He said in part:

"During the first half of 1918, 17,000,000 tons of steel was produced, and it was estimated that the requirements of the second half would be 21,000,000 tons. The total produced under normal conditions in six months' time would have been 4,000,000 tons less than was then required for war purposes alone.

"We now have an annual capacity of producing 45 million tons of steel, and apparently no ready market to absorb this production. The War Industries Board will continue to give help and supervise steel production until conditions readjust themselves. The removal of the present limitation for the use of steel in nonessential industries, and renewed activity in building construction, will consume a large amount. The only priority retained will be for Army and Navy requirements both here and abroad."

Capt. P. E. Dulieux, of the French High Commission, said that at the beginning of the war Germany was very short of steel and needed it for war purposes. For this reason she grabbed the iron mines and steel plants in Belgium and northern France.

In 1913 France produced five million tons of pig iron and also imported some from Spain and Algiers. The German invasion effectually destroyed over 80% of the iron-producing capacity, so that during the war, to advance supplies for the troops, railroads in other parts of France had to be torn up and taken to the front. These must now be replaced. The total requirements of France are about eight million tons, which must be supplied by the United States and England, and new equipment is likewise required for the reconstruction of the French steel mills. With Alsace and Lorraine in their possession, and by means of combinations of the steel-producing interests similar in form to the United States Steel Corporation, France will become a competitor of the other countries in the production of steel and within a few years will be in a position to meet possible German competition in neutral countries.

Société Minerais et Metaux

The Société Minerais et Metaux, with a capital of 10,000,000 francs, was organized (August, 1917), at the suggestion of the French Ministry of Commerce and Industry, and has for its principal objects: (1) The dealing in ores, metallurgical products, and metals; (2) establishment of close relations with the mineral and metallurgical industries of the Allied countries, free from any Germanic influence; (3) development in France of the mining and metallurgical industries.

The company is a coöperative organization of metal producers, its object being to keep them in contact with the producers of the world and fully informed as to the statistical data of the mining and metallurgical industries.

This company comprises among its shareholders 26 French mining or metallurgical companies representing interests in France, Spain, Mexico, Algeria, Tunis, Serbia, Chile, Bolivia, Italy, and Russia. Its directors are eminent in the mining, metallurgical, banking, and industrial circles of France.

The Société is now selling lead for all purposes to the French and British governments. It purposes developing this trade; and, being in a particularly favorable position to know in detail the metal necessities in France, to act as agent for the purchase and sale of ores and metals. This association of French producers represents today an output of about 200,000 tons of lead, 40,000 tons of copper, and 50,000 tons of zinc.

The Société expects to institute research work on a large scale and to organize laboratories for this purpose. It is its intention to compete on all points with the German organizations having similar objects which existed in Europe before the war.

The directors of the company are: MM. G. Teissier; R. G. Levy; E. Paraf; A. Vincent; W. d'Eichthal; F. Robellaz, and F. Ledoux. The mining and metallurgical companies that are participating are the following: Société Minière & Métallurgique de Penarroya; Société d'Affinage de Métaux; Compagnie des Mines d'Ain-

Barber; Association Minière; Sté des Mines de Zinc d'Ain-Arko; Compagnie du Boléo; Compagnie française des Mines de Bor; Corocoro United Copper Mines, Ltd.; Sté des Mines de Fedj-el-Adoum; Société des Mines de Zinc de Guergour; Compagnie des Mines de Huaron; Société Minière du Kanguet; Comptoir Lyon Alemand; Compagnies des Minerais de fer Magnétique de Mokta-el-Hadid; Société Anonyme des Mines de Malfidano; Compagnie des Mines d'Ouasta et de Mesloula; Société des Mines de Parzan; Compagnie Industrielle du Platine; Sté Anonyme des Mines & Fonderies de Pontgibaud; Sté des Mines d'Antimoine de Rochetréjoux; Sté des Anciens Etablissement Sopwith; Sté française d'études et d'entreprises; Sté des Mines du Djebel-Ressas; Sté Anonyme française du Djebel-Hallouf; Société Anonyme des Mines & Usines de Peyebrune; Compagnie La Cruz.

Australian Metal Production

MELBOURNE CORRESPONDENCE

The conclusion of negotiations for the purchase of the surplus copper production till the end of the present year, which really means the yield from ore secured to the end of September, occasioned a feeling of relief on the part of Australian producers, but the uncertainty will again be manifested in the near future, although a general air of optimism is apparent. The value of the Australian output at present prices is approximately £5,000,000 per annum.

As previously reported, the exportable output of zinc concentrates has been sold to the imperial authorities for the period of the war and 10 years afterward. This covers 300,000 tons of concentrates annually.

The Australian production of lead amounts to about 175,000 tons per annum, and the exportable output to the end of 1918 has been sold to the British Ministry of Munitions, with the exception of lead for the markets of the East. As with zinc and copper, large accumulations of lead are awaiting shipment, and this fact makes the extension of the present agreement more difficult.

The formation of the Tin Producers' Association on the same lines as the zinc and copper associations has been approved. An embargo has been placed on the exportation of tin ores and concentrates, and in future all locally produced tin ore and concentrates will be smelted in Australia.

The Wallaroo and Moonta mines have produced, in the last half century and more, over 300,000 tons of fine copper, and although operations are now being carried on at varying depths to 3000 ft., the company has still a good lease of life. At Moonta, although large sums have been spent in prospecting, no new discoveries have been made, and work is now confined to the extraction of ore in the upper levels of the mine. The Wallaroo mines now yield the bulk of the ore. The ore raised at Wallaroo during the first half of 1918 averaged 3.95% copper, whereas the Moonta quota averages only 2.7%. After preliminary treatment and concentration, the tonnages from the two properties sent to the smelting works were respectively 29,586 tons, averaging 8.69%, and 4396 tons, averaging 13.91%. In addition, 404 tons of precipitate, averaging 68.81%, was produced at Moonta. The smelting works treated 35,371 tons of ore, concentrate, and precipitate, producing 3,804 tons of refined copper. The refinery also treated 864 tons of blister from Mount Cuthbert mine, North Queensland.

The Waihi-Paeroa Gold Extraction Co., of New Zealand, which erected a modern plant in 1911 for the treatment of the tailings and silt washed down the Ohinemuri River from the Waihi and Karangahake batteries, has decided to go into liquidation. Nearly £80,000 was spent on plant and equipment. The yield of gold from the treatment of 922,000 tons to the end of 1916 was valued at £279,375, but only £18,750 has been distributed among shareholders.

Shipping Australian Metals

SYDNEY CORRESPONDENCE

Australia pays part of her debts by the export of lead, copper, tin, and zinc. Local consumption is insignificant. Recently published figures of metal exports for the last two years show that the dearth of ships has caused stocks to accumulate. In the year ended June 30, 1917, about 38,000 tons of copper was shipped, and in the year ended June 30, 1918, only 29,000 tons. Assuming the annual output to be 40,000 tons, this would leave a stock of about 13,000 tons of June 30, 1918. A few shipments have been made since June last, but not enough to keep pace with the production since that date. It seems likely that by the end of the year the stocks will be still greater. The quantity is not large according to American ideas, but it is about 33% of the whole output of the commonwealth. The lead stocks are larger, for, though lead has had the preference for export on copper and zinc, the production has been quadruple that of copper. In 1917-18 only about 120,000 tons was lifted, leaving at least 40,000 tons in stock.

Zinc concentrates are, of course, increasing greatly in amount, and no figures can now be given of these stocks. Production of zinc concentrates is bound up with the production of Broken Hill lead concentrates, and though not all of the current zinc sands are concentrated at present, stocks still grow.

The programme of shipbuilding laid out for Australia is a fine one, and there seems every prospect of its being carried out well. The 60-odd ships being built in Australia and in America for the commonwealth, will not be able to help much before the end of next year, though some of the American-built ships are arriving monthly. There is, of course, far more other weight to lift than metals. Wheat alone is said to be over five million tons today—without the harvest due early in 1919—and there are vast quantities of wool, meat, and other produce waiting shipment. Australia's pre-war annual clearance of approximately 11 million shipping tons just about sufficed for production, and now the annual clearances are rather less than half this amount. Suggestions have been made to use such ships as are available for the shorter sea route to San Francisco or Vancouver. Though this might shift a larger amount from Australia than by taking the ships to England, it would impose a heavy burden on the railways of the United States and Canada.

So far as the lead- and copper-producing interests are concerned, the establishment of the "Associations" dealing with the outputs as a whole, has been of the greatest benefit. In no other way would such excellent business with the Imperial Government have been made possible.

Editorials

The Prospect for the Metals

WE HAVE previously expressed the opinion that eventually there is going to be a great demand for the metals for reconstruction purposes, for the replenishing of the depleted stocks of goods for ordinary commercial purposes, and for new construction for the institution of industrial economies, such as a more general use of water-power, etc. But before that is to be expected we regard it as inevitable that there will be a period of readjustment, during which there will be lower prices. Such markets as have been free to do so, especially zinc and antimony, and even tin, in spite of its restrictions, have already been reflecting this. However, there is considerable reason to expect irregular conditions, and while most metals may go down, some may hold at their present levels and others may even rise. Thus the demand for silver for financial purposes may perhaps maintain its present price, while the acute shortage of platinum may not inconceivably result in a rise in its market when it becomes quite free. But nobody entertains any such expectation with regard to iron, copper, lead and zinc.

The continuance of control of these metals (which never has been more than partial in the case of zinc) by the War Industries Board gives rise to some misunderstanding as to just what it means. That body did not, for example, ever fix the price for copper in the sense that it guaranteed it for a certain period. It fixed a maximum above which sellers might not go. The hanging of the price at that maximum meant that at no time was there enough copper to satisfy the demand, and persons desiring copper had to be rationed. If there had been at any time more than enough copper, the price would have receded from the stipulated maximum price, just as high-grade zinc declined below the maximum price of 12c. that was fixed for it.

Now, the War Industries Board in making a new agreement with the copper producers whereby the latter promise to maintain production and not to reduce wages, the board reaffirming the price of 26c., does not say that it will maintain that price, which it could do only by buying all the copper that was offered to it, but apparently means only that it will not resell any copper over which it has control at less than that price, and sanctions the producers' concertedly asking that price and getting it if they can; whereupon the producers acted accordingly, i.e. unitedly agreed to demand and hold out for 26c. This is, of course, directly in line with the oft-repeated efforts of large producers in the past to starve consumers into paying what they, the producers, would like to have. The solution of such a policy will be now, as heretofore, whether the producers prefer to have money or own unsold copper, or how long and to what extent it may be advisable to lug accumulations of copper.

It will be perceived immediately that the agreement exacted by the War Industries Board that the producers shall maintain production does not match at all with the price program. Washington, however, seems to be in mortal terror in facing any readjustment of labor, either as to employment or rates of wages, and therefore passes the buck to the producers, who will pass it on to the primary manufacturers, who will pass it on to the secondaries, who will pass it on to the consumers. But while the War Industries Board institutes this policy, the Railway Administration, which is a large consumer, says that it will not pay present prices for anything, including copper, except labor. We do not think that the copper producers are under any illusions as to the outcome. They can see the time near at hand when stocks of refined will begin to pile up, besides the stocks of crude that they have already; with three months of high-cost production of the mines on the road to them; with a maintenance of high-cost production; and with no buyers in sight. Their real attitude toward the maintenance of the *status quo*, including an officially sanctioned asking price, is doubtless that it affords a breathing spell, during which everybody will have a chance to see more clearly what ought to be done next.

We have previously expressed the opinion that even if there had been no war the world's consumption of copper would naturally have been as large as it was in 1918. This would have been so if the old rule that copper consumption about doubles every 10 years had held good. We look forward to a great demand for copper after the period of readjustment, but it will not begin with the price for the metal at the present nominal level. Any idea of a prolonged maintenance of that level is simply preposterous.

The situations in steel and lead are not dissimilar to what exists with respect to copper. The steel producers are perhaps better sold ahead than producers of either copper or lead. The lead producers are more disposed to face the facts than are the copper producers and make reductions in price, acting concertedly, with allocation of orders, until such time as free competition may be restored. Here again a determining factor will be the quantity of unsold stock they will be willing to carry. Another important consideration in the lead situation is that the mines are probably less able to maintain production than are the copper mines, more serious inroads upon their developed resources having been made.

Zinc has conditions peculiar to itself. It is the only one of the major metals that has had a free market during the whole period that the United States was at war, and is the only one that has had an accumulation of marketable product in producers' hands. The industry stands immensely overbuilt as to smelting capacity and overdeveloped as to mining and milling capacity, with the prospect that plant to the value of many millions, into which was put much of the profit of 1915-17, will have to be written off. Even the diminished production of 1918 has had to be absorbed o a considerable extent by foreign consumption, for the supply of which British and Japanese competition s increasing (with the prospect that Belgian will ere ong be resumed), while of the domestic a large portion has been for brass-making for ammunition that will be summarily suspended. At the same time the industry experiences internal competition from mining districts possessing rich ore and metallurgical districts enjoying favorable conditions that are bound to be influential factors. It is true that labor conditions, both in zinc mining and in zinc distilling, have been almost intolerable, and during 1918 the price for the metal has been most of the time below what was reasonably regarded as the equivalent of 5c. spelter before the war. But that did not prevent the market last spring from going down to 6¾c., reckoned as equivalent to 3¾c. before the war. Of one thing we may be fairly certain, which is that a further decline in the price for zinc will be followed by prompt closings of mines and works, with the simple explanation of "*non possumus*," and it is not unlikely that we shall see the earliest readjustment in this industry, which is not to imply that it will be painless.

In copper especially there will be new international conditions. We are going to be confronted by collective buying from abroad. In Great Britain there has already been formed a big metals company, while in France an association has been organized. These will be met by an American selling corporation or association, in which producers will unite under the permission of the Webb law. The conducting of international business among such powers, and the reactions upon domestic business, will without doubt develop highly interesting things. In the meanwhile, there are no buyers, either foreign or domestic, and there is a general reluctance among politicians to admit that industrial business cannot be resumed at the price scales of a war basis, in which cost did not enter so much into the calculations as exigency. But whatever be the reluctance on the part of anybody, or whatever desire there may be to compel the public to pay the piper, it will be the force of circumstances that will drive.

The Retirement of Mr. McAdoo

MR. McADOO this week added another to his bag of offices, when he was appointed a member of the Reconstruction Board. Mr. McAdoo's capacity for office holding was exciting the admiration of the world, when on Nov. 22 his resignation was announced, to the great surprise of everybody. The real reason for his relinquishment of his great powers is a mystery. Mr. McAdoo has done things for which he has been properly criticized, but those have been greatly outweighed by the things that he has done well. He has been an efficient executive and a useful public servant in a time of crisis.

Mr. McAdoo, who was a lawyer by education and training, first became generally known as the promoter of the company that built the tunnels under the North River. The tunnels were completed and put in operation, but the enterprise was not successful financially. Entering upon the administration of the Treasury Department, well-informed people were doubtful as to the wisdom of the choice. However, Mr. McAdoo, without being a great Secretary of the Treasury, formulating great financial principles, has nevertheless been a sound and able one in a period of great emergency, and especially has he proved himself to be a great executive. The country owes him a wealth of gratitude for his opposition to the ruinous plans of the ignorant Mr. Kitchin, if for nothing else. It will be fortunate if the President selects a successor to Mr. McAdoo who will be as good as he.

The departure of Mr. McAdoo will become a matter of greater regret if it prove true, as has been suggested, that the mystery in his case is his opposition to governmental appropriation of the railways and telegraphs, to which the Administration is said to be committed.

Ventilation of Metal Mines

AIR is such an invisible substance, and is so apparently able to take care of itself, that it is not surprising that the metal miner should undertake its regulation last among the common demands that press upon his attention. The air in a heading or stope must often reach a condition that prevents a candle from burning before steps are taken to better the ventilation. Even under these conditions acetylene lamps have been used because they would operate where candles would not. Only under the most extreme circumstances would ventilating pipe and blowers be installed. Too much reliance has been placed upon the efficacy of ventilation produced by the exhaust from air drills. Happily, this condition is rapidly passing.

Mr. Mitke's article in this issue is a good one. It reviews the field in a way that will be appreciated by mining engineers and operators. We concur in his opinion that a quantity standard is the most practicable. Under coal-mining conditions a quality standard is probably best, but there is little need in the majority of metal mines to undertake the regular analysis of the air in the mine, although abnormal conditions may necessitate this procedure at times.

The "good working atmosphere" that Mr. Mitke defines—a temperature of 78°, a relative humidity of 80%, a velocity of 125 ft. per min. and 350 cu.ft. per minute per man—can usually be readily attained. Mechanical ventilation is necessary for proper control, and this point has been thoroughly discussed. We agree, also, with the necessity for the working out of the ventilation problem for the mine as a whole, both for developing and for stoping. The insistence upon the standardization of small ventilating equipment is a good point. The relative merits of metal and canvas air pipes are discussed.

After all, improvements in underground conditions must find a measure upon the cost accounts. The test of time as well as the operating results secured under a "good working atmosphere" have been applied to Mr. Mitke's work and show in no uncertain manner that attention to ventilation pays. Mine ventilation, held in such casual estimation in many instances, has an important significance in operating economy when subjected to painstaking engineering investigation and followed up by an adequate installation.

The Postal and Telegraphic Service

MR. McADOO, as Director General of the American Railway Express Co., this week ordered an increase in express rates, and thus added something to the cost of living. Mr. Burleson, as Postmaster General and Administrator of the telegraphs, announced a reduction in the rates on telegraphic night messages, which was supposed to win plaudits from the public as something contributing to reduction in the cost of living. However, Mr. Burleson's announcement had a string to it in the form of the proviso that night messages at the reduced rate are to be delivered by letter carriers. If anybody wants the usual delivery, that the telegraph companies heretofore have afforded, he must pay the full "fast rate" on his message. For practical purposes, in business affairs, this is equivalent to an abolition of the night rate, for nobody having in mind what happens to letters in Mr. Burleson's mail service is going to take chances on that kind of delivery. Thus Mr. Burleson, instead of contributing toward a reduction in the cost of living, is in all probability adding, like Mr. McAdoo, his quota of increase. It used to be "The public be damned." Now it is "The public be humbugged."

It was a shock to every thoughtful citizen to hear last week that Mr. Burleson had taken over the cable companies, and that at a time when the war was practically, if not technically, over, and there was no conceivable reason why such a seizure should then be made. Mr. Burleson's reasons, as stated by himself, are in no wise convincing. To the plain citizen it looks like a step to take into governmental hands the last of the public services while there was still a right to do so, regardless of whether that right conformed to the spirit of the law or not. The cable service has heretofore been efficient and satisfactory. We shudder to think what Mr. Burleson will make of it. For what purpose does he wish to demoralize the postal, telegraph, telephone, and cable services? Do the people want poor service instead of good?

Thursday, Nov. 21, will go down in history as the day upon which the German fleet sailed toward the Firth of Forth between two long lines of British warships to surrender. Events follow one another with rapidity in these days, but the far-reaching significance of the event strikes home to every thoughtful person. There was no cheering, nor outward sign of elation from the British. The greatness of the sacrifice on the part of the British, the grimness of this grim war, left no room for the customary outbursts of feeling. The fangs of the snake have been drawn. It cannot strike again.

Accident prevention pays. A proper record of accidents, a careful and consistent study of this record, together with the fullest use of the deductions made, is urged by D. E. Charlton in an excellent article in another part of this issue. Mr. Charlton speaks from experience and touches upon some of the vital points in practical accident prevention. Keeping records is, after all, only a means to an end. Unless there is a definite decrease in accidents, such records serve only to satisfy statisticians. Keeping the workers in close touch with safety progress is recognized by superintendents and managers as necessary. Education is, a Mr. Charlton says, the solution of the safety problem but it must have its beginnings in the thorough understanding of underground conditions by the miners an other workers, as well as by those in direct charg of mining operations.

BY THE WAY

Those who with a love of nature combine a passion for statistics will find a recent bulletin of the U. S Geological Survey on gems and precious stones a source of innocent pleasure. They will learn that quartz, fo instance, masquerades under 200 different names, all of them English. Garnet is a poor second, with only 54. Opal, corundum and feldspar follow, their aliases ranging in number from 46 to 35; and spinel, beryl topaz, and half a dozen others smell just as sweet by any one of a dozen or two different monakers.

"For the sin ye do by two and two ye must pay for one by one" wasn't intended, of course, by the eminent bard who wrote the verse, to apply to the Democratic Administration, says David Lawrence in the *Evening Post;* but that is just about how Secretary Houston of the Department of Agriculture must have felt when the editors of twoscore farm and agricultural publications whom he had asked to coöperate with him in telling the farmer what must be done in the reconstruction period bluntly confessed that the operation of the Postal Zone law was hampering and stifling them.

Sir John Pettus, who wrote on assaying back in the seventeenth century, evidently had his bad moments. He had probably just let the cupels freeze, or done something similar, when he set down his ideas on litharge. Says he: "This word is written littarge, and by some lithargy; and that signifies the public office of devotions, litturgy, and the sleepy disease, lethargy. And I wish that the plenty of our littarge or lithargy may raise up our litturgical devotions to be delivered in all times from our wealth and from the lethargical or sleepy hours of death."

The efforts of the Unevida company to recover from the Carson River in Nevada the gold and silver lost in the old Comstock days bring to mind another of Dan De Quille's sketches of those times. During the first few years on the Comstock, millions of dollars was lost in the tailings. After freshets in the canyon the miners used to go out and collect amalgam by digging it out of crevices in the rocks. Having retorted this, they would make rings of it by melting the bullion and pouring it in a mold cut in an adobe or piece of brick. These rings weighed an ounce or more, and of nights, when going into town to have a good time with the "boys," the men would slip three or four of them upon the fingers of their right hands, for use in lieu of brass knuckles.

Of the two men in Government positions who have had most to do with the personal comfort of our citizens since we entered the war, one has come out with greatly increased popularity and the other with less than none, says the *Boston News Bureau.* A few days go a prominent bank president was speaking approvingly of Mr. Hoover's methods of handling problems. Where his rulings affected corporations, their officials soon got to realize that if there was any seeming hardship to their business, it was only necessary to have an interview with the head of the Food Administration to have the difficulties cleared away or perhaps to become convinced that the order was necessary for the winning of the war. "He's no bull in a china shop," said the bank president to me. "Now, I'm talking about Hoover—not Garfield. I didn't say a word about Garfield," he added cheerfully.

Mining litigation in the early days was attended with other dangers than those of losing the suit. When the case of the Ophir Company *vs.* McCall *et al.*, popularly known as the "Middle Lead Boys," was called at Genoa, Nev., in the Carson Valley, in 1860, three or four hundred men, armed to the teeth, were present. This according to Eliot Lord in Monograph 4, U. S. Geological Survey. The room was crowded with excited partisans, and an unguarded expression might at any moment bring on a collision which would cover the floor with bleeding bodies. The lawyers engaged in the suit, being fully aware of the disposition of their respective supporters, exercised a judicious caution in discussing the merits of the rival claims, and they were markedly courteous in their personal allusions, as well as in the examination of the witnesses, while their show of deference for the rulings of the court was extremely flattering to the presiding judge. In the face of this prevailing harmony, the jury appeared unnaturally obdurate in persistently refusing to agree upon a verdict.

J. V. N. Dorr sends us the following extract from a letter from Capt. E. R. Graham, 309th Engineers, formerly manager of the Mogul mine, in the Black Hills, and one of his old boys: "I drew a rock-quarrying job about eight miles out of the city and three miles out of the main camp, and I am having the time of my life. This place is what I call 'Miners' Heaven.' Can you imagine having all the men you want and not having to worry about costs? I have about 30 men to do the supervising and mechanical work, and 130 German prisoners assigned as laborers. There have been about six officers on this job in the last six months, and they were sharpening their steel by finishing it on the emery wheel. This will give you a fairly good idea of how the place was run. I have a good bunch of men with me, but only two have had mining experience. The rest are willing, and I never saw a bunch take hold more quickly. Everybody is glad to get a rest from the continuous drilling. As I understand, we are to get out rock for about 60 miles of road. The tonnage we will get out will depend on the transportation furnished."

The efforts of mining communities to raise their quota in the recent drive recall Mark Twain's account of a similar campaign made in Virginia City, Nev., during the Civil War, while he was city editor of the *Territorial Enterprise*. It runs:

> The news came over the wires that money was wanted for the relief of wounded sailors and soldiers languishing in the Eastern hospitals. Right on the heels of it came word that San Francisco had responded superbly before the telegram was half a day old. Virginia rose as one man. A committee was hurriedly organized, and its chairman mounted a vacant cart in C Street and tried to make the clamorous multitude understand that if the town would only wait an hour, an office would be ready, books opened and the commission prepared to receive contributions. His voice was drowned and his information lost in a ceaseless roar of cheers, and demands that the money be received now—they swore they would not wait. Men plowed their way through the throng and rained gold coin into the cart and scurried away for more. Hands clutching money were thrust aloft out of the jam by men who hoped the eloquent appeal would cleave a road their strugglings could not open. The very Chinamen and Indians caught the excitement and dashed their half-dollars into the cart without knowing what it was all about. It was the wildest mob Virginia had ever seen, and when it dispersed, it had not a penny in its pocket. To use its own phraseology, it came there "flush" and went away "busted."

We wonder how these old Comstockers would have responded to the appeal for the 27th Engineers.

27th Engineers in Argonne Drive

We have been thinking about a Christmas present for the boys of the 27th. Colonel Perry has written us that they crave sweet chocolate, and of course cigarettes and tobacco are always wanted. We took up the matter of getting a supply of chocolate and found a good deal of difficulty in obtaining any. We finally secured an option on 4000 lb. In the meantime we were taking up the matter of shipment. Just when we got the news that we could get the chocolate we heard from Washington that the Transport Service would not take anything for shipment for anybody; also that there was an ample supply of chocolate and cigarettes in France, and that the best thing to do is to send over the money and let the officers buy the supplies over there. So we are sending $2500 for the Christmas present.

Company A, we are informed, has been actively engaged for the last few months in various sectors and has done extremely creditable work. It played an important part in the recent drive in the Argonne region in constructing and rebuilding bridges for the advance. The health of the company, in general, is excellent and the men are all in good spirits. The full strength of the regiment, according to the latest records of Washington, is 42 officers and 1615 men.

It is not too late to subscribe to the Comfort Fund. The regiment has done its part, but ours is not yet finished. Friends are urged to send their gifts in promptly.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$1[illegible],192.77
C. M. Eye	[illegible]
C. A. Burdick	[illegible]
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
[illegible]	[illegible]
W. L. Gibson	[illegible]
C. M. Fenton	[illegible]
Charles Le Vasseur, [illegible]	[illegible]
B. N. Jackson	[illegible]
H. A. [illegible]	[illegible]
Mrs. A. B. Emery, Messina, Transvaal	10.00
A. C. Stoddard	[illegible]
Robert E. [illegible]	[illegible]
Nelson P. [illegible]	[illegible]
Lawrence Addicks	[illegible]
R. R. [illegible]	[illegible]
E. R. [illegible]	[illegible]
W. J. Olcott	[illegible]
J. E. Clennell	10.00
C. M. Eye, [illegible]	[illegible]
M. H. [illegible]	10.00
Total	[illegible]

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Because of the work involved in administering the Comfort Fund, contributions are acknowledged only by publication in the *Journal*.

Personal

Have You Contributed to the Association of the 27th Engineers?

Albert G. Wolf examined mining property near Imlay, Nevada, recently.

A. Charles Meagher, of the Butters staff, Chile, is returning to the United States.

James S. Douglas has returned to France to resume his work as director of the American Red Cross stores.

Emmet D. Boyle, Governor of Nevada, and **Whitman Symmes**, of Virginia City, Nev., are in New York.

Charles A. Chase is in Telluride on professional business in connection with the Liberty Bell Gold Mining Company.

W. H. Seamon has been made manager of the Richmond Basin group of claims, seven miles north of Globe, Arizona.

Robert R. Hedley, mining engineer, is developing a mining property at Stump Lake, Nicola mining division, British Columbia.

Arthur Curtiss James and **William Church Osborne**, of the Phelps-Dodge Corporation, have been inspecting the company's properties in the Southwest.

Arthur J. Bensusan, superintendent at the mines of the Ouro Preto Gold Mines of Brazil, Ltd., at Passagem, Minas Geraes, Brazil, is now in New York.

Charles T. Sokup, who has been connected with the Bureau of Aircraft Production for the United States Government, is now with Ford, Bacon & Davis, of New York.

Forest Rutherford, consulting metallurgical engineer, has returned to New York from Colorado, where he has been making interesting mill tests on ores of the Breckenridge district.

J. C. Agnew, formerly superintendent of the Mahoning Ore and Steel Co., Hibbing, Minn., has been appointed assistant manager of the Midvale Steel and Ordnance Co., of Pennsylvania.

M. H. McLean, for several years general manager of the Morenci branch of the Phelps Dodge Corporation, has resigned and will reside in California. **Joseph P. Hodgson** will be his successor.

S. W. Cohen, formerly general manager, Crown Reserve Mining Co., Ltd., Ontario, Canada, has been appointed general manager of the Dominion Reduction Co., Ltd., succeeding the late **E. L. Steindler.**

Harry J. Wolf was in Colorado Springs several days last week in connection with metallurgical tests conducted at the Portland mills for the Buffalo Hunter Mining, Milling and Development Company.

Capt. Percy E. Barbour has been relieved from duty at the Engineer Officers' Training School, Camp Humphreys, Va., and has been assigned to the 150th Engineers, Camp Shelby, Mississippi.

H. E. Eye, manager of the Sasco, Ariz., plant of the American Smelting and Refining Co., has been given charge of the company's smeltery at Hayden, Ariz. He will be succeeded by **R. B. Green** at Sasco.

Fletcher G. Downs, assistant manager of the Ely-Copperfield Associates, at West Fairlee, Vt., expects to be in New York early in December, as the company is suspending its milling operations for the winter.

Major A. S. Dwight, who was detached from the 11th Engineers to do metallurgical work at Marseilles, is now detailed upon metallurgical reclamation work. **Captain Stehli**, formerly of the 11th Engineers, is acting as his assistant.

Scott Leavitt, of the U. S. Department of Labor, arrived recently in Butte, Mont., from Washington, D. C. for the purpose of investigating labor conditions in the mines, with a special view of inquiring into the rustling card system.

W. S. Valentine, president of the New York & Honduras Rosario Mining Co., was recently elected chairman of the board of directors. This office was created by changing the by-laws for the purpose. **William A. Prendergast**, former controller of the City of New York, was elected president.

William Malcolm Corse, manager of the Titanium Bronze Co., Inc., Niagara Falls, N. Y. arrived in New York recently and registered at the American Institute of Mining Engineers. Others who registered were **Toner Antisell**, Washington, D. C.; **W. H. Staver**, Ciudade de Bomfim, Bahia, Brazil, and **Benjamin F. Tibby**, of Salt Lake City, Utah.

Capt. C. E. Kilmer, of Toronto, a graduate of Toronto University, who had considerable mining experience in the United States and Sweden previous to his enlistment, has been engaged as consulting engineer for the Bellevue Mining Co., which is preparing to develop several claims at Hole River in the Rice Lake district, Manitoba.

W. L. Honnold, director of the Commission for Relief in Belgium, is leaving for France on the S. S. "Rochambeau," Nov. 30, and will represent the Guaranty Trust Co. in reconstruction matters calling for financial coöperation. He will continue as a member of the advisory committee of the Commission for Relief in Belgium. His address will be with the Guaranty Trust Co., 1 and 3 Rue des Italiens, Paris.

Obituary

Charles A. Wheeler, assistant assayer at the Consolidated Mining and Smelting Co.'s electrolytic zinc plant, Trail, B. C., died of pneumonia Nov. 1.

Oscar Frederick Ambur, mine representative at the Consolidated Mining and Smelting Co.'s smeltery at Trail, B. C., died of Spanish influenza recently, aged 42 years.

O. T. Storrs, of Cripple Creek, Colo., died recently of pneumonia, following influenza. Mr. Storrs was 41 years old. His wife, who was stricken at about the same time, also succumbed.

Robert Milton Green, manager of the Butte & Great Falls Mining Co., Butte, Mont., died of influenza-pneumonia Nov. 12, aged 32 years. He was also manager of the Butte Copper Czar Mining Co. of Butte.

R. James, who was employed at the smelting works at Trail B. C., before enlisting for military service overseas, was killed in action in France on Sept. 27. He was 25 years old, and was a graduate of Cambridge University, England.

Bruce White, president of the Noonday Mines Co., Sandon, B. C., died of pneumonia Nov. 15 at Nelson, B. C. He was a pioneer of the province and one of the discoverers of Slocan Star mine, now operated by the Silversmith Mines, Ltd. Mr. White was a member of the Northwest Mining Association.

O. C. Schaeffer, chemical engineer with the Chemical Products Co., Denver, Colo., died Nov. 14 of pneumonia, following influenza, at the Red Cross hospital, Dolores, Colo. He was formerly associated with the Du Pont Powder Co. and the U. S. Bureau of Mines. While in the employ of the Government he designed the National Radium Institute plant, at Denver.

Pierre de Peyster Ricketts, for 32 years connected with the teaching staff of the School of Mines of Columbia University, until his retirement in 1900, died Nov. 20, at his home in New York. He was born in Brooklyn 70 years ago, the son of George Richard Ashe Ricketts and Catherine Adriana de Peyster Greene; was graduated from the School of Mines, Columbia, in 1871, and received his degree of Ph.D. five years later. He was an assistant in the School of Mines for a number of years prior to 1885, when he was appointed professor of assaying, and in 1893 was made professor of analytical chemistry and assaying, retiring in 1900 to become the head of the firm of Ricketts & Banks, assayers, chemists, and consulting mining engineers. In 1876 Dr. Ricketts published a textbook, "Notes on Assaying," which was one of the first American works on the subject and found extensive use among the colleges throughout the United States. He was at one time president of the Society of the Older Graduates of Columbia, and was always prominent in alumni affairs and popular with graduates, young and old, for his even disposition and his love of his university. He was a member of the Columbia University, Union League, Chemists' and Barnard Clubs, the Century and Down Town Associations, the American Association for the Advancement of Science, New York Academy of Sciences, American Institute of Mining Engineers, and American Chemical Society. Dr. Ricketts (who is not to be confused with Dr. Louis D. Ricketts) was one of the old type of consulting mining engineers, which has now, like the old type prospector, all but disappeared. As a member of the firm of Ricketts & Banks, which for many years enjoyed a high reputation as assayers, chemists, ore samplers, and ore testers, Dr. P. deP. Ricketts was quite successful. He was less so in his ventures afield as an advisory engineer and as an engineering promoter. Not many years ago the old firm of Ricketts & Banks was dissolved, its successor being Ricketts & Co., Inc., John H. Banks retiring to do consulting engineering work on his own account.

Industrial News

Ohio Brass Co. has removed its New York office from 30 Church St. to 1781 Hudson Terminal Bldg., 50 Church St., New York. The telephone numbers remain the same, 2495 and 2496 Cortlandt.

Walter C. Mack has been elected president of the Hoover Steel Ball Co., Ann Arbor, Mich., succeeding L. J. Hoover, founder of the company, who died a few weeks ago. F. A. Stivers is the new vice president; M. J. Fritz, treasurer and H. D. Runciman, secretary and general manager.

Fairbanks, Morse & Co., of Chicago, announces the appointment of R. H. Morse as vice-president and general manager of purchasing and traffic; C. W. Pank, general director of sales, as vice-president in charge of sales of all factory products; W. S. Hovey, general manager at Beloit, Wis., as vice-president in charge of general manufacturing; W. E. Miller, formerly first vice-president, as vice-president and treasurer, and F. M. Boughey, formerly treasurer, as secretary and controller.

Dwight P. Robinson and Co., Inc., constructing and consulting engineers, have opened offices in New York. Dwight P. Robinson, a former partner of Stone & Webster, is in charge of the construction and engineering business. Associated with him will be R. M. Henderson, in charge of construction; C. W. E. Clarke, mechanical engineer; R. A. Philip and D. L. Galusha, electrical engineers, and M. E. Thomas, structural engineer, together with the nucleus of a strong purchasing, accounting and field construction organization. All of the members of the company have for many years been engaged in large undertakings under Mr. Robinson's direction.

Trade Catalogs

"V. V." Fittings and Safety Switches. V. V. Fittings Co., Philadelphia. Catalog No. 21; Nov. 1, 1918; 8½ x 11; pp. 127; illustrated. This catalog includes a pictorial index as well as descriptions and prices of the many types of conduit fittings and switches, with attachments.

Pyrometers. Wilson-Maeulen Co., 781 E. 142nd St., New York. Catalog No. 12; 8 x 10½; pp. 24; illustrated. A catalog descriptive of pyrometers, with an inserted wall-card giving the melting points of the elements and a table for Centigrade-Fahrenheit conversion. There is a cartoon on the reverse side of the card.

Manual of Oxy-Acetylene Cutting and Welding. Victor Oxy-Acetylene Equipment Co., 884-886 Folsom St., San Francisco, Calif.; 6 x 9¼; pp. 37; illustrated; price, 50c. The manual gives a brief description of the practical application of oxy-acetylene welding and cutting of metals, and has been prepared especially for the man who has had little or no previous experience.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Aluminum Alloy and Process of Making. Levi S. Gardner, Detroit, Mich. (U. S. No. 1,280,706; Oct. 8, 1918.)

Drill, Core. Richard A. Conkling and William Richard Guiberson, Tulsa, Okla. (U. S. No. 1,281,140; Oct. 8, 1918.)

Excavation—Combined Trench Machine and Open-Ditch Excavator. James C. French, Kenosha, Wis., assignor to Frederick C. Austin, Chicago, Ill. (U. S. No. 1,280,701; Oct. 8, 1918.)

Gold, Disintegrating Apparatus for Use in Recovery of. Eduard Maria Rombouts, Amsterdam, Netherlands (U. S. No. 1,281,073; Oct. 8, 1918.)

Gold-Panner. John A. Kimber, Atlanta, Ga. (U. S. No. 1,280,766; Oct. 8, 1918.)

Hoisting-Machine. Edward D. Hooker, New York, N. Y., assignor to Gillis & Geoghegan, New York, N. Y. (U. S. No. 1,280,007; Oct. 8, 1918.)

Editorial Correspondence

DENVER, COLO.—Nov. 21

A Community Sampler to be established by the mining men of Boulder County is the subject of serious consideration by interested citizens. The Boulder Commercial Association and the Boulder County branch of the Colorado Metal Mining Association have passed resolutions endorsing a proposal to organize a local company to take over and run the sampler formerly operated by the Chamberlain Ore Co. Among the prominent mine operators concerned are John R. Wolf, L. E. Girard, L. A. Ewing, Timothy O'Connor, Louis Herman, W. F. Bleecker, H. A. Frey, J. W. Pherson and Lloyd Buchanan. These men believe that such a sampler, operated by a local stock company, would more than pay operating expenses, to say nothing of accomplishing the more important object of accommodating the small producer and lessee. It is proposed that a company with a capital of $25,000 be organized for the purpose. Several local business men have expressed their willingness to support the scheme financially.

A Japanese Delegation of six members of the Tokio Chamber of Commerce is visiting Denver and other commercial and mining centers of Colorado. This commission desires to promote coöperation between American chambers of commerce and the numerous similar bodies in Japan, with the view of improving the commercial relations of the two countries. The party includes R. Yamshina, vice-president of the Tokio Chamber of Commerce and head of the commission; S. Sheba, secretary of the Tokio Chamber of Commerce; also S. Teraba, H. Yoshida, S. Okuno and I. Sugahari. The commission was entertained at luncheon by the Denver Civic and Commercial Association. After leaving Denver it visited Colorado Springs, whence it will proceed eastward to New York, and thence to Europe. South America will be visited on the return to Japan. The chief object of the commission is to bring about close coöperation between America and Japan in the development of the commercial and mining resources of China and Siberia.

SPOKANE—Nov. 21

The Spokane Stock Exchange resumed its sessions on Nov. 19 after being suspended six weeks because of influenza. Much greater interest is displayed by investors than when the exchange closed.

Northwest Mining Men are waiting for a settlement of the war-tax problem. Many of the larger mines of the Cœur d'Alene region have been accumulating surpluses, and in the meantime passing dividends or reducing them because of the uncertainty of Government requirements. The hope is expressed on all sides that a settlement will be quickly made.

The Northwest Mining Association will hold its tenth annual convention Feb. 10 to 16 inclusive, in the association's club rooms adjoining the Hotel Spokane. "If the Government forestry department and the Indian Department will be more friendly to prospectors," says Frank C. Bailey, secretary, "there will be extensive exploration of comparatively untried districts." The territory to be represented at the convention includes the four Pacific Northwest states, British Columbia, and Alaska.

WALLACE, IDAHO—Nov. 21

Early Construction of the Pine Creek Railroad by the Oregon-Washington R. R. and Navigation Co. is hoped for since the return of ex-Senator George Turner, of Spokane, from Washington and New York, where he again urged upon Director General McAdoo and Judge R. S. Lovett, chairman of the executive board, the necessity for building this nine-mile branch. Senator Turner is president of the Constitution Mining and Milling Co., which has a mine and mill at the end of the proposed branch. He reports that he has assurance that the road will be completed at an early date. The fact that repairs have been undertaken on the two-mile stretch built last year, and later washed out, indicates that new construction is about to begin.

The Sweeney Mill, which came into the possession of the Bunker Hill & Sullivan company through the settlement of litigation between that company and the Federal Mining and Smelting Co., is being remodeled for custom work and for treating ore from ground owned by the Bunker Hill that is being worked by lessees. Along with the mill, the Bunker Hill company became owner of the tailings accumulated during the 20 years that the Federal company was operating the Last Chance mine. These are being carefully sampled, and results indicate that a good profit may be made.

BUTTE, MONT.—Nov. 22

Manganese Producers of Philipsburg district received orders to discontinue shipment of ore amounting to about 10,000 tons monthly soon after the signing of the armistice. Considerable gloom has been cast over this section in consequence, as much money had been invested in bringing local properties to a paying basis, in response to the war demand. One company has a contract good until April, but others are not so fortunate. A protective tariff against foreign ore is hoped for, though opposition of steel interests is expected. All but 400 men are now idle of the 1200 employed in the manganese mines at the time of the slump.

SALT LAKE CITY—Nov. 21

Manganese Producers and Buyers in Utah were directed by telegraph by their Eastern connections, from Nov. 15 to 19, to ship no more manganese ores until further notice. No definite reasons have been given or received here, but it is understood locally that the Eastern market is oversupplied.

The Mines Amendment to the Constitution of the State of Utah, which was carried at the elections on Nov. 5, was passed principally through the activity of the state administration headed by Governor Simon Bamberger, and by the organized efforts of the superintendents, professors, and teachers of the public schools. The amendment was defeated in Salt Lake, Summit, Tooele and Carbon counties. The mining communities all voted against it by the largest majorities. The state officials now seem to be more or less in perplexity as to how the measure can be made operative, as there is a probability that it conflicts with the other constitutional provisions. The attitude of the state administration is that legislation will be necessary to make the amendment operative, and there is a doubt as to whether it can be made to apply to 1919 taxes. Complete returns from the election in regard to the amendment will not be received before Nov. 25.

JOPLIN, MO.—Nov. 23

Growing Discontent Over High Royalty Charges in the Oklahoma section of the Joplin district may result in a campaign to bring relief soon. Speculation in leases when the Oklahoma part of the district was first opened, three years ago, resulted in the repeated turning of tracts, and with each sale the seller reserved a royalty percentage. Some mining companies thus have paid as high as 50% royalty, and the average probably is around 25%. In the older part of the district, royalty charges rarely went over 15%, and more frequently were 10%. Oklahoma producers, confronted with present unsatisfactory ore market conditions, are recalling this fact now. Many are being forced to close, whereas if they had a reasonable royalty charge, they could continue to operate and make a small profit. Original land owners would gladly alleviate the situation if they could, but the royalty charge is distributed to so many different persons in most cases that relief will be a hard problem

Borrowing Money on Zinc Ore up to 90% of average value will be started in the Joplin district on Dec. 1. The Oklahoma Warehouse Association has given official notice to producers to this effect. In striking an average for making loans, the average price of ore for the preceding six months will be used to arrive at the basis. Notes will be issued, using the warehouse receipts as collateral on two, four or six months' time, to be taken up at the option of the borrower. The Picher warehouse is only one-third completed, and contracts have been let for the construction of warehouses at Douthat and Tar River. It is the plan of the association to build narrow-gage railroads from the principal mines to the storage bins to eliminate teaming. The association believes that the new plan will result in stabilizing the zinc ore market.

CLEVELAND, OHIO—Nov. 16

The Ore-Shipping Season will be practically over at the end of this week, making the earliest closing of Lake shipments in several years, according to "Iron Age." Boats are now taking their last cargoes, and many will return to Duluth for storage cargoes of grain which will be brought down to Lake Erie ports before navigation closes. The Pittsburgh Steamship Co. will load no boats after Saturday, and it is expected that the number of cargoes sent by other shippers after that date will not exceed 25. Total Lake shipments will probably fall slightly below last year.. Sales made for delivery during the season of 1918, these including ore sold to merchant furnaces and ore requisitioned by consumers interested in ore properties, amounted to 61,900,000 tons as of Nov 1, and ore delivered on that date amounted to 56,000,000 tons, leaving a balance due of 5,900,000 tons. Shipments that were deferred until next season are not included in these figures.

VICTORIA, B. C.—Nov. 21

Need of an Iron and Steel Industry is again being agitated in this province. A plant of this sort, previously referred to, is in operation at Irondale, Wash., under direction of the Pacific Coast Steel Co., at which pig iron has been produced for some time. When the furnaces were first blown in, it was for the specific purpose of using a large quantity of Chinese iron ore which had been accumulated by the former operators and left untreated when the plant closed down. With a satisfactory output and good prices, however, the company decided to continue, if possible, after its stock of imported ore was exhausted. A source of supply, therefore, was sought and has been found, it is thought, in British Columbia. The large deposit of bog iron, near Mons, on the line of the Pacific Great Eastern Ry., proved suitable to mix with the magnetites of Texada Island, where the limestone needed was also available. As production has not been great up to the present, the success of the project cannot be said to have been demonstrated. Of the amount of bog iron contracted for, 5000-odd tons, 1000 tons has been delivered and has been used with steel scrappings as well as with some magnetite. In all tests the pig iron produced has proved suitable for foundry work, although possibly not up to standard for steel manufacture. The company is said to be confident, nevertheless, that with the raw material referred to, an output of good pig can be continued. It is also purposed, if successful, either to enlarge the present plant or to build a new one closer to the source of supply.

TORONTO, ONT.—Nov. 23

Mine Managers in Southern Ontario have received requests from the government to employ all the labor they can, owing to the release of men from the munition industry. A large influx of unemployed to mining camps is looked for, and will be welcomed by operators. The present shortage of labor at Porcupine is estimated at about 50%, and at Cobalt 10%. The latter is expected to be speedily made up, and provided no serious change occurs in the situation the gold mines will probably have their full complement of workers before spring.

Improved Transportation Facilities will be asked of the provincial government by the mine operators of northern Ontario Important projects for road construction, which were necessarily postponed until the close of the war, are being brought forward involving the expenditure of several hundred thousand dollars. It will probably require $100,000 to place the Elk Lake-Gowganda road in good condition; about $40,000 to macadamize the road from Swastika to Kirkland Lake, and at least $25,000 to construct the road from Boston Creek Station to the east boundary of Pacand Township. Kirkland Lake operators claim that the importance of that camp justifies their asking the government for a large outlay to provide a suitable highway, the present road being in bad condition.

The Mining News

ALASKA

NORTH MIDAS COPPER (Strelna)—Treating [illegible] to [illegible] tons per day and securing better than 95% recovery. Gold and silver ores only being mined; copper deposits to be worked later.

ARIZONA

Pinal County

MAGMA CHIEF (Superior)—Sombrero Butte claims in Copper Creek district, 20 miles south of Hayden, purchased. Property idle for several years owing to litigation. Development will be under direction of Charles A. Kumke, who will move to Hayden.

PICKET POST GOLD (Superior)—Hoist, compressor, and other sinking equipment sold to Magma Chief Copper Co. and will be moved to Sombrero Butte property in Copper Creek district.

ARKANSAS

Independence County

LOYALTY (Cushman)—Will start construction of small washing plant soon. Company operating 40-acre manganese tract.

Marion County

PARADIS (Dodd City)—Salina Mining Co. plans 150-ton mill. Will push development work.

OHIO (Yellville)—Mill completed; constructon time, 90 days. Three headings developed in mine sufficient to keep plant running full time.

COLORADO

Boulder County

ALICE (Jamestown)—Taken over by W. G. Chesebro to be operated for fluorspar. Earl Nelson is superintendent. Company will open up deposits for leasing. Three leases in operation, namely, Tower Bros.' lease on tunnel level, which is shipping regularly, and two surface deposits being developed by M. Milhise and L. A. Markt.

Clear Creek County

COUNTY SAMPLER organized by operators in Clear Creek County. North American Sampler, in Idaho Springs, being remodeled to be used by new organization. W. E. Passmore will be superintendent. New sampler will replace Chamberlain sampler recently shut down.

Dolores County

BLACKHAWK (Rico)—Now worked under lease by Marmatite Mining and Leasing Co., Salt Lake City, which has also leased Silver Swan property.

Gilpin County

TWO FORTY (Central City)—Group in Russell district bought by Pilgrim Gold, Silver, and Copper Mining and Milling Co. Will add new compressor.

Lake County

DOWN TOWN (Leadville)—Will retimber Coronado shaft. Steam plant replaced with electric hoist.

San Miguel County

INFLUENZA EPIDEMIC responsible for 52 deaths in Telluride during last 20 days. [illegible] only two deaths being reported during last week.

Teller County

[illegible] (Cripple Creek)—Four carloads shipped during [illegible] El Paso Extension Company. Crosscutting on 1200 level [illegible] opened in 900-level winze. Al. Campbell is superintendent.

[illegible] (Victor)—[illegible] Cripple Creek Mine and Development Co. [illegible] Pike's Peak [illegible] McLeod & [illegible] Cripple Creek, [illegible]

[illegible] GOLD MINES (Victor)—[illegible]

operated through Dexter shaft, and four from Wilson lease, operated through Trail tunnel. Three cars of milling ore shipped by W. P. H. Leasing Co. Development work continued in Deadwood mine.

IDAHO

Shoshone County

NABOB (Beeler)—Hauling ore six miles to railroad. Only property active on Pine Creek.

ANCHOR (Murray)—Compressor being installed and electric power line being extended to reach it. Control owned by Michael Melley, of Murray.

MICHIGAN

Copper District

BUREAU OF MINES has established temporary headquarters for the Lake Superior district at the Michigan College of Mines, Houghton, pending the completion of the Bureau of Mines station at Ironwood. Byron O. Pickard is in charge.

NEVADA

Humboldt County

NEVADA-SULPHUR (Sulphur)—Mine two miles east of Sulphur producing sulphur from crude ore by screening and treating in steam-heated retorts. Recovery low because of total loss of fines. Production limited by shortage of men.

ARIZONA (Unionville)—Fifty-ton flotation plant under construction by Sunset Mining and Development Co. to be ready Jan. 1. E. S. Van Dyck, manager.

BUSH (Unionville)—Unionville Mining Co. grading for mill. J. A. Spiker, of Salt Lake City, president.

RYEPATCH (Unionville) — Installing leaching tanks to treat tailings dump.

Nye County

TONOPAH DISTRICT ore production for week ended Nov. 16 was 6312 tons, of estimated gross milling value of $107,287. Producers were: Tonopah Belmont, 1854 tons; Tonopah Extension, 2304; West End, 1037; Jim Butler, 136; Montana, 108; Tonopah Divide, 252; MacNamara, 400; Rescue, 129; North Star, 54; and miscellaneous, 38.

ORIZABA (Orizaba)—Will abandon old steam surface plant and install distillate or gasoline plant. Controlled by Charles S. Sprague. J. K. Turner, engineer in charge.

GOLDFIELD MINING (Tonopah)—Preparing to sink working shaft. Twenty-five horsepower gasoline hoist installed, and new headframe, blacksmith shop and bunk houses built. Marion Arnold, manager. Company owns seven claims.

TONOPAH BELMONT (Tonopah) — Milled 9968 dry tons in October; produced 1,185.478 oz. gold bullion and 116,378.44 oz. silver bullion.

NEW MEXICO

Grant County

REPUBLIC (Hanover)—Shipping crude zinc ore running 15% Zn at rate of 12 cars per month. New shaft started about 500 ft. south of present hoisting shaft.

UNITED STATES COPPER (Hanover) Sinking shaft on Philadelphia group with three shifts per day.' Much water encountered. Expect to begin work on Hardscrabble group in Pinos Altos district in near future.

CARLYSLE (Steeple Rock)—Mill treating 30 tons per eight-hour shift. Lead-copper-silver concentrates shipped to El Paso. Zinc-copper concentrates being stored for future treatment. George H. Utter is manager.

MOUNT ROYAL (Duncan, Ariz.) — Harold C. E. Spence and associates erecting cyanide plant. Property five miles from Steeple Rock.

SOUTH DAKOTA

Lawrence County

CUTTING (Deadwood)—Will sink two-compartment shaft to [illegible] ft. Shaft house and compressor house being erected; to install new electric hoist and compressor

ECHO (Deadwood)—New shaft down 100 ft. and will go to 300 ft. Development shows body of lead-silver ore.

UTAH

Juab County

TINTIC SHIPMENTS for the week ended Nov. 8 were 142 cars, by 19 shippers. The Dragon Consolidated, Chief and Iron Blossom were the largest shippers, sending out 23, 21, and 19 cars respectively. Shipments the week previous totalled 150 cars. Influenza has been bad among the miners, but is abating. Shipments for the week ended Nov. 15 were 126 cars by 16 shippers. Tintic Standard was the heaviest shipper, with 24 cars, or about 1000 tons.

Salt Lake County

UTAH METAL AND TUNNEL (Salt Lake City)—Dispute with Utah Consolidated over apex rights understood to have been settled amicably; latter said to have acquired these rights for consideration.

UTAH ORE SAMPLING (Salt Lake City)—Cars released at Murray during week ended Nov. 13 included 30 from Utah, 21 from Nevada, 3 from Idaho and 4 from California. Sixty cars were sampled and released by sampler at Silver City.

Summit County

PARK CITY SHIPMENTS for week ended Nov. 15 were 2,396,100 lb., which is less than normal, due principally to labor shortage, influenza, and winter weather. There were six shippers.

ONTARIO-SILVER (Park City)—Shipments for week ended Nov. 15 were 966,200 lb., or 483 tons. The 600-level tunnel being used by Ontario for ore hauling, and by Ontario lease, old Daly, New Quincy and Daly West to reach their respective ground.

Utah County

AMERICAN FORK CANYON has first snow and freezing weather. Mines still operating are Old Miller, Mineral Flat, Belorophon, South Park, Bog Iron Lease, Pacific, and Globe.

BELOROPHON (American Fork)—Mill closed for season, but development to be continued through winter. Another car of concentrates being hauled.

CANADA

British Columbia

SILVER STANDARD (New Hazleton)—Concentrator has begun operations. Property owned by Foley, Welch & Stewart.

QUEEN (Sheep Creek)—This group and the Vancouver, Kootenay Belle and Alexander consolidated by A. W. McCune, of Salt Lake City. New mill said to be planned.

Ontario

BIG DIPPER (Barrie Township)—Property comprising 1404 acres in Frontenac County sold by sheriff on Nov. 20 for $2000 to E. P. Huntington, of Potter County, Penn., formerly manager.

OCTOBER SHIPMENTS over Temiskaming & Ontario Ry. were: Buffalo, 495 tons (2000 lb.); Coniagas, 42; Dominion Reduction, 77; Hudson Bay, 32; La Rose, 70; McKinley-Darragh, 364; Mining Corporation, 251; National, 68; Nipissing, 289; O'Brien, 61; Penn Canadian, 33; and Trethewey, 43. Total, 2365 tons, of which Deloro Smelting and Refining Co. received 1014 tons; Coniagas Reduction Co., 119; Metals Chemical Co., 762; and A. S. & R., Perth Amboy, 470.

MEXICO

Sonora

SAHUARIPA TUNGSTEN—Twenty-ton concentrator lately completed at mine, 60 miles below Sahuaripa.

LAS CHISPAS (Arizpe)—Property has resumed operations.

NORTH TIGRE (Douglas)—Leasing company following several stringers from lower tunnel. New mill will be driven by electric power from Copper Queen works at Douglas by extension of Tigre transmission line.

The Market Report

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
21	4.7600	101⅛	48¾	25	4.7570	101⅛	48¾
22	4.7575	101⅛	48¾	26	4.7575	101⅛	48¾
23	4.7575	101⅛	48¾	27	4.7550	101⅛	48¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Nov.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
21	*26	†	8.05	7.75	7.75@7.85
22	*26	†	8.05	7.75	7.90@8.00
23	*26	†	8.05	7.75	8@8⅛
25	*26	†	8.05	7.75	8@8⅛
26	*26	†	8.05	7.75	8.10@8.15
27	*26	†	8.05	7.75	8.10@8.15

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
Nov.	Spot	3 M.		Spot	3 M	Spot	3 M.	Spot
21	122	122	137	325	305	29½	28½	54
22	122	122	137	320	300	29½	28½	54
23								
25	122	122	137	320	300	29½	28½	54
26	122	122	137	310	290	29½	28½	54
27	122	122	137	310	290	29½	28½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Nov. 27, 1918

This week was again conspicuous by the general absence of business in copper and lead. There was small business in antimony, tin, and zinc, without there being any radical changes in price.

Copper—Producers received no inquiries from any quarter. Manufacturers intimated that they could not pass on the 26c. price to consumers, for the reason that the latter would not pay it. On the other hand, producers received numerous cancellations of private contracts on the alleged ground that governmental contracts for which the copper was to be used had been cancelled. Producers refused to accept such cancellations. The attempt to make them came from manufacturers who are new to the business and who do not appreciate the ethics of the copper business established by immemorial custom. In this business contracts have always been contracts, and arbitrary cancellations have previously been unheard of. Sellers and buyers have both lived up to the letter of their agreements, no matter how unpleasant it might be to do so.

While the major market is sealed by agreement between the War Industries Board and the producers, and by agreement among the producers themselves, there is developing a sort of a minor market similar to the "gutter market" in Wall Street in the fall of 1914. Casting copper has been offered and sold in carloads at 24@23c., and was offered today at 23@23½c. Scrap copper, for conversion into casting, is offered in quantities aggregating thousands of tons from all parts of the country upon almost any terms that a buyer will pay. Virgin copper has been offered for resale by consumers who had overbought. As to the last, such offerings are contrary to the standard contract entered into between producers and the buyers from them, wherein it is stipulated that "all the copper hereby sold will be used by the buyer, and that the buyer will not sell or otherwise dispose of, or attempt to sell or otherwise dispose of, any of said copper."

Meetings have been held among the producers to consider the organization of an export selling company or association. There have also been conferences respecting the labor situation.

John D. Ryan, having resigned as Assistant Secretary of War, has been elected a member of the board of directors of the Anaconda Copper Mining Company.

Copper Sheets—The base price of copper sheets is 35½c. per lb. Copper wire is quoted at 28½c. per lb. f.o.b. mill, carload lots.

Tin—A good deal of tin of various grades is being offered for resale by consumers who found themselves oversupplied. This business is permitted by the War Industries Board. On Saturday last a 25-ton lot of electrolytic tin was sold at 70c. Tin of 99% grade was offered on Nov. 26 at 69c., with 68c. bid. About the same ideas continue today.

The London quotation for tin on Nov. 18 was £327 for spot and £315 for 3 months; on Nov. 20, £327 for spot and £317 for 3 months.

Lead—At the request of the War Industries Board, the Lead Committee will continue the allocation of business until the end of this year. Prices at New York and St. Louis are maintained at unchanged figures, which apply to orders that are being filled. Producers are not getting any new orders, and, on the contrary, are receiving a good many cancellations, which are not accepted if it can be helped. Here is somewhat the same situation as exists with respect to copper.

Washington reports that the armistice came at a very fortunate time, from the Government standpoint, insofar as the lead situation is concerned. A buying contract had just expired, and the Army is making no more contracts, but the Navy is still buying. Only very small stocks are being carried by either of these departments.

Zinc—After a day of further weakness, resulting from a notice of Government cancellation, the market rallied on the conjecture that there might be some mistake about the notice, with the thought that it might not therefore be safe to sell prompt supplies supposedly released. Moreover, there developed a small inquiry, aggregating perhaps 1000 tons, from galvanizers, which resulted in some business for which there was sharp competition. On Nov. 25, a governmental communication was received, rescinding the notice to cease production, which was said to have been unauthorized and producers were directed to await specific instructions from Washington. This strengthened the market a little more, but there is no feeling of confidence in the situation. This is reflected by the fact that while prompt and December spelter are around 8⅛c., January and forward is freely offered at 7⅞c. However, at present there is neither desire to buy nor pressure to sell, and quotations are more nominal than representative of business. In the meanwhile, stocks are presumably piling up in the hands of the Government, which will not be shown in the statistics, and export shipments are being deferred on the ground that shipping facilities are required for foodstuffs. Foreign governments do not intimate anything about cancellation of contracts, but, nevertheless, it is not unlikely that a good deal of the spelter that is being deferred will never go forward.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of February 4.

Other Metals

Aluminum—Unchanged at 33c. per lb., but the situation as to supplies is a good deal easier.

Antimony—At the close of last week, we quoted spot at 7⅞c., with the market irregular and uncertain. There followed a sharp rally, and on Friday and Saturday carload lots of 25 gross tons each were sold at 8⅜c. On Tuesday and Wednesday carload business was done at 8½c. We quote the market at 8½c. at the close. November-December shipments from the Orient were offered at 8⅝c., duty paid, New York

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—We quote New York at $125. There was some inquiry, but not much business done. San Francisco reports, by telegraph, "no quotation, market unsteady." Washington reports that at the meeting on Nov. 21 between producers and the price-fixing committee there was no apparent necessity for fixing maximum prices. Particular emphasis was laid upon the fact that agreements now existing between the producers and the non-ferrous metals section are not to be affected by the action taken at the meeting with the price-fixing committee.

Silver and Platinum

Silver—Market remains unchanged. The latest advices from London are to the effect that though the Indian Treasury is in a much stronger position as regards its reserve of silver, there is at present no sign of a reduced demand for rupees. Shipments to London for week ended Nov. 23 were 307,000 ounces.

Crop prospects in India are so poor that the government has prohibited the export of foodstuffs, a fact which the London "Bankers' Magazine" thinks may have some bearing on the price of silver, and which may cause some withdrawals of the metal from India's secret hoards.

Mexican dollars at New York: Nov. 21, 77½; Nov. 22, 77½; Nov. 23, 77½; Nov. 25, 77½; Nov. 26, 77½; Nov. 27, 77½

Platinum—Unchanged as to price, which will be maintained officially at $105 until Dec. 1. Upon that date all restrictions will be removed and there will be a free market.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 23—Blende, per ton, [illegible] Class B, $65@60; Prime W[illegible] outside [illegible] calamine [illegible] age selling [illegible] all zinc ores [illegible]

[illegible] high, $104.90; basis 80% lead, $100; average selling price, all grades of [illegible]

Shipments the week: Blende, 7658; calamine, 510; lead, 1318 tons. Value, all ores the week, $562,310.

Of the 4700 tons purchased this week, about 3000 tons was sold on schedule price. At least two buyers report approximately 1700 tons purchased on a basis of $47.50 to $45, cutting to the latter price yesterday, and are still taking all offerings late tonight.

The Zinc Institute committee is working tirelessly to strengthen sellers to hold for schedule price.

Platteville, Wis., Nov. 23.—Blende, basis 60% zinc, highest settlement price reported for week and year to date, $76.90; base price for premium grade, $75; base price for high-lead blende declined to $47.50 per ton. Lead ore, basis 80% lead, $96 per ton. Shipments reported for the week were 1981 tons blende, 40 tons galena, and 395 tons sulphur ore. For the year to date the totals are 113,723 tons blende, 7341 tons galena, and 38,989 tons sulphur ore. During the week 2560 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—No business and no market Consumers are reported to have all the ore on hand that they can possibly use between now and early next year. The chrome-ore producers are conferring today with Secretary Lane in order to obtain relief from the serious predicaments into which the sudden termination of the war precipitated them.

Manganese Ore—No business and no market. Consumers overstocked. Shipments of ore from Butte and other districts have been discontinued.

Molybdenum Ore—Negotiations are said to be proceeding for some of this ore. It will be interesting to see what price is made. In the meanwhile, there are reports of private business done at figures far below $1.

Tungsten Ore—The producers, importers, smelters, and consumers of tungsten ore held a meeting in New York on Nov. 25 to consider the situation in their industry, and appointed a committee, representing each element in the business, to recommend to the Government what steps might advisably be taken to prevent too sudden a readjustment of price. At the meeting it became immediately apparent that there are widely divergent and conflicting interests and views. American producers, who say that no one of them can operate successfully under present conditions, if they do not receive more than $20 per unit for their product, and speculators and manufacturers who are long of supplies bought at high figures would like to see a maintenance of prices, even at the expense of restrictive measures. Other manufacturers and consumers generally would prefer to see nature take its course. It was clear that there are large supplies of ore, ferrotungsten, tungsten powder, and tungsten steel.

In the meanwhile there has been no market, for nobody has been willing to buy. There are plenty who would sell if they could and would make sharp concessions. Prices like $18, $17, and so on down, are intimated. Foreign ore of 65% grade and excellent quality has been freely offered for shipment at $15 per unit per long ton. These figures are merely indicative and are not given as quotations, for at present there is no way of telling what the real market is, or would be.

Other Minerals

Pyrites—Whether the embargo on Spanish pyrites will be suspended between now and Jan. 1 has not been definitely settled. Spanish pyrites is quoted, subject to the raising of the embargo, at 17c. on the basis of 10s. ocean freight, buyers to pay war risk and insurance.

Iron Trade Review

PITTSBURGH—Nov. 26

At this writing, more than a fortnight after the signing of the armistice, there have been scarcely any cancellations of either war or peace orders on which work was actually being done, though nearly all contracts for war material that will not be needed and on which work had not been begun have been canceled. The Government which is presumably fortified with information, regards it as essential that there be no serious interruption to the country's industrial activity on account of a menace for which the only recognized term is Bolshevism.

There is criticism of the Government's policy to continue work on contracts by those who desire to see wage reductions. The great majority of steel manufacturers do not wish wage reductions in their industry unless as a sequel to lower costs of living, and feel that with immigration shut off for more than four years, and emigration of the foreign born in prospect rather than immigration, it is going to be difficult to find an adequate supply of labor, as the American born do not naturally gravitate to employment at coke works, blast furnaces and steel mills. The future of steel prices hinges largely upon these considerations, including the great question whether the permanent and stable basis for iron and steel prices that must come some time is to be reached merely by a gradual decline or by a sharp recession or slump and then a recovery. The latter would be the natural course, according to steel market history.

Though only a week or two ago it was regarded as a foregone conclusion that the War Industries Board would continue to set prices for some time, it is now an even chance whether it will do so even for the first quarter of the new year. An awkward feature of the situation is the desire of the Railroad Administration to buy as cheaply as possible, and this runs counter to the desire of the War Industries Board to let the market down gradually.

All the steel mills are running as well as they can, having plenty of orders for the immediate future at least. With the removal of practically all restrictions upon the production and consumption of steel, a demand has quickly arisen from jobbers, automobile builders, and a few other classes of buyers, for steel that they can turn over at once, the question of price practically not entering. There is absolutely no interest in forward deliveries. The so-called investment buyers, in particular, will probably not be in mood to consider purchases for some time.

Operations are interfered with by shortage of coke, due to the influenza epidemic and the peace celebration, which was prolonged in the Connellsville region. In the past few days the Carnegie Steel Co. has banked five blast furnaces by reason of shortage of Connellsville coke, produced by mine-labor shortage rather than oven-labor shortage. The company has blown out one stack at Farrell for rebuilding. Of its 59 furnaces, four are out of blast, five banked and 50 producing. The company's steel-ingot output last week was 94% of capacity, but, through shortage of pig iron, this week's steel output is likely to be a few points less.

Pig Iron—There is a little insistent demand for pig iron, particularly in steel making, but only for small lots for almost immediate shipment. Full Government limits are readily obtained: Bessemer, $35.22; basic, $33; No. 2 foundry, $34; malleable, $34.50; forge, $33, f.o.b. furnace freight from the Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less.

Steel—Odd lots of unfinished steel, chiefly odds and ends of various sizes and analyses, are beginning to develop. There are no offerings for production to specification. The market remains at Government limits: Billets, $47.50; sheet bars and small billets, $51; slabs, $50; rods, $57.

Ferroalloys—The market is absolutely stagnant on ferromanganese and spiegeleisen, consumers showing no disposition to buy, and price cuts would not tempt them, so that prices remain nominal at former figures, $250, delivered, for 70% ferromanganese and $75 f.o.b. furnace, for 16% spiegeleisen.

Coke

Coke—Coke production in the Connellsville region decreased even last week, when the output was estimated at about 30% under the former rate. Production at byproduct plants is only fairly well maintained. Furnaces are short of coke, but not to the extent to be expected from the curtailment in output, and a resumption of the former rate of production would probably result in cut prices from the Government limit. Furnaces regard the coke price as relatively the highest of all the Government limits, and, moreover, are not pleased with the way coke matters went during the war, and they are likely to seek lower prices by every means possible. The market remains quotable at Government limits: Furnace, $6; foundry, 72-hour selected, $7; crushed, over 3-in., $7.30; clean screenings, over 1-in., $5.50, per net ton at ovens, Connellsville region.

STOCK QUOTATIONS

N.Y. EXCH.†	Nov. 26
Alaska Gold M.	3¾
Alaska Juneau	2
Am.Sm.&Ref.,com	83¼
Am. Sm. & Ref., pf.	107
Am. Sm. Sec., pf., A.	93
Am. Zinc	13
Am. Zinc, pf.	41
Anaconda	65⅞
Batopilas Min.	1⅞
Bethlehem Steel	62
Butte & Superior	20¼
Butte Cop. & Zinc.	8
Cerro de Pasco	33⅛
Chile Cop	19⅝
Chino	38⅝
Colo.Fuel & Iron	36
Crucible Steel	56
Crucible Steel, pf.	89½
Dome Mines	12¾
Federal M. & S.	11
Federal M. & S., pf.	38½
Great Nor., ore ctf.	33¼
Greene Cananea	46½
Gulf States Steel	66⅞
Homestake	90
Inspiration Con	48⅛
International Nickel	31¼
Kennecott	35½
Lackawanna Steel	71
Mexican Petrol	161⅜
Miami Copper	25⅜
Nat'l Lead, com	63
National Lead, pf.	103
Nev. Consol	18⅛
Ontario Min	7
Ray Con	21⅝
Republic I.&S.,com	76⅜
Republic I. & S., pf.	99¼
Sloss-Sheffield	45⅛
Tennessee C. & C.	14½
U. S. Steel, com	100
U. S. Steel, pf.	111⅛
Utah Copper	79
Va. Iron C. & C.	59

BOSTON CURB*	Nov. 26
Alaska Mines Corp.	‡.12
Boston Ely	.80
Boston & Mont.	.48
Butte & Lon'n Dev.	.15
Calaveras	.75
Chief Con	3¼
Contact	.05
Corbin	.25
Cortez	.15
Crown Reserve	.20
Crystal Cop	.39
Eagle & Blue Bell	2¼
First Nat. Cop	2½
Houghton Copper	.40
Intermountain	‡.05
Iron Blossom	.55
Iron Cap	16½
Majestic	.26
Mexican Metals	.27
Mines of America	1¼
Mojave Tungsten	.07
Nat. Zinc & Lead	.11
Nevada-Douglas	.39
New Baltic	.90
New Cornelia	16¾
Oneco	.20
Pacific Mines	‡.35
Rex Cons	.05
Yukon Gold	1

SAN FRAN.*	Nov. 25
Alta	.03
Andes	.04
Best & Belcher	.02
Caledonia	.02
Challenge Con	.03
Confidence	.10
Con. Virginia	.10
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt.	‡.03
Mexican	.05
Occidental	.40
Ophir	.04
Overman	.01
Savage	‡.02
Sierra Nevada	.01
Union Con	.12
Utah Con	.01
Belmont	3.00
Jim Butler	.41
MacNamara	.24
Midway	.13
Mont.-Tonopah	.13
North Star	.06
Rescue Eula	.08
West End Con	1.20
Atlanta	.06
Booth	.07
Comb. Frac	‡.02
Florence	.11
Jumbo Extension	.11
Kewanas	.05
Nevada Hills	.02
Nevada Packard	.32
Round Mountain	.19
Silver Pick	.04
White Caps	.15

COLO. SPRINGS*	Nov. 25
Cresson Con	5.00
Doctor Jack Pot	.04½
Elkton Con	.06½
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.76½
Granite	.17
Isabella	.06½
Mary McKinney	.08
Portland	1.03
United Gold M.	.15
Vindicator	.39

BOSTON EXCH.†	Nov. 26
Adventure	‡.60
Ahmeek	77
Algomah	.30
Allouez	47
Ariz. Com.	13½
Arnold	‡.20
Bingham Mines	9
Bonanza	.20
Butte-Balaklava	‡.35
Calumet & Ariz.	66
Calumet & Hecla	452
Centennial	‡13½
Copper Range	45½
Daly West	2¼
Davis-Daly	4½
East Butte	10½
Franklin	4½
Granby	‡79
Hancock	7
Hedley	‡12
Helvetia	‡ 20
Indiana	‡.60
Isle Royale	26
Keweenaw	‡1
Lake	5½
La Salle	‡3
Mason Valley	3⅜
Mass	‡5
Mayflower	3
Michigan	‡3⅜
Mohawk	‡57
New Arcadian	1 11/16
New Idria	‡13
North Butte	12⅝
North Lake	‡.40
Ojibway	1
Old Dominion	40
Osceola	‡57
Quincy	67½
St. Mary's M. L.	43½
Santa Fe	‡.50
Seneca	13
Shannon	3⅜
Shattuck-Ariz	‡16½
So. Lake	‡1⅜
So. Utah	.11
Superior	6
Superior & Bost.	3½
Trinity	3
Tuolumne	.77
U. S. Smelting	46
U. S. Smelt'g, pf.	45¼
Utah Apex	3⅝
Utah Con	8⅝
Utah Metal	2¼
Victoria	2½
Winona	.75
Wolverine	20½
Wyandot	‡.50

N. Y. CURB†	Nov. 26
Big Ledge	1 1/16
Butte & N. Y.	.50
Butte Detroit	.03
Caledonia	.35
Calumet & Jerome	.50
Can. Cop. Corpn.	[illegible]
Carlisle	‡2
Cashboy	.06½
Con. Ariz. Sm.	1½
Con. Coppermines	5⅛
Emma Con	‡.03½
Goldfield Con	.22
Goldfield Merger	.04
Greenmonster	‡ 1/16
Hecla Min.	5
Howe Sound	4½
Jerome Verde	‡.50
Louisiana	‡ 1/16
Magma	29
Marsh	.03½
McKinley-Dar-Sa.	.48
Milford	‡.75
Mother Lode	.35
Nixon Nevada	.33
Ohio Cop.	‡⅜
Rawley	‡2¼
Ray Hercules	3⅜
Richmond	‡.56
Rochester Mines	.31
St. Joseph Lead	14
Standard S. L.	½
Stewart	.16
Success	.10
Tonopah	‡3¼
Tonopah Ex.	1⅝
Tribullion	‡⅜
Troy Arizona	.10
United Eastern	4 1/16
United Verde Ext.	35½
United Zinc	‡⅜
Utica Mines	‡.08

TORONTO*	Nov. 26
Adanac	.10
Bailey	.03
Beaver Con	.38
Chambers Ferland	.10
Coniagas	3.00
Hargraves	.02
Kerr Lake	5.75
La Rose	.30
Lake Shore	.90
Min. Corp. of Can.	2.50
Nipissing	8.37½
Peterson Lake	.07
Temiskaming	.32
Wettlaufer-Lor	.03
Davidson	‡.60
Dome Exten	.24
Dome Lake	.12
Hollinger	6.12½
McIntyre	1.62½
Newray	12½
Porcu. Crown	.23
Teck-Hughes	.25
Vipond	.20
West Dome	.13

* Bid prices. † Closing prices. ‡ Last quotations.

Engineering and Mining Journal

December 7, 1918

Volume 106 Number 23

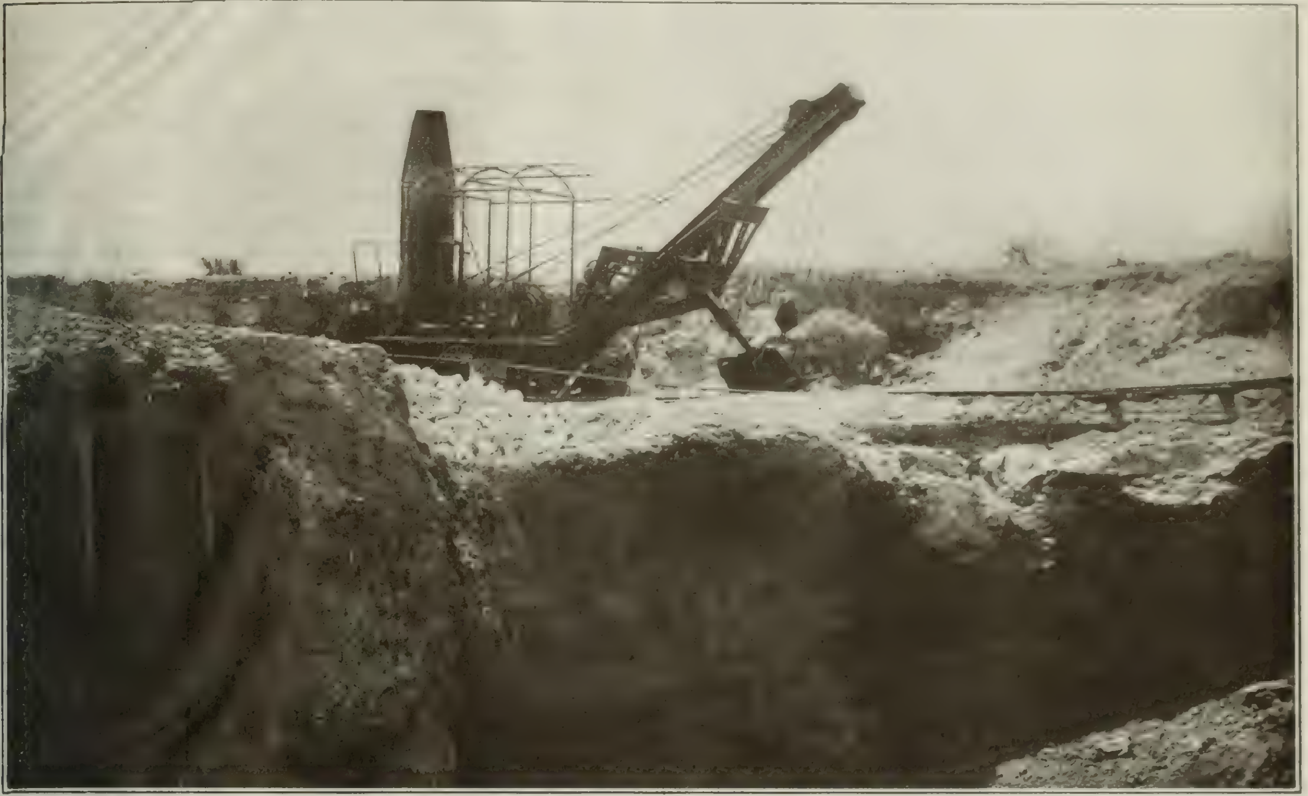

FIG. 1. STEAM SHOVEL OPERATING IN THE OREBODY OF THE WEST TEXAS SULPHUR COMPANY

Sulphur Deposits of the Trans-Pecos Region, In Texas

BY KIRBY THOMAS*

An account of the location and characteristics of the sulphur deposits which occur in Culberson and Reeves counties, Texas. Although the extent of these deposits has long been known their exploitation was begun only a few years ago. A number of companies are now operating in the district, and a large amount of intensive geological, mining, and metallurgical research has been carried out. The future of the industry in this part of the country is hopeful, and a steady output for many years may be anticipated. The data given will be of general interest.

THE deposits of native sulphur, or brimstone, which occur in Culberson and Reeves counties, Tex., in the region just south of the New Mexico boundary and west of the Pecos River, have been known for many years, but it is only recently that serious attempts have ben made to utilize them, on a commercial scale, as a source of supply of this essential commodity. Within the last three years more than 20 companies, some of them with large capital issues, have been formed to operate in the district; and investigations and explorations have been undertaken by representatives of private interests and by the geologists of the Texas Survey.

Several deposits in the district have been explored and developed to a considerable extent, and two have been equipped with mining and treatment plants and have produced a small amount of refined sulphur for shipment. Owing partly to internal difficulties with the operating companies and to mistakes in the installation of the treatment equipment, together with a failure to provide facilities for transportation from mines to railroad, the output of the district so far has been restricted.

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Commercial Future of the District

The commercial future of the Trans-Pecos sulphur industry, in my opinion, is much more important than the present accomplishments indicate. The obvious and essential factors in the situation are, first, sufficient tonnages of commercial ore, accessible and available for mining and treatment, at low costs; second, the application of suitable mining and treatment methods, with the provision of economical and effective equipment therefor; and, third, the provision of transportation facilities for the cheap delivery of crude material at the treatment plants and inexpensive and reliable transport of the product from the treatment plants to the main-line railroads which bound the district on the east and south. The question of market need not be here discussed because the conditions considered are predicated on profitable operation at the pre-war price of $22 a ton for the product delivered at the railroad.

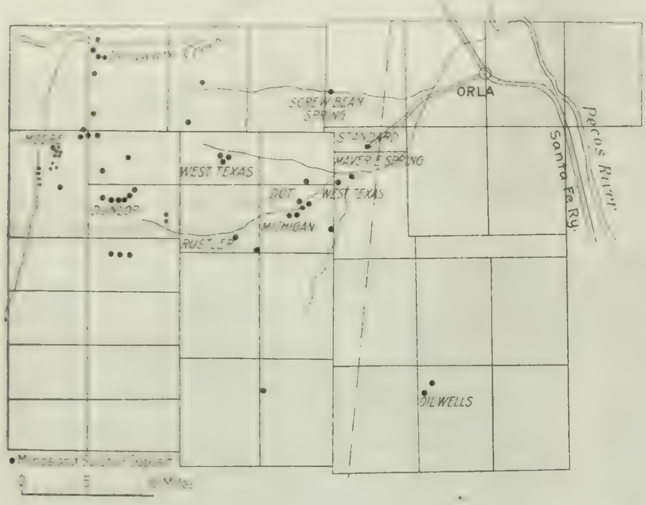

FIG. 2. LOCATION OF SULPHUR AND OTHER DEPOSITS IN THE TRANS-PECOS REGION OF TEXAS

Character of Deposits

The sulphur deposits in the Trans-Pecos region are all of the same character and have a common origin, though differing slightly as to the kind of ore and the accompanying gangue or waste material, and varying considerably in individual extent. They have their genesis in the combination of geological and physical conditions which have permitted the escape to the surface, from great depth, of sulphurous waters or gases along fissures or fault planes. These have intersected and dislocated a thick series of beds of limestone, gypsum, clay, and other sedimentary rocks. The sulphur may have had its primary origin in the iron pyrite-bearing shales which occur in the district, or in some of the deep gypsum beds, from which it may have been freed by thermochemical action. Under a suitable combination of conditions, the sulphur in solution, or as a gas, was precipitated as elemental sulphur on coming to the surface or within a short distance from the surface, thus forming localized deposits of varying and often considerable horizontal extent, having only moderate depth except in the chimneys or channels through which the solutions have ascended, and here occurring to depths of a few hundred feet at most. The deposits, however, are numerous, and, individually, some of them have sufficient horizontal area to assure for the district as a whole, and as far as the most important deposits or groups of deposits are concerned, an ample tonnage for commercial operations, notwithstanding the localization and limitations of the deposits individually, and their surface character.

Estimation of Available Sulphur Impracticable

Calculation of definite tonnage is precluded, except in a few instances, owing to the limited amount of exploration and the nature of the developments. However, careful consideration of the conditions disclosed, and comparison with the results of developments in the district, justify the expectation that a number of the deposits may each yield upward of several hundred thousand tons of sulphur, and that the district itself presents a reasonable expectation of production on a commercial scale for a number of years. It will be observed from a study of the general map that the deposits are roughly in convenient groups for operation in combination.

The sulphur-bearing material grades from practically pure sulphur, in masses, to mixed gypsum and earthy material carrying a small percentage of sulphur. The commercial limit, of course, will be determined by conditions and efficiency of operations. The character of the deposits is such that many of them possess commercial reserves in quantities sufficient to justify operations, utilizing all of the sulphur-bearing material down to 25%. Probably lower-grade material can be utilized for its sulphur content or sold as fertilizer.

Method of Mining Desirable

The material must be mined by open-cut methods, as the escaping gases make underground operations impossible. I have observed no deposits in the district, so far disclosed by exploration, where the Frasch method of underground liquation and pumping would be feasible. There are no obstacles, mechanical or physical, to cheap mining in the district. The application of open-cut methods, using the steam shovel or the drag-line scraper, will permit of the mining of the ore, and its delivery at the treatment plant at a low cost. A factor in the mining cost will be the removal of the overburden of gypsum, which occurs several feet thick in many places, and the selective extraction of the commercial grades from the low-grade and barren part of the deposits. If operations are undertaken on a large scale, with adequate and proper equipment, the material can probably be mined for less than $1 a ton.

The recovery of the sulphur presents a comparatively new metallurgical problem. The liquation method used in connection with other similar deposits had been found more economical than volatilization in retorts. This method was used in the earlier operations of the Trans-Pecos district, and adaptations of it were installed in the two commercial plants erected. The results indicate that the process is commercially possible, but that it is costly to install, expensive to operate, and that the percentage of recovery of sulphur is low. Several other processes are being tested, but recent experiments have practically demonstrated that the sulphur-bearing material is amenable to the new oil flotation process, which has been recently applied to other phases of metallurgy with important results as to costs and saving. The introduction of flotation in the Trans-Pecos district will probably result in greatly reducing treatment charges, and in effecting a high percentage of recovery. The present difficulties with regard to bad water and high fuel costs will also be largely overcome by the adoption of flotation.

TRANSPORTATION IS MAIN PROBLEM

A present problem in the district is transportation from the deposits to the railroad. It is difficult to maintain roads for trucking in the gypsum-covered surface, and there has been no adequate expenditure of money to provide suitable roads, and no coöperation of the different interests. The conditions, however, present no serious obstacle if the problem is properly attacked, with an expenditure justified by the volume and value of the traffic involved.

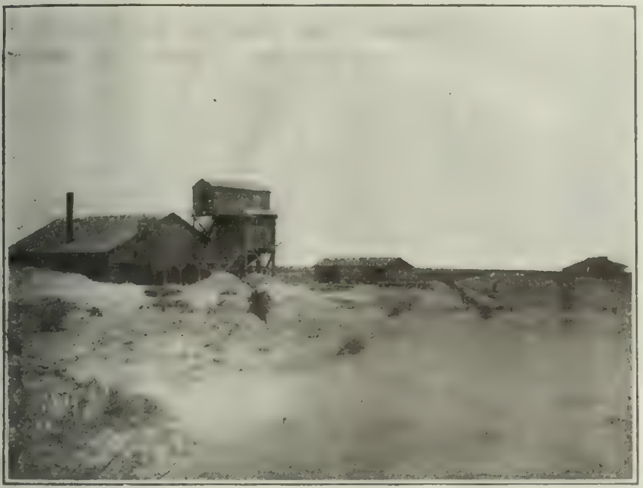

FIG. 3. LIQUATION PLANT OF THE WEST TEXAS SULPHUR COMPANY

The deposits lie from 12 to 30 miles from the nearest railroad station; and a suitable trunk line road, with branches, should and can be provided, so that haulage and trucking can be done at moderate costs. However, it is practicable to build a broad-gage or industrial railroad to serve all the principal properties at a cost that is justified by the traffic which is assured by the present state of development. The Santa Fé railroad is willing to provide facilities under proper assurances, and Government agents have indicated their intention to authorize and support the project for railroad extension, providing serious endeavors are made to realize the sulphur possibilities of the district as a whole.

It will probably be found advisable to establish central treatment plants, and to assemble the ore from groups of deposits within a reasonable radius. This can be effectively done by providing a system of portable industrial tramways, using mule haulage or gasoline engines for motive power.

Adequately equipped and effectively managed operations on a reasonably large scale can probably produce sulphur at a cost of about $10 a ton for operating charges, this cost to include mining, treatment, and general management, but not to provide for the amortization of capital investment in property, plant, or equipment, or to include the cost of transport to railroad of the product in case the extension of the railroad to the district is not arranged.

It is hardly likely that the limited exploration and development which have been done in the district have disclosed all of the deposits or fully defined the limits of any of them, and it is probable that expectations based on present available data, conservatively interpreted, will be greatly exceeded by actual operations and development.

Dummy Mining Lease Fraud

In respect to the occurrence of gold, Western Australia occupies a unique position, states the *Journal* of the Chamber of Mines there. A great deal of the richest material occurs in sulphide and telluride ores; and the government should provide against unlawful traffic in these ores as well as in the case of gold or free milling ore. It might seem more difficult to deal in sulphide and telluride ores, which require special treatment, than in the metal itself, but in the present imperfect state of the local laws this is hardly so. Such dealings are rendered easy by the "dummy lease" fraud. Under this simple but effective plan a person might own and work a lease with ore containing, perhaps, a few pennyweights of gold per ton, but the ore alleged to come from it, after treatment at works owned by himself or by an accommodating friend, would often give phenomenal results, perhaps 10 oz. to 20 oz. or even 100 oz. to the ton. To put a stop to this ingenious fraud it was recommended, in addition to the licensing of treatment plants, that power should be given to magistrates and the police to take samples for assay from leases of this peculiar description, and so arrive at some estimate of their real value.

The "dummy-lease" fraud was thoroughly exposed by the proceedings in the Golden Zone case. It is certain that the proprietor could not long have carried on his illicit gold dealings had he been compelled to license his Golden Zone treatment plant, and bring it under police supervision, and had he been required to say from what part of the mine came the ore that yielded him such bountiful returns. The Golden Zone mine, out of which thousands of pounds worth of gold had been nominally coming, month by month, was subsequently put up at auction and sold for a five-pound note. There are other leases on the Kalgoorlie-Boulder field of no greater intrinsic value than the Golden Zone, under the cloak of which the holders are making fortunes, by means of some scheme of adding to actual mill returns, similar in general characteristics to the fraud described.

Before the war electric steel was not noted in the official returns of output in Great Britain, according to the *Mining Magazine*. In 1917, however, 110,000 tons was made, of which 90,000 tons was in the form of ingots and 20,000 tons in the form of castings. There are now more than 50 electric-steel furnaces at work in Sheffield. The development of the electric furnace for the production of high-class steels has provided a notable innovation in Sheffield practice.

Standardization of Mining Methods
IV—Explosives[*]

BY CHARLES A. MITKE[†]

Safe and efficient methods of storage and handling of explosives, both on the surface and underground, are enumerated. Suitable powder and fuse sacks are described, and details given of the construction of an effective and economical fuse cutter. The use of a modified brick-and-tile machine for producing stemming, an idea originally suggested by the author of the paper, is advocated. Data are given on the practice of loading and blasting; and precautions mentioned to obviate, or minimize the danger from, missed holes. The paper concludes with details of gas production from explosives and gives information on improved methods of ventilation.

THE dangers incidental to the storage and handling of explosives are the cause of much concern to members of mining organizations. Apart from unavoidable hazards and fatal and serious accidents due to carelessness, the injurious effects produced by large quantities of noxious gases resulting from the explosion of dynamite must be considered. Many serious injuries have been sustained by men who are gassed.

All operations connected with the handling and use of explosives should be standardized. This would be of considerable help in eliminating many of the regrettable accidents which are constantly occurring, and would tend to reduce the quantity of noxious gases, produced by the explosives, to a minimum.

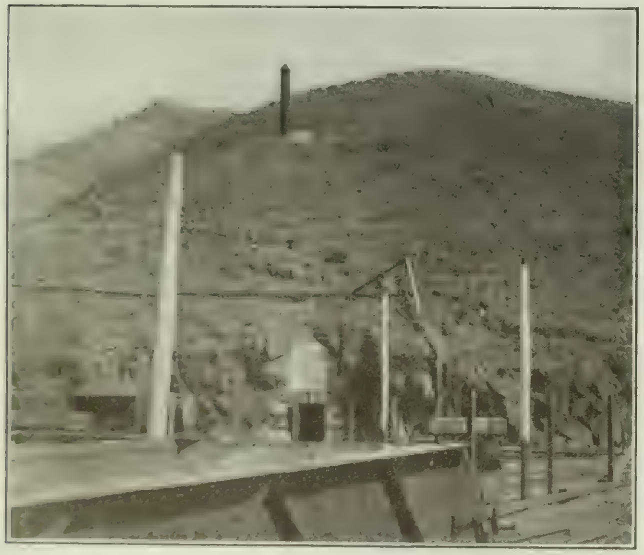

FIG. 1. EXPLOSIVES MAGAZINE IN HILLSIDE

When a carload of powder is received at the mines, it is necessary to have it unloaded and stored on the surface. Great care should, of course, be exercised in its transportation to the magazine, and provision made for the different kinds of powder stored in one place, so that there may be no confusion between low- and high-strength explosives. To prevent this, the magazine should be divided into a number of compartments, each being properly labeled for the different kind and strength of powder which is to be stored in it. The magazine should be well ventilated, to avoid the powder being kept in an atmosphere where the humidity is high, and should preferably be constructed as a chamber driven into the hillside, where it will be free from shock and where there will be no possibility of a chance rifle bullet entering it. In exceptional cases, where it is not practicable to drive into the hillside, an adobe, cement, stone, or brick magazine is usually constructed in which to store the powder. Adobe is preferable to cement, stone or brick, because, in case of an explosion, it will probably crumble and there is less danger of the material used in its construction being broken up into missiles.

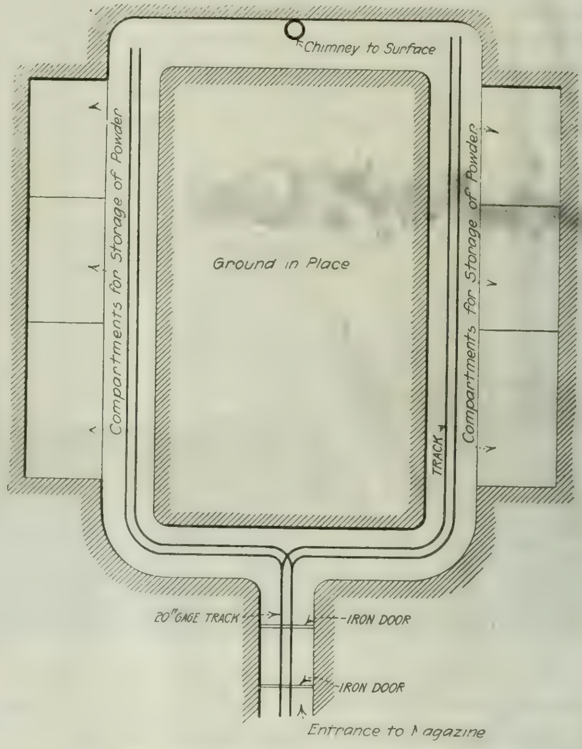

FIG. 2. PLAN OF POWDER MAGAZINE

The powder house should have double doors, with openings large enough to admit a man's hand, so that they may be locked from the inside. This is effectual in preventing any one working at the lock in an endeavor to pick or strike it with a hammer. Fig. 1 is an illustration of such a magazine. In this case there is one main adit leading into the hillside, closed by double doors, locked from the inside. In Fig. 2 a plan view is given of the parallel drifts leading from the main tunnel, showing the placing of chimney and the different compartments in the magazine.

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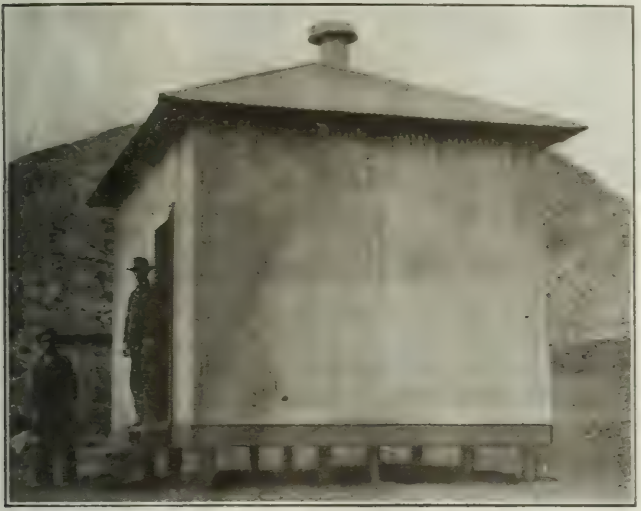
[*] The fourth of the series of articles which began in the Nov. 9 issue of the Journal. Copyright, 1918, McGraw-Hill Co., Inc.

[†] Mining engineer, Bisbee, Arizona.

When the powder is transported from the surface magazine to the different mine shafts, it should not be left at the collar of the shaft longer than is absolutely necessary, as many accidents have occurred through the explosion of powder there, before being taken underground. This is of the utmost importance. I have recently noted cases where the powder is taken to the collar and left there for an hour in the morning during the time when the shift is going to work.

Not more than one day's supply of powder should, of course, be taken underground. Powder should never be lowered with tools or supplies of any kind, as that will establish a practice which will lead to the lowering of powder with steel and similar material. At the different shaft stations it should be a rule that the powder men must remove the powder from the stations immediately after it is brought down. A boulder falling down the shaft might accidentally strike the explosive.



HOUSE WHERE FUSES ARE CUT AND CAPPED

From the shaft stations the powder is taken to the underground magazines, of which there should be one on each level. These magazines should be situated conveniently for all the men on the level, and at the same time far enough removed from the blasting to minimize the danger from shock. The magazines should be well ventilated, and not placed where the humidity rises to more than 80% and the temperature is high. They should be used for the storage of powder only and not as combination magazines for powder, tools, and supplies, as is the practice in some mines. Each magazine should be in charge of a powder man, usually called the "powder monkey." His duties are to give out the powder to the drillers as they call for it, and to keep an accurate check on the amount and the place where it is to be used, and this work is usually combined with other duties, such as checking up tools and other supplies in the tool house, which should be situated some distance from the magazine. The same man also attends to another magazine which contains the caps and fuse.

Though it is advisable to have the powder and capped fuses taken to the heading separately, it is impracticable in most cases, and all miners coming to the powder magazine should have powder and fuse sacks in which to carry their powder, fuse, caps, and stemming. The fuse, caps, and stemming should be placed in one sack and the powder in the other. These sacks should have suitable handles, so that a man can put one on each shoulder when climbing up a raise. Instances have been known of men tying fuse around sticks of powder, and carrying it up ladders in this manner. Should the fuse become loose and a stick of powder drop, the results are likely to be serious. The caps and fuse should be kept in separate houses on the surface. In mines where the humidity is high, the fuse should not be capped underground. The cutting and capping should be done by men who devote their entire time to the work, and these operations can readily be standardized.

Mechanical Fuse Cutter

A fuse cutter is preferable to a knife or ax, as it is necessary that the fuse be cut square across and to exact measurements. Fig. 3 is an example of a suitable arrangement. This consists of a table 3½ ft. high, 3 ft. wide, and 10 ft. long, with a blade of steel, foot pedal, and spring attached. The table is marked into feet and inches, so that the fuse may be cut any length up to 10 ft. At one end is a movable block, set at right angles to the table. This regulates the length of the fuse. The fuse spools are set on pegs, just above the table at the opposite end to the movable block. In cutting, the movable block is placed at the length desired, and the fuses, of which the table accommodates any number up to about 25, are drawn along the table until the ends touch the movable block. The operator then steps on the foot pedal, which pulls the steel blade, set at zero, down to cut the lengths of fuse. On releasing the pedal the spring raises the steel; the operator again pulls the freshly cut ends to the movable block, steps on the pedal, and repeats the operation. The use of this machine obviates all danger arising from the fuses not being cut square. After being cut, the lengths of fuse are drawn along the table a little further, where they are capped.

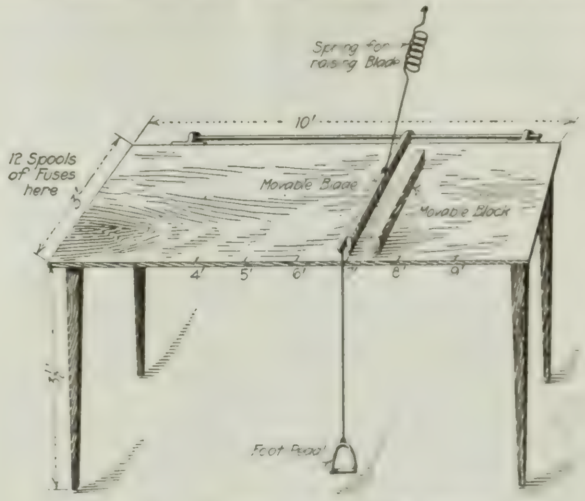


FIG. 3. ADJUSTABLE FUSE CUTTER

Capping of Fuses

In capping, the fuse should be placed in the cap so that it barely touches the charge, and the cap not too tightly crimped on. If the fuses are to be used in damp or wet places, a further precaution should be taken by using P. & B. paint, heavy grease, or some other material which is water-tight, to keep all moisture from penetrating the cap through the junction between the cap and fuse. Whenever a sufficient quantity of fuses are capped and ready for use, they are put into special fuse cans. These may be made by taking carbide cans, cutting them down about 9 in., fitting them with special lids which are water-proof, and lining the inside with felt ½ in. thick. The lids should be lined as well as the cans. The fuses are coiled and placed inside these cans and transported in this manner to the shafts, from which they are transferred to the different underground fuse houses. The fuse cans should be sent back to the fuse house on surface to be refilled as the supply underground runs low.

From the standpoint of efficiency, the capping of fuses by men specially employed for that purpose has proved to be a success at a number of mines. In one instance, two men do all the cutting and capping on the surface for the entire mine, averaging 3000 caps a day. This work was formerly part of the duties of sixteen powder men, who cut and capped fuse for their individual levels, and who are now required to do repair work and cleaning tracks in the time formerly spent in crimping caps. At another mine, one man is employed in a well-ventilated fuse house underground, and cuts and caps from 1100 to 1400 fuses a day.

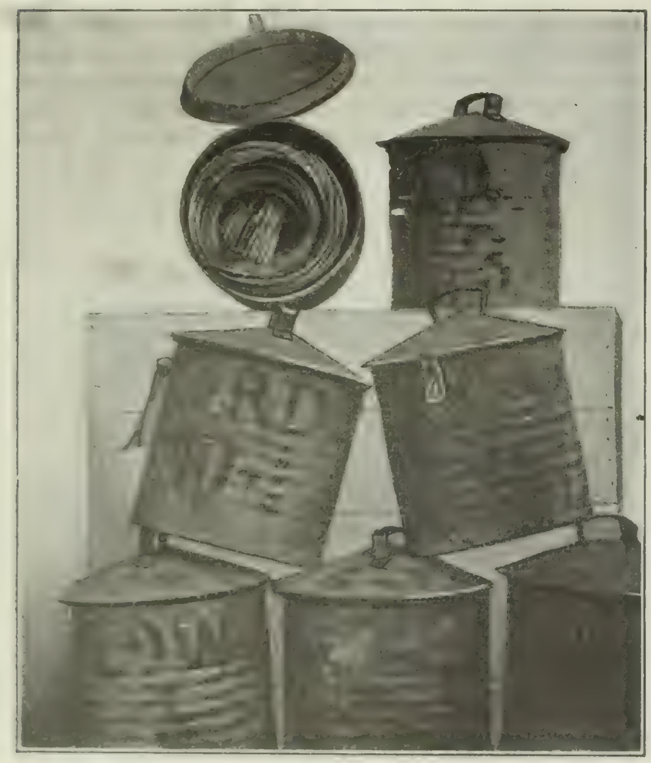


FIG. 4. FUSE CANS

STEMMING OR TAMPING

Stemming, or tamping, as it is occasionally called, is used in practically all mines except metal mines. Its use has been in practice in coal and iron mines and in mines in England and on the Continent for many years, but it is not extensively used in the metal mines in this country. In Michigan, where many of the miners originally came from England, stemming is used, for the reason that the men have been trained in that country to the idea that stemming goes with the powder, but its use has never been enforced by the operators in the West; and the miner has come to know that by filling the hole with powder and using the explosive instead of stemming he can satisfactorily pull the ground, and, inasmuch as the company furnished the powder, there is no need for him to be economical.

It naturally became the practice for miners in this country to load a hole with powder and then use an extra amount for stemming, thus establishing a custom for the use of an excessive amount. In this connection it may be noted that contractors in the Southwest who furnish their own powder generally use stemming. The miners working on day's pay, on the other hand, never do so, as they well know that holes loaded with an excessive amount of powder without stemming will satisfactorily break the ground, and that the use of stemming entails extra work and is contrary to custom. In justification of the miners' attitude it should be taken into account that not enough has been done in eliminating missed holes, as it is dangerous to clear out the stemming in a missed hole in order to blast it over again. It is therefore absolutely essential that the number of missed holes be reduced to a minimum before making the use of stemming compulsory.

FIG. 5. MAKING STEMMING AT A MEXICAN MINE

STEMMING INCREASES EFFICIENCY

It is an established fact that stemming increases the efficiency of the charge, and Technical Paper No. 17 ("The Effect of Stemming on the Efficiency of Explosives") of the U. S. Bureau of Mines, describes experiments showing that the gain in work accomplished when dynamite is tamped varies from about 35% with the quick-acting to over 90% with the slow-acting explosives. De Kalb says that in no case is detonation absolutely perfect under ordinary conditions, but this perfection is approached more closely according to the concentration of the explosive impulse, due to good confinement.

Experiments made by the Western Australian Government Commission, and described in the "Blue Book" of 1905, showed that the tamping of charges has a marked effect on the proper detonation of the explosive used. When bore holes are tamped carelessly, or when no tamping is used, the lack of confinement apparently causes a small part of the explosive to be detonated incompletely, and consequently more offensive fumes are given off than when the charge is tamped properly.[1]

Some of the arguments advanced against the use of stemming are as follows:

1. It takes longer to load a round of holes when stemming is used.
2. In the case of missed holes, the stemming must either be cleaned out or another hole drilled alongside; and if the miner is careless there is danger of drilling into the unexploded charge.
3. It is contrary to custom, especially in the Western States.

The advantages of stemming are:

1. Greater efficiency of the explosive.
2. Complete detonation, and, therefore, a minimum amount of noxious gases.
3. A saving in powder and, incidentally, in cost.

CLASSES OF STEMMING USED

Different kinds of stemming are used on a small scale in some of the metal mines in the West. In one mine, for example, the powder man collects several boxes of clay, which he brings to the powder magazine. The clay is rolled into balls about the size of the ordinary baseball, and he hands these to the miners when they come for the powder. About half this stemming is scattered along the way to the working places. When ready to load, the miner is often so rushed for time that he is unable to take these large balls of clay and roll them down by hand to fit the holes, so the remainder of the stemming is usually lost. In cases where the miners actually do use it, the quantity is so small that the effect is negligible.

Another method which is being tried in some places is the use of paper forms made the same size as the powder. These forms are filled in some instances with wet and in others with dry sand (see Fig. 5). So far, this has been tried out only occasionally in certain mines, and therefore has not produced the results for which it was intended. Mill tailings are sometimes used, the fine dust in drill holes has been collected and used in others, and dust from the ores has been tried in a few mines, but this has not as yet passed beyond the experimental stage.

VALUE OF CLAY FOR STEMMING

It has been proved by experiments that plastic clay which has been properly tempered is most suitable for stemming. Consequently, when an attempt is made to introduce the practice in a mine, it is advisable to use the best material available. At the property of the Mogollon Mines Co. a machine was devised and has been in use for some time to mold clay in the desired form, and a system also has been adopted by which the stemming is properly distributed.

In the larger mines 3000 or more shots are fired every day. This requires a large amount of stemming and necessitates manufacture on a large scale. After a careful study of this matter and after taking up the question with authorities on brick-making at different plants, I came to the conclusion that a brick-and-tile machine, with a die made to suit the measurements of stemming, would be practical for such a purpose. Fig. 6 shows a machine of this kind, capable of turning out stemming in quantity greater than required at the average mine. For this reason a smaller machine should be designed to meet requirements.

USE OF AMERICAN AUGER MACHINE

The clay from which the stemming is to be made should first be thoroughly mixed and tempered in a pug mill, boulders broken and sufficient water added to make it plastic. After being thoroughly mixed, the clay is run through the stemming machine and forced out through a cluster die, containing six to ten orifices each approximately one inch in diameter, cut into about ten-inch lengths, and wrapped in paper. This paper should be of different color to that used for the powder. The product should be sent to the various shafts, lowered, and taken to the powder magazines together with the powder. When the miner goes for his powder and caps he should receive the stemming at the same time.

A plant such as is suggested could be designed and constructed at a reasonable cost. The pug mill and stemming machine can be operated by electricity at small expense, and the clay obtained from waste dumps, and the quantity of water used would be negligible. When it is considered that the machine shown in the illustration is capable of turning out from 1000 to 2000 building bricks per hour, it is obvious that with a smaller machine, designed to meet the requirements of the average mine, two men could turn out sufficient stemming within a few hours to supply the daily needs, and for the remainder of the shift they could be put to other work.

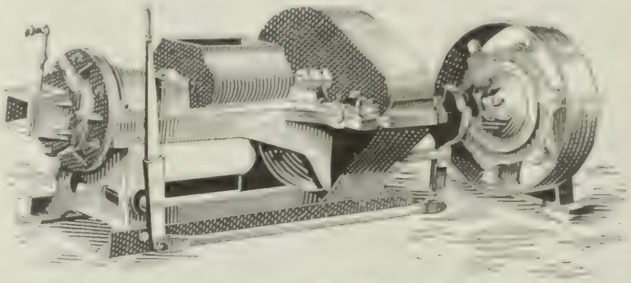


FIG. 6. AMERICAN AUGER MACHINE FOR MAKING STEMMING

LOADING AND BLASTING PRACTICE

Great care should be exercised in slitting the powder and putting it in the holes. Except in the case of very wet holes, every stick of powder should be slit. A wooden tamping stick should be used, and the powder carefully tamped so that it will fill all the air spaces in the drill holes.

In placing the primer, there is considerable difference of opinion as to where it will have the greatest effect. It is best to decide on one particular place, let that be the common practice, and adopt it as standard. Though it is possible, with the uninflammable ammonia dynamite and the gelatins so extensively used in mining, to place the primer anywhere with small danger of ignition, (providing a high quality of fuse is used), the tamping can be done more effectively if the primer is placed near the top of the charge. On the other hand, the explosive is more generally detonated by having the cap in the center of the charge. In the Southwest, the general practice seems to be to place the primer near the bottom of the hole; and although there is a possibility of the powder being set on fire by the fuse before it reaches the detonator, the use of the best quality of fuse seems to have, so far, avoided this danger.

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[1] "Blasting Explosives and Accessories," by Charles S. Hurter, technical representative, Hercules Powder Co., Wilmington, Delaware.

In making up the primer many methods have been practiced, of which Fig. 7 shows one of the most popular. In the practice illustrated misfires are of frequent occurrence. In those instances where the fuse was cold it was doubled up by the miner so as to break, which was also the cause of misfires. The wrong way and the right way, shown in Figs. 7 and 8, respectively, should be illustrated by blueprints, which should be placed in front of the mine office for the benefit of the men. Orders should also be given to the men regarding the standard practice which has been adopted.

After loading and placing the primer (in case stemming has been introduced and become a regular practice), the remainder of the hole, to within about six inches of the collar, should now be filled with stemming. By leaving this distance unfilled it will then be possible, in the case of a misfire, to ascertain the exact direction of the missed hole, so that another may be drilled with safety.

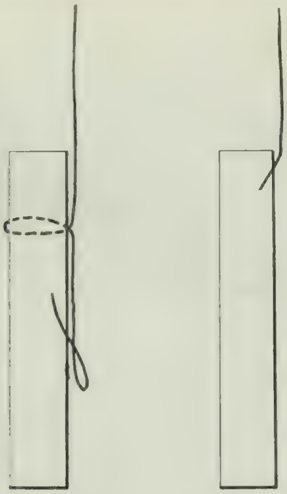
FIG. 7 FIG. 8

WRONG AND RIGHT WAYS OF MAKING UP THE PRIMER

The fuses are now spit about ½ in. so that they can easily be ignited. The old method of using a piece of fuse about a foot long and cutting it about every inch is the most practical fuse spitter in use at present. At this moment caution should be exercised to spit the cut holes first, as many rounds are lost on account of miners neglecting this important point, and hastily spitting the fuses, regardless of the order in which they should be fired.

Danger From Missed Holes

As previously mentioned, before stemming is used, the number of missed holes must be reduced to a minimum. The causes have frequently been enumerated and are well known. A thorough investigation of conditions should be made at mines where a large percentage of missed holes occur, and the causes eliminated. Frequently, the use of a stronger detonator will have a marked effect on the reduction of missed holes. If, therefore, proper attention is given to the handling and care of powder, caps, and fuse, as outlined above, and only the best quality is used, there should be few misfires. In some mines the number has already been reduced to less than 1%, and at one in particular, where a strong detonator is used, the monthly average is about 0.25%. In headings where a great deal of water is encountered, or when sinking in wet ground, it is generally advisable to blast by electricity in order to eliminate missed holes.

Gases From Explosives

Some conception may be formed of the effects of gases produced by explosives from the fact that, in one mine, 37 men were gassed during a year, of whom 11 (29.72%) were gassed in stopes, 12 (32.43%) in drifts, 12 (32.43%) in raises, and 2 (5.42%) in winzes. The total time lost was 84¼ shifts, with individual losses up to 10 shifts per man. At another mine 21 men were gassed in a single night as the result of excessive powder smoke and gas from blasting.

When it is considered that one stick of 1⅛-in. 40% gelatin dynamite will produce approximately 1.54 cu.ft. of carbon dioxide and 0.09 cu.ft. of carbon monoxide (calculated for atmospheric pressure at sea level), and that in a drift or raise averaging 10 to 20 holes, with six sticks of powder to a hole, there would be about 90 times this amount, or 157 cu.ft. of gas, some idea can be formed of the effect. It takes approximately 650 cu.ft. of fresh air to dilute the gas from one stick of such powder and improve the atmosphere until the carbon dioxide present is 0.25%. For the drift mentioned, a relatively larger amount, about 58,500 cu.ft., of good air would be necessary.

Stopes worked by undercutting systems, where boulders must be plugged during the shift; caving systems where ore is simply drawn off and where it is necessary to put in more holes with the stoper from the chute in order to cave the ground above; horizontal or incline cut-and-fill stopes, necessitating the breaking of boulders for the chutes; top slices, in order to break the ore in case the previous shift did not blast—all require blasting to be done during the shift. This results in an excess of gas over and above that formed from the regular blasting at the end of the shift. The greater the atmosphere is vitiated, the more good air must be produced. This requires more power and closer supervision of the ventilating system in order to have the place ventilated as thoroughly as possible; and this naturally adds to general cost.

The large amount of gas produced is due partly to the excessive use of powder on the part of the miners and partly to incomplete detonation. The former naturally multiplies the volume of gas, and it is a well-known fact that when a charge of dynamite burns instead of exploding, a much greater amount of carbon monoxide is formed, and other harmful gases are produced. Incomplete detonation, due to the use of caps of insufficient strength, or the presence of moisture in the cap, adds to the seriousness of the situation by increasing the percentage of dangerous gases present. The efficiency of the explosive is also reduced when the charge burns instead of exploding; in fact some authorities estimate its efficiency to be only about 50%.

"In practice, the fact that an explosive has not been properly detonated is made manifest principally by the production of considerable quantities of disagreeable and poisonous fumes, the presence of unexploded powder, the small amount of work done by the powder, and often, with high explosives, a section of the borehole in which the powder has burned is unaffected. . . . The bad fumes in incompletely detonated powder are due to the fact that its decomposition was effected at a temperature below that which corresponds to the most violent chemical action. The result is that instead of producing nitrogen and carbon dioxide in the gases from the explosion, both the poisonous nitric oxide and carbon monoxide are formed. . . . The weaker effect from imperfectly detonated powder is due largely to two causes—lesser heat of formation of carbonic oxide gas and the heat absorbed in the formation of nitric oxide. Thus, when carbon monoxide and nitric oxide are present in the gases from an explosion, poorer results are obtained than when carbon dioxide and nitrogen are liberated. Further investigation during late years has shown the presence of volatilized nitroglycerin in the fumes from burning or incompletely detonated dynamite. Nitroglycerin is very volatile, and a small quantity may easily be evaporated by the heat from burning powder. This is made manifest by the action of these fumes on human beings. It is a common fact that men breathing the fumes from nitroglycerin explosives, particularly when improperly detonated, get violent headaches, similar to those due to slight nitroglycerin poisoning. This great similarity, and the fact that the same treatment effects a cure in both cases, are accepted by a number of authorities as satisfactory evidence that nitroglycerin vapor is present in the fumes from poorly detonated or burning dynamite."[3]

FORMULATING OF BLASTING RULES DIFFICULT

Though it is difficult to formulate rules regarding blasting in mines where the method employed necessitates the use of explosives during shifts, something can still be done to systematize the work as much as possible. If men are working over a grizzly and find it necessary to blast frequently, then instead of blasting each boulder separately as they come to it, they may be able to keep the ore running until they have five or six of these boulders together. In place of the customary one, two, or three sticks of powder on each boulder, they should put a small hole in each with a Jackhamer, insert about half a stick of powder, a strong detonator, and a little stemming on the top.[3] This will generally break the rock just as effectively and reduce the total quantity of powder from 10 or 12 sticks to about 2½ or 3. This would result in a marked effect on the ventilation in general, as it would decrease the quantity of poisonous or noxious gases which are generated in the first place, and thereby require less air to dilute the products of combustion. It would also effect a considerable saving in powder. The organization can insist on these different operations until they become habitual with the men and finally become standard.

Jaw Crushers Have a Larger Opening, per unit of capacity, than do gyratories. This factor determines the employment of jaw machines for plants demanding a small tonnage, but handling coarse sizes of run-of-mine ore.

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[3] *Ibid.*

Mexican Oil Law Redrafted

A new oil law which will be presented to the Mexican Congress will modify the present laws on that subject, to which American holders of oil lands have objected vigorously, says a copyrighted dispatch dated Nov. 21 from Mexico City appearing in the New York *Times*. The law will be effective one month after its promulgation.

Article 2 provides that those lands in which capital had been invested prior to May 1, 1917, for the purpose of exploring for or exploiting oil, are not denounceable, provided the holders of the lands, including owners or lessees, shall justify their rights of possession before the Executive within a period of three months from the date of the law's passage. Claims owned in fee are to pay territorial contributions and the production taxes imposed by the decree of July 31 of this year, or those which may be hereafter established under the classification of rents and royalties on claims to which titles are issued in conformity with the new law.

Claims held under lease contracts are to pay during the life of the contracts the taxes fixed by the decree of July 31. This provision will terminate upon the expiration of the lease contracts, which may not be modified or renewed, even though the power of the contracting parties to do so may be stipulated in them.

Upon the expiration of a contract, an exploiter, during the three months following, may obtain a title in his favor to the claim upon the payment of a title tax. Claims covered in this article are to be subject to the regulations on exploitations which govern claims to titles of petroleum lands. The dispatch continues:

> Article 3 provides that land owners holding contracts consummated prior to May 1, 1917, who have not invested capital in oil exploration or exploitation operations, shall enjoy during one year, counting from the day the law is enacted, the preferential right to denounce underlying claims to the properties, provided they justify their rights before the Executive within a period of three months. When a single piece of ground is denounced by various lessees, title is to be issued to that lessee holding the contract at the latest date.
>
> It is provided in Article 4 that in justifying rights to oil lands referred to in the preceding articles the interested parties may use certified documents which had previously been filed in the Department of Industry, Commerce, and Labor.
>
> Article 5 provides that owners and lessees who have invested capital in oil exploration and exploitation operations from May 1, 1917, to the time of the issuance of the new law may obtain titles in their favor to underlying oil claims by the payment of the title tax, upon furnishing proof within a period of three months from the issue of the law of having the authorization of the Executive to carry out the operations mentioned.
>
> Article 6 stipulates that all denouncements of petroleum claims presented to agencies of the Department of Industry in accordance with the provisions contained in the decree of Aug. 8 of this year are valid.

Copper Extraction From Pyritic Ashes

A new method for the electrolytic extraction of copper from pyritic ashes is described in *L'Industrie*, and is based on the electrolytic conversion of sulphide or sulphate of copper into cupric or cuprous chloride by the action of chlorine at the anode. If in an electrolytic bath containing hydrochloric acid in solution the anode is surrounded by a mass of pyritic scoria, the chlorine liberated by the hydrogen attacks the oxides, sulphates, or sulphides of copper more rapidly than it attacks the oxides or iron, and combines with them to form cupric chloride. Copper loss by this method is only 0.1 per cent.

Electro-Cyanidation of Gold and Silver Ores*

BY RUSH T. SILL AND HARLEY A. SILL

IN THE early development of the cyanide process, an electrical current was used to precipitate gold and silver from cyanide solutions. Though efficient as a means of precipitation, it required a complicated and expensive electrical equipment and a large precipitating area for a comparatively small amount of solution. Exhaustive experiments were then made, using inexpensive base metals as precipitants, which resulted in the ultimate adoption of zinc shavings and dust as economical and efficient agents.

The Pelatan and Clerici equipment consisted of a wooden tank with an amalgamated copper plate on the bottom, forming the cathode, and a rotating vertical cast-iron shaft carrying four arms, which formed the anode of the electrical circuit. The anode segments, which formed one-fourth of the cathode area, acted as a mechanical stirrer and kept the pulp in suspension. This was a distinct advance in the electrometallurgy of the precious metals. However, owing to mechanical imperfections and the rapid development of zinc precipitation, electro-cyaniding received a setback from which it has never recovered; and although many prominent metallurgists worked on the problem and developed electro-cyanide machines, the process became dormant and had been almost forgotten as a metallurgical possibility.

Electro-cyaniding has a wider field of adaptability than the standard methods of leaching and agitation, because it can successfully treat gold and silver ores in the presence of considerable amounts of the base metals, lead, zinc, copper, and arsenic. This is made possible by the fact that the time required for the treatment of ores by electro-cyanidation is from one-eighth to one-twentieth of that in standard methods. The cyanide solution is in contact with the ore a much shorter time, and is regenerated by the electrolytic precipitation of the precious and base metals.

REGENERATION OF CYANIDE

Cyanide is a solvent of base as well as of precious metals; and the lead, zinc, or copper dissolved is precipitated on the amalgamated copper plate, together with gold and silver, forming a base bullion. However, with the exception of zinc, the base metals are less readily soluble in cyanide solution than are gold and silver, and, consequently, relatively small amounts are dissolved, precipitated, and melted into the bullion. With the deposition of the metals by means of an electric current, the cyanide is liberated and again becomes a dissolving agent, thus completing a cycle of alternate dissolution and precipitation. Tests have shown that it is unnecessary to use as strong solutions as in other methods. A strength of one to two pounds has been found sufficient for any class of amenable ores.

Chemically, electro-cyaniding does not differ materially from standard methods. Lime is added to neutralize the acidity of the ore and to provide a protective alkalinity. A small amount of common salt is added to increase the conductivity of the solution. The amount required varies slightly on different ores, but rarely exceeds 10 lb. per ton, and usually is considerably less. With the exception of a few complex cyanide compounds which are formed, and which cannot be decomposed by electricity, the cyanide is kept in a state of active purity, a condition not always easily controllable by zinc precipitation. The electric current also precludes the necessity of the addition of lead acetate and similar compounds which serve as auxiliary chemical reagents.

The salt is decomposed by the electricity, and metallic sodium is precipitated on the mercury-coated copper plate, forming sodium amalgam. The sodium is converted into caustic soda by its reaction with water, which, uniting with the acid radicals in the ore, protects the cyanide from compounds from which the lime does not so readily protect it, thus saving a larger percentage of cyanide salt than can be saved without the current. Chlorine is also generated, but rarely indicates its presence, probably being united with basic radicals of the complex charge.

CURRENT REGULATION

The application of the electric current is simple in its operation, but extremely important in its functions. The question of the quantity and character of the current required to produce the highest efficiency in the deposition of the metals has necessitated much experimenting. It has been found that a direct current with 10 volts and approximately 2¾ amperes per sq.ft. of precipitating or cathode area is the most effective. The amperage is easily regulated by the addition of salt to the solution.

THE AMALGAM PLATE

The dressing of the copper plate is identical with general practice in stamp battery plating. The dissolution of the salt into metallic sodium produces sodium amalgam, which keeps the plate soft and in excellent condition. In the treatment of gold and silver tailings containing mercury as amalgam or chloride, the particles of any appreciable size are amalgamated at once without the dissolving action of the cyanide solution, and the more minute particles, in both the metallic and chloride state, undergo dissolution and subsequent precipitation and amalgamation. Gold and silver in a free state act similarly. The copper plate serves as an efficient amalgamator in these instances because the pulp travels a distance of approximately seven miles, over the plate, in the course of a 2½-hour treatment.

Two distinctly different products are obtained from electro-cyaniding and standard methods of leaching and agitation. In the one, the precious-metal values are recovered as amalgam, which requires retorting before melting. In the other, zinc-press or zinc-box clean-ups are necessary. Frequently the precipitates require further refining to facilitate their melting, because of the relatively high melting point of zinc, and consequent complications due to an excess of the precipitant. An excess of zinc raises the melting point and causes a correspondingly greater degree of loss in gold and silver due to volatilization.

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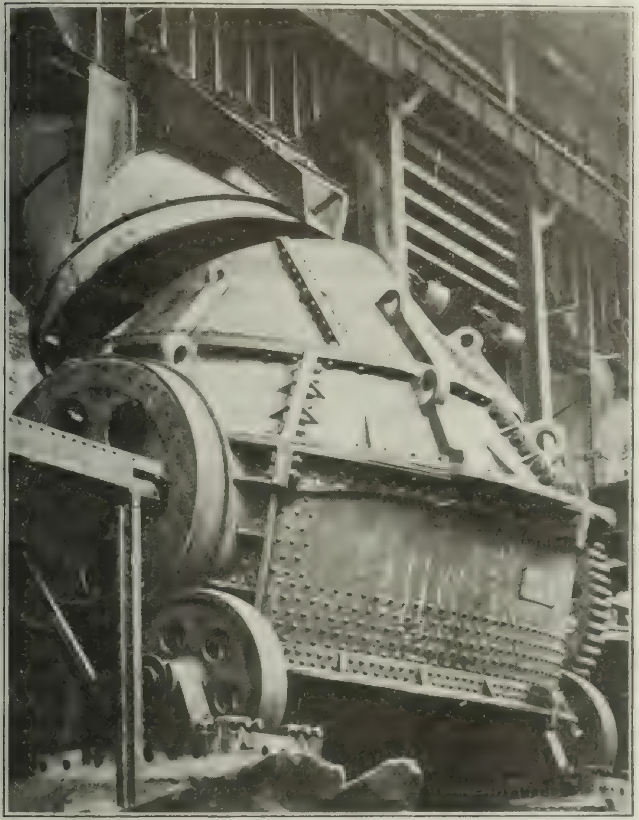
*Abstract from the *Mining and Oil Bulletin*, April, 1918.

From tests on a large number of ores it has been determined that from 70 to 95% of the dissolution takes place within two hours, and that all of the commercially extractable materials of value are obtained in six to eight hours for silver ores and two to four hours for gold ores. A process that has such a wide field of application and which is so simple and efficient in its operation merits the attention of metallurgists and electrochemists.

New Converters at Granby Plant

By W. A. Williams*

A new type of 20-ft. Great Falls converter was installed at the plant of the Granby Consolidated Mining, Smelting, and Power Co. last summer. The main feature of the improved machines, of which two have been erected, will be appreciated by reference to the accompanying halftone.



GREAT FALLS CONVERTER

Experience has shown that with converters of the usual design there is a tendency to sag after operating, thus throwing the gears out of line. To obviate this, the new type of converter has been reinforced with cast angle plates and a ribbed top. These additions insure a stiff beam effect; but, in order to compensate for any possible sagging, the gears have been designed slightly beveled, so that when the sag does develop it will straighten up.

The two converters are now in operation, and all the matte will soon be converted direct from the blast furnaces at whatever grade made, although it is hoped to keep this at 16%. The modification in treatment method has eliminated the regrading furnace and the rehandling of the matte—a considerable saving, considering the tonnage handled. The change has also permitted an increase in the amount of "green" ore handled and will reduce costs. The furnaces are giving entire satisfaction.

To Advise on Contract Adjustment

By agreement with all the war-making agencies of the Government, the War Industries Board is to be promptly advised of revisions and adjustments of all war contracts of the Government in excess of $100,000, it was recently announced. Though it has never been the function of the War Industries Board to make contracts, and, therefore, it cannot assume responsibility for any of the financial adjustments with contractors incidental to cancellations, the board will undertake by advice and recommendation to so control the situation as to stabilize the flow of materials, labor, and plant facilities back to peace channels.

To this end, the facilities section of the War Industries Board will act as the clearing house of all information relating to contract adjustment. It will receive information concerning contracts to be cancelled from the various departments of the Government, and, through the commodity sections of the board, keep in contact with the various industries. At all times contact will be maintained with the Labor Department also, so that as labor is released from the war industries by contract cancellations immediate demand for its services can be placed elsewhere. Bearing in mind the fact that for some time those parts of the war program necessary to maintain the existing military establishment here and abroad must be continued, it will likewise be a function of the facilities section to divert, where possible, the materials, labor, and facilities, released by one department, to the requirements of another department.

Utah Copper Co.

The last quarterly report of the Utah Copper Co., covering the third quarter of 1918, shows that 3,412,700 tons of ore was treated, 210,800 tons more than for the preceding quarter. The average grade of the ore was 1.2004% copper, and the average extraction, 65.07%, as compared with 1.2535% and 64.49%, respectively, for the second quarter. The gross production of copper was 53,311,943 lb., an average monthly production of 17,770,648 lb. In addition, a total of 1,116,509 lb. of copper was contained in precipitates from the leaching plant, 35,481 lb. in shipment of precipitates, and 275,745 lb. in ore shipped direct to the smeltery, making a total gross production for the quarter of 54,739,678 lb., as compared with 52,724,053 lb. for the previous quarter. Total net income amounted to $5,310,011.59, and disbursements to stockholders were $4,061,225.

Tin Smeltery at Arica, Chile, has a reverberatory and a roasting furnace with a capacity of 1000 tons of barilla per month and an approximate production of 650 tons per month. The plant is being enlarged so as to make its capacity 1500 tons per month. Petroleum residuum imported from California is used as a fuel.

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*Superintendent of smelteries, Granby Consolidated Mining, Smelting, and Power Co., Anyox, British Columbia.

Leaching and Filtration Nomenclature *

By A. W. Allen

The difference between the meaning of the words "percolate" and "leach" is not always recognized. "Percolation" infers the passage of a liquid through the interstices of any material or materials permitting it. "Leaching" is the process of extracting soluble matter by percolation. "Lixiviation" is analogous to "leaching." Percolation and leaching may occur simultaneously. Percolation may be hastened by the application of pressure or vacuum. Leaching may be improved by modifying the physical or chemical character of the solvent. Percolation occurs during filtration.

A filter may be used for one of two purposes—either to strain suspended or finely divided matter from a liquid, or to separate a liquid from a solid. In the former case it is usually referred to as a clarifier, although the term "clarification" usually infers the addition of some settling or flocculating agent which permits the decantation of the clear supernatant liquor. The use of the word "clarifier" has apparently been adopted to mark a distinction from the more complex filtration methods. A clarifying press may be, and usually is, an ordinary type of plate-and-frame filter press. A clarifier or clarifying filter may consist of a straining device containing filter cloth or sand by which a clear solution is obtained, with or without the aid of artificial vacuum, natural gravity, or applied pressure.

In chemical or wet chemico-metallurgical processes the use of the word "filter" has been extended beyond its previously accepted scope. The simple separation of solid from liquid, such as occurs when a thickened flotation concentrate is filtered, is usually termed dewatering. The word "filtration" is used more to cover the complex process of separating, as far as possible, solid from liquid by vacuum or pressure, removing the residual solution by wash, and at the same time leaching any recrystallized, absorbed, or undissolved matter by percolation with the solvent. At the Homestake plant the gold is leached from the sandy product in vats. The slime pulp is dewatered in presses, and the cakes are leached with cyanide solution and water. In this instance the filter press functions mainly as a convenient means of permitting satisfactory percolation after dewatering has been accomplished.

The filters used in various processes are of two classes—pressure filters and vacuum filters. A pressure filter, usually termed a filter press, is an apparatus in which the separation of liquid from solid and the percolation of liquor through the cake are insured by means of pressure against the filtering medium. A vacuum filter, on the other hand, is an apparatus by means of which the same result is achieved by the aid of a vacuum *through* the filtering medium. There is often a lack of distinction between the two terms which results in failure to appreciate the fundamental difference of operation between the two types of apparatus.

Revolving-drum and suspended-leaf types of vacuum filters are frequently referred to as filter presses, with the result that their comparatively limited application is often overlooked. All the operations of a vacuum filter are dependent on the pressure of the atmosphere at the particular elevation where the machine has been installed. The maximum force available for the purpose of separating solid from liquid, or for drawing the percolating solution through the cake, is limited to a theoretical pressure of 30 in. of mercury, or under 15 lb. per sq.in. The maximum pressure obtainable in practice at sea level is probably nearer 12 lb. per sq.in., and is proportionately reduced at altitude. This pressure is, however, ample for many purposes.

The limit of operating force in the filter press is controlled only by the strength of the apparatus and the filter cloth, and the permeability of the caked material. It is usual to operate such a machine at a pressure that may rise to 80 or 100 lb. per sq.in. A pressure of 200 lb. per sq.in. may be adopted in certain operations in the ceramic industry where it is necessary to dewater a finely divided colloidal clay. On account of the pressure which can be used within this type of apparatus, a pulp carrying certain finely divided noncrystalline substances can be successfully dewatered in a filter press, whereas the use of a vacuum filter would be impracticable.

Cake formation in a filter press is achieved by means of gravity pressure, compressed air, or a force pump. Hydraulic pressure is often adopted to close the press and maintain contact between plates and frames during operation, but it is not usually used in the actual filtration, as stated in the Standard Dictionary.

I remember an instance where an engineer was impressed by a published account of a certain type of vacuum filter, in which the apparatus was referred to as a filter press. Having satisfied himself, after questioning his technical associates, that the operation of a filter press was practically unaffected by altitude, he arranged for an installation in a plant situated at a considerable elevation above sea level. The results were disappointing, and the equipment was subsequently dismantled to make room for pressure filters.

In all preliminary work dealing with proposed filtration installations at altitude it is advisable to keep in mind the fact that theoretical vacuums cannot be realized in practice; and that, in all the intermittent-action filters, particularly those of the suspended-leaf types, the failure of vacuum at certain stages of the cycle of operations may result disastrously. On the other hand, a reserve of pressure is usually a valuable asset. Hence the imperative need of distinguishing between a filter press and a vacuum filter in the first instance.

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*The second of a series of articles on the standardization of terms used in hydrometallurgical operations. The first paper, "The Difference Between Extraction and Recovery," was published in the October 26th issue.

South African Diamond Output

According to the official figures of the South African Department of Mines and Industries, the total diamond production of South Africa for the first six months of 1918 amounted to 1,410,836 carats, valued at $19,086,092. Of the total output, 1,395,596 carats were sold for $18,162,425, says a consular report.

The Transvaal produced 446,411 carats, of which 412,900 carats were from the Pretoria district and 33,498 from river diggings. The Cape Province was, however, the largest producing area, with 847,538 carats, and the Orange Free State was responsible for 116,887 carats.

Driving and Timbering Transfer Chutes

By C. T. Rice

A successful method of driving raises used as transfer chutes is employed in the Coeur d'Alene district where the veins are from 8 to 10 ft. wide. It consists of carrying up a combined manway-and-slide compartment in the center of the raise. This permits the ore to run down on either side, saves timber and insures safe operation. Sufficient bracing is provided to prevent side thrust, and only enough ore is drawn at each blast to make room on top of the last set for the men to carry on operations. When the raise is holed through, timber is removed, taking out the bottom set first.

At the Hecla mine, at Burke, Idaho, chutes used in transferring ore from level to level in order to drop it to the main haulage levels are placed in the mine where the ore is from 8 to 10 ft. wide and when the walls are sufficiently strong to stand without timbering. Moreover, these transfer raises are driven 15 ft. long in section, in addition to being flared out at the bottom to permit the placing of two chute discharges, as is shown in Fig. 1. Then when the raises have been driven through to the level above, they are stripped of all timbers, and the wear is thrown ore upon ore. At the bottom, a method is used for timbering which protects the bottom timbers from wear and tear, as well as making it possible to start the ore again easily and safely in case the raise gets blocked. The two chute mouths permit rapid loading of trains as well as larger storage capacity.

Combined Manway and Slide Saves Use of Timber

Instead of carrying up a manway and chute and three lines of stulls, as is often done in putting up transfer chutes, a combined manway-and-slide compartment is carried up in the center of the raise, and the broken ore allowed to run down to each side. This enables the miners to place their drilling stages easily and reduces the expense of putting in timbers, as well as of tearing them out when the raise is finally completed.

The first set above the level is cut 25 ft. long in section, whereas the next set above tapers to the regular length of 15 ft. The posts on the level and those on the floor immediately above are 9 ft. 3 in. long, which gives plenty of working room over the chute mouths in case the chute becomes blocked. But above the two bottom sets of the chute, the stulls are placed with 5-ft. centers vertically as well as horizontally, which makes it practicable to use for lagging the sides of the manway as a covering over the manway while making room for the next line of stulls.

Method of Timbering the Level and First Floor of the Raise

The level is timbered by means of a line of horizontal stulls from foot to hanging at 5-ft. centers along the vein, and with posts placed under them, both at their foot and hanging ends. On the first floor of the raise, posts are placed along the foot and hanging walls, and four stull caps are put in. These stulls are reinforced with headings from three to four 3-in. planks thick at each end, and round braces 8 in. in diameter are used to brace them laterally against the heavy side thrust that occurs later in the life of the raise. The posts are strongly braced to prevent side movement.

Center posts are placed under the two outside stulls about 3 ft. out from the foot-wall posts, as shown in Fig. 2, so that the outside posts may be lagged in such a way as to limit the flow of ore to the chutes. These posts are then lagged with a double layer of 3-in. planks. The lagging extends from the center post out beyond the hanging-wall post to the hanging wall itself. Then for about 3½ ft. down from the top, laggings, that extend from the center post beyond the foot-wall post to the foot wall itself, are nailed on. The purpose of the hanging-wall lagging is to keep an open space near the hanging and over the chute, to enable a man to work while starting the chute when a timber or a boulder blocks the opening. The lagging at the top is put in to prevent the flow of ore from reaching beyond the far side of the chute mouth. When this has been done, the stulls to each side of the manway are lagged over tightly with a floor of 3-in. planks, and then a layer of 8-in. poles is put on top to protect them. Two extra sprags, one on each side, are then put in from foot to hanging over the manway stulls, to keep these poles in position, in addition to holding the lagging of the manway set on the floor above, as the manway is lagged vertically with a double layer of 3-in. planks.

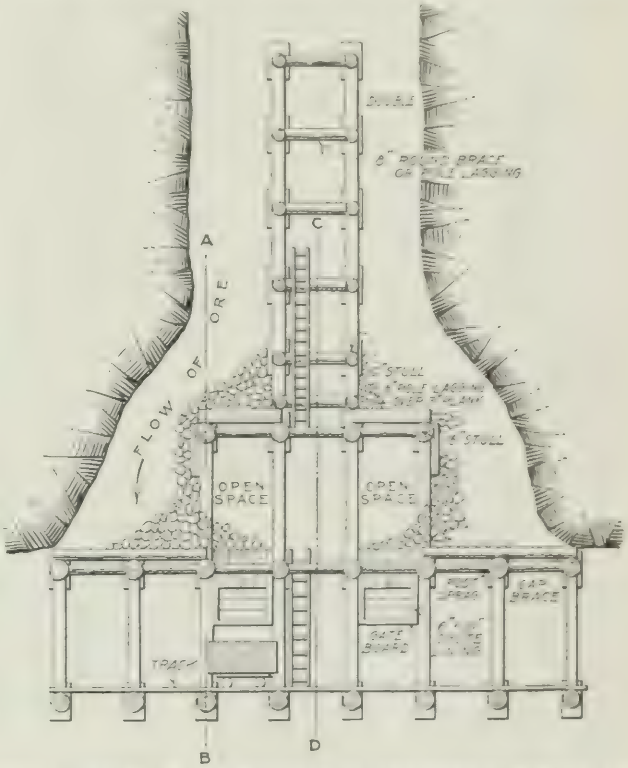


FIG. 1. SECTION ILLUSTRATING TRANSFER CHUTE AT HECLA MINE, BURKE, IDAHO

Fig. 1 shows the manner in which the timbers are protected from wear by the ore itself. The poles extend a few inches out beyond the outer stulls, to keep the flow of ore off these timbers. The ore banked up along the hanging wall protects the lagging and post on that side from wear, and there is a tendency for the ore to remain in equilibrium between the foot-wall post and the foot wall as large pieces become wedged there, so that that post also is fairly well protected from the wear and tear of the ore as it passes by. As the chute is kept full, and only enough ore drawn out at each blasting to make room on top of the last set for the miners to work in, the broken ore banks itself up in the feed hole above the chute mouth at its angle of repose. Then, when the chute is drawn again, the ore toward the center, rather than that along the sides of the feed hole, has more of a tendency to run, as it is the freer to move. Consequently, the ore that is against the top laggings of the feed hole will tend to hang there and thus protect the top of the opening from wear.

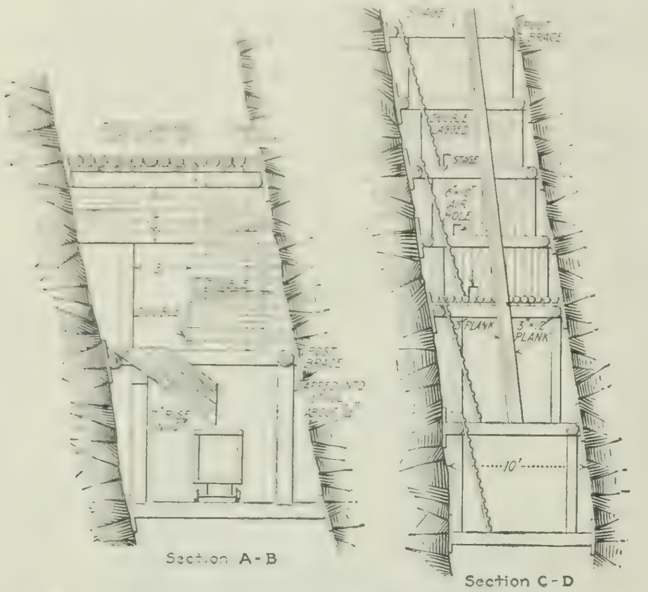


FIG. 2. SECTIONS SHOWING FEED HOLE IN COVER SET AND MANWAY-AND-SLIDE COMPARTMENT OF TRANSFER CHUTE

Timbers and Boulders Removed at Feed Hole

Any timbers that are blasted out and become buried are allowed to travel down with the ore until they reach the feed hole in the side of the cover set and finally block the opening completely. A hole bored in such a timber and loaded with half a stick of dynamite will shatter the stull so that the chute will run again in a short time. Moreover, the man, while boring this hole, works in the open space of the cover set, where he is protected from the flow of ore, as he can step back if the stick should move and the pile start running suddenly.

In the manway compartment a timber slide and a ladderway are carried up with platforms in the ladderway every 10 ft., to break the fall. The timber slide is carried along the hanging wall, and the ladderway is along the foot-wall side of the compartment, as shown in Fig. 3.

The raises are driven with two super-Leyner drills, and two extra machines are kept in reserve at the bottom of the raise, as the ground is hard. A 6-ft. cut is taken, using a center cut, a machine being mounted on a cross bar in each end of the raise. Three eight-hour shifts worked in the raise that was being put up from the 600 level to connect with workings from the No. 3 adit. This connection makes it possible to drop all the ore from the upper workings to the 900 level and to hoist it through the shaft, so that it can be sent to the crushing and sorting plant before going to the mill.

Slow Progress Made in Drilling Hard Ground

Four men worked on each of the shifts, but, owing to the hardness of the ground, only a cut a day, or 6 ft. of advance, could be driven, taken out and timbered up, as it takes 40 holes to break the ground. The drilling proceeded slowly, and the work of the crew was planned to speed up as much as possible, and bonuses were paid.

Timbers are kept about 6 ft. below the back. The planks that are to be used in lagging up the next set of stulls are piled over the top stulls to cover the manway. As the sides of the manway are doubled-lagged, there are five layers of these 3-in. planks, including those that go into the stage carried next to the top floor and that are later used in bringing up the timber slide. These planks are piled closely, so as to leave no air space between them. Helper posts are put in under the centers of the top stulls to keep them from being broken. Cross angle braces, running from stull to stull, are also put in near the foot and hanging walls between the top four stulls, to prevent lateral move-

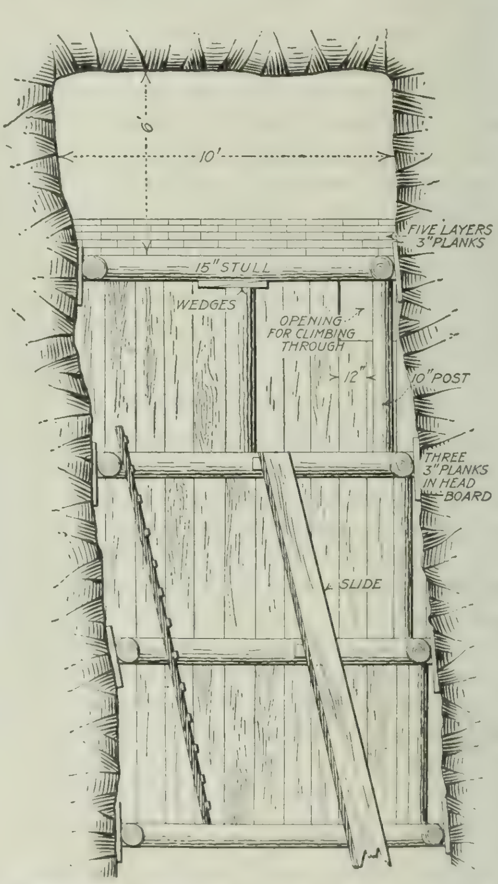


FIG. 3. SECTION THROUGH TOP OF TRANSFER RAISE, HECLA MINE, BURKE, IDAHO

ments of the top stulls when a round is blasted. Short sprags are placed from the stulls horizontally to the sides of the raise, and help hold up the staging on which the men stand while drilling.

The double planks in the sides of the manway are chopped to fit the hanging and foot walls tightly, that the first rush of air after the blast will not get into the manway and lift the planks before they have been loaded with dirt.

When the round is blasted, everything is tight excepting the hole through which the miners crawl after they have spit the fuses. This entrance is provided by sawing off the second plank from the hanging wall at about its middle, and the pieces are used to close the hole. As soon as the round has been blasted, the men pull enough dirt out of the chute to lower the top of the pile, in order that an air hose can be worked through the hole and the gas blown out of the raise. Then the miners get in and pick down the back. This having been done, the ore is removed from on top of the raise and a hole made through the platform to hoist the next two stulls that are to be put in. A sprag is then placed from foot to hanging, over the middle of the timber slide, and the pulley that carries the cable for hoisting the timbers is fastened to it.

TIMBER REMOVED WHEN RAISE IS HOLED THROUGH

When one of these transfer raises is through to the level above, it is emptied, stripped of its timbers and the manway set lagged over with 3-in. planks and poles, as were the other sets at the bottom. Owing to the manner in which the timbers are put in at the bottom of the chute, practically all wear and tear are thrown on the ore itself instead of on the timbers, and there is the further advantage that if a boulder should get into the chute it can be worked out on the floor above the chute mouth and blasted. If the chute becomes blocked, it is not at the chute mouth itself, but at the feed hole in the side of the cover set, and so can be started easily and quickly, and without danger.

BOTTOM SETS REMOVED FIRST IN STRIPPING RAISE

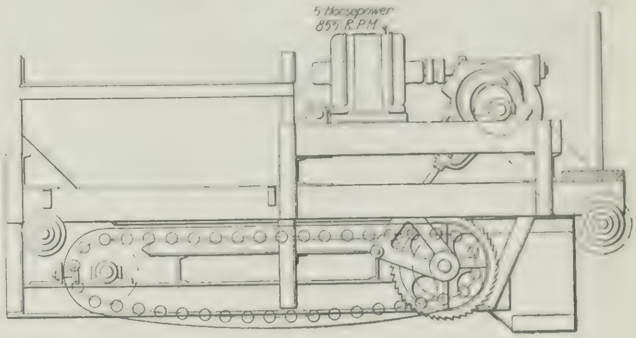
It may be well to warn against a natural mistake that might be made when stripping the stope of timbers. Ordinarily this would be done by beginning at the top and stripping the raising, coming down and lowering the timbers to the level below, which would be the easier way were it not for the fact that, after about 100 ft. of the raise has been stripped of timbers, the miners begin to get nervous lest some slab may loosen up along the walls, no matter how well they may have trimmed them down.

The proper way to strip the raise of its timbers, and to convert it into a transfer chute, is to begin at the bottom, above the cover sets, and take out the manway stulls. Five or six sets are taken out, according to the condition of the timbers and the walls, and broken ore is dumped in for the men to work on. Five or six more sets are then torn out, the timbers are hoisted up to the level above, more broken ore is run in, and the process is repeated until the top is reached. In this way there is little ground open at any one time, and the men can work without fear of impending danger. Unless the headboards have taken such weight from the walls that a few hard blows will knock them out, it will be found easier to chop the stulls off near the foot-wall end than to try to chop out or saw off the headboards. Chopping off the stulls near the ends does not injure them greatly, as they can be sawed off and used again in some of the narrower stopes of that level, and the loss of length of stull is more than made up for by the time that is gained in getting the timbers out.

Variable-Speed Apron Feeder

The ore at the Bunker Hill smeltery is received in four 250-ton bins. From these it is delivered, by an apron feeder, to a belt conveyor that takes it to the Blake crusher. In order to enable the crusher man to attend to the feeding of the ore from the bins, Bradley, Bruff & Labarthe, who designed the smeltery, devised a special type of apron feeder that is self-propelling, and arranged so that the speed can be varied. A switch in the power circuit of the driving motor enables the man at the crusher to stop or start the feeder.

The chute mouths of each receiving bin are equipped with arc gates. A tiller rope, that fastens over a hook on the side of the apron feeder, holds this gate open so as to permit the ore to travel freely down the chute to the hopper over the apron belt of the feeder. The rate at which the ore is drawn off depends upon the speed at which the belt of the apron feeder is being operated.



VARIABLE-SPEED APRON FEEDER

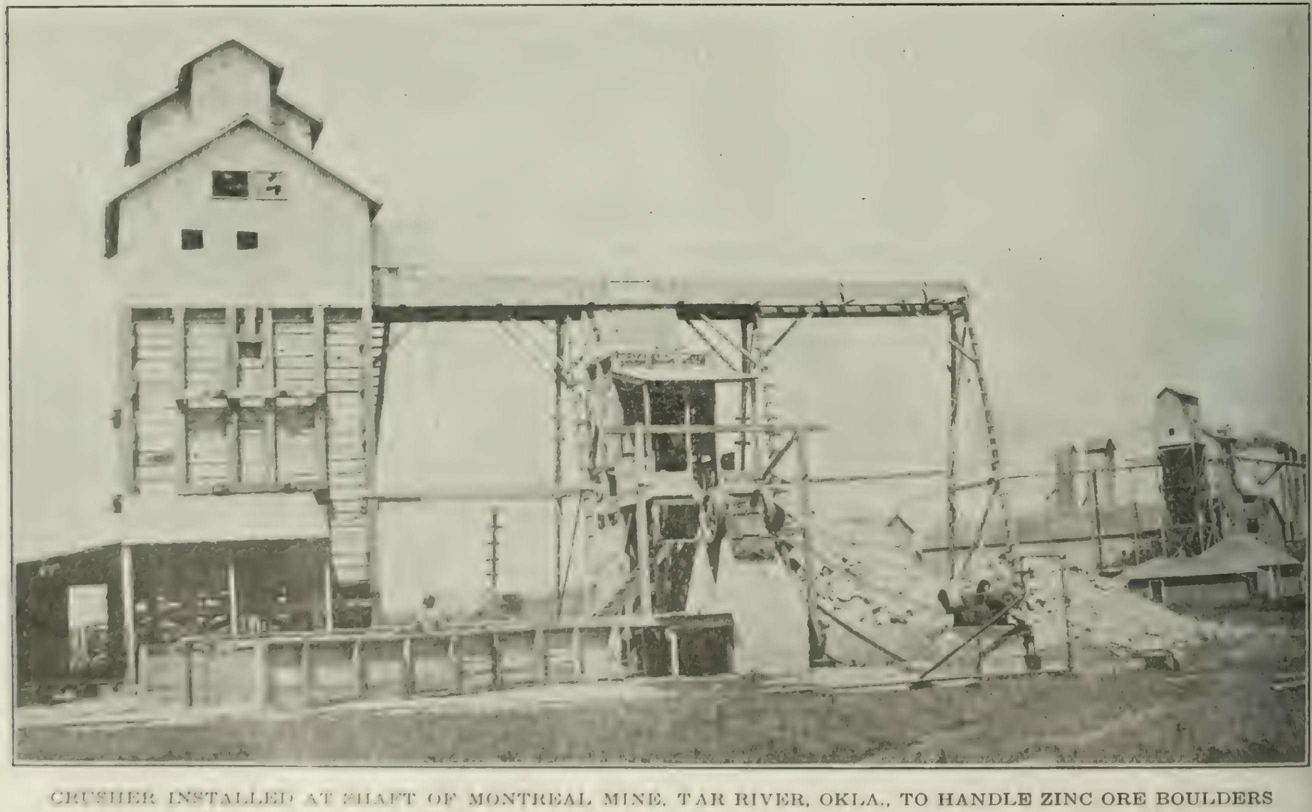
The feeder is driven from a 5-hp. General Electric Type K motor through a shaft and eccentric that actuates the apron drive wheel by means of a pawl carried on a rocker arm. The eccentric is of the variable-throw type, so that by locking the two disks in different positions with respect to one another, the number of teeth that the pawl will be pushed over, and so the distance that the apron belt will be pulled ahead on the return stroke of the eccentric, can be varied according to requirements.

A sprocket wheel mounted on the main driving shaft of the feeder connects by means of a detachable chain belt to another sprocket wheel carried on one of the axles of the feeder carriage. Thus, by throwing the driving sprocket into gear by means of a lever, the feeder can be moved along the track from one chute to another at a speed of 80 ft. per minute.

The adoption of this feeder permits the crusher man to spend practically all his time at the crusher, where, by means of the switch, he can immediately stop the feeder in case anything goes wrong. The feeder has a wide range of application.

Northeast Oklahoma Lead-Zinc District

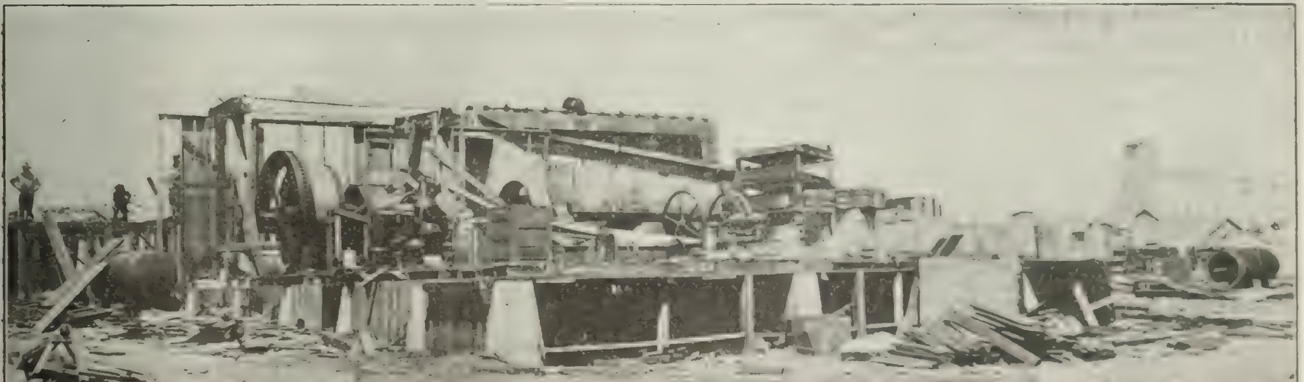
TYPICAL DRILL OUTFIT IN THE NORTHEAST OKLAHOMA ZINC-LEAD FIELD



CRUSHER INSTALLED AT SHAFT OF MONTREAL MINE, TAR RIVER, OKLA., TO HANDLE ZINC ORE BOULDERS

MACHINERY FOR 300-TON MILL AWAITING ERECTION AT THE UTOPIA MINE, PICHER, OKLAHOMA

CONCENTRATING MILL UNDER CONSTRUCTION IN THE MIAMI ZINC FIELD



DISMANTLING JOPLIN DISTRICT MILL PREPARATORY TO MOVING IT TO THE PICHER DISTRICT

The Cementation Process in Mining*

By A. H. KRYNAUW

The cost of pumping water in the gold mines of the Witwatersrand district of South Africa is more than $2,500,000 annually. Reduction of this expense by the wider adoption of the François cementation process is suggested, and experimentation has shown that cement under pressure sets extremely rapidly; and it is probable that this may be due to the squeezing out of excess water. Brief descriptions are given of the applicability of the process to a number of phases of mining work.

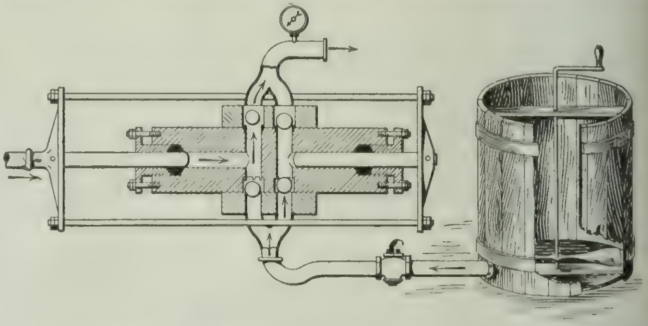
IN RECENT years experience has proved that cement can be introduced, under pressure, into the smallest fissures and cracks in rock strata, as well as into cracks and interstices in masonry and concrete constructions, and made to set there. The practice of introducing cement grout under pressure has evolved to that known today as the François cementation process. An essential condition in the introduction of cement into fissures and cracks is that the injection should be done under a considerable pressure, the object being, first, to overcome the contra pressure of water present in the fissure; second, for the purpose of forcing the cement as far as possible into the minute cracks, and, third, to squeeze the superfluous water from the cavity which is being filled with cement pulp, and thus leave the cement in a condition most suitable for its rapid and efficient setting. In the following instances cementation has been successfully applied:

1. In greatly minimizing water difficulties in shaft sinking or tunneling through water-bearing strata, faults and dikes.
2. In sealing and rendering water-tight the concrete tubbing or lining often used in circular shafts.
3. In sealing open fissures through which water is flowing.
4. In damming back water leaking through broken ground, in the vicinity of faults and dikes.
5. In rendering underground dams water-tight.
6. In rectifying defective boreholes.
7. In rendering impervious the foundations of surface dams or making solid the rock and concrete foundations of engines and other machinery.

APPLICATION OF PROCESS IN SHAFT SINKING

The process as applied to shaft sinking consists of a treatment of the strata, through which the shaft is to be sunk, with cement grout, which is injected into the fissures and cracks of the rock mass, thus sealing them and rendering the ground practically free of water. The method of carrying out the work is as follows: A system of drill holes is put down on the periphery of the shaft, and through these holes a thin cement mixture is introduced, which finds its way into the cracks and crevices, rendering them impervious to water.

In shaft sinking, particularly in the case of circular shafts, a lining of ferroconcrete or bricks is generally adopted, and in this connection it frequently becomes desirable to dam back water behind the lining. As this water may be under considerable pressure, the problem is no easy one, unless a process such as the François method is adopted. In this instance a number of weep pipes are built in with the lining, which allows the escape of the water while the lining is being constructed, thus relieving the "green wall" of the water pressure. After allowing the lining sufficient time to set, the weep pipes are in turn connected to the cementation pump, and cement grout is injected behind the lining and into the fissures, in this way sealing them up. Should the lining of the shaft not be of sufficient thickness to permit of a high pressure being applied, the method adopted is somewhat modified in that, before direct injection takes place, one or more release boreholes are drilled through the walls of the shaft, well back, to intercept the fissure at a considerable distance inside the rock. These holes allow the water to escape and relieve the side of the shaft of the pressure necessary for cementation. A thick cement mixture is then introduced through the weep pipes, which seals the fissure in the immediate vicinity of the shaft, and when set the final injection takes place through the release holes mentioned. By systematically dealing with all water in shafts in this manner, it is possible to get a perfectly dry shaft.



DIAGRAMMATIC SKETCH OF WATER END OF CEMENTATION PUMP, AND MIXING TUB

SEALING OF OPEN FISSURES

Generally speaking, the method adopted in dealing with open fissures through which any considerable quantity of water is flowing is to drill two or more release holes at some distance back from the mouth of the fissure, for the purpose of allowing the escape of the water during the time of sealing the opening of the crevice. It is readily understood that unless some system like this is used, the force of the water will wash out the cement grout as fast as it is injected. If, however, the water can find an easier escape through these release holes, it will take that course, and thus permit of the following treatment:

The flow of water from the mouth of the fissure is first restricted by carefully wedging it. Thick cement, with an addition of sawdust when necessary, is then injected through one of the drill holes, and settlement

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*Excerpt from the *Journal* of the Chem., Met. and Min. Soc. of South Africa, [illegible] begins on the support offered by the wooden wedges driven into the open end of the fissure. When this cement has set in the area between the release holes and the fissure opening, the final injection takes place directly through the release holes.

DAMMING BACK WATER IN THE VICINITY OF BROKEN GROUND

The process adopted for sealing back water leaking through the cracks and crevices of broken ground is similar to that adopted for sealing open fissures, though at times it calls for special care, as the weak nature of the rock tends to burst it out when subjected to pressure while injecting.

RENDERING UNDERGROUND DAMS WATER-TIGHT

It has no doubt been the experience of many that, however carefully an underground dam is constructed, a great deal of leakage takes place, more especially when the water is under considerable pressure. In this connection cementation can be particularly successfully used for making the dam water-tight by injecting cement through holes suitably drilled into the construction.

RECTIFYING DEFECTIVE BOREHOLES

Sometimes boreholes for the purpose of obtaining domestic water are required to pass through one or more rock strata containing inferior or corrosive water. In such cases the usual method is to line these boreholes with metal tubes, but these tubes frequently become corroded at the point of contact with the bad water, with the result that they become useless and the good water is polluted. In this case the upper feeders of bad water can be successfully closed off by means of cementation.

RENDERING IMPERVIOUS FOUNDATIONS OF DAM WALLS

It frequently occurs that at the site of a dam the rock foundations are of such a nature as to be unsuitable for the purpose of withstanding the pressure of the water behind the dam. This in the usual way is overcome by deep excavations, which consequently greatly increase the cost of the dam. It is intended to treat by means of cementation the pervious rock foundation at a dam site in the Mazoe Valley, Rhodesia, and there is little doubt that the operation will be successful and thus greatly reduce the expenditure on this dam. Briefly, the rock foundation is treated with cement introduced through a system of drill holes. Foundations of engines and machinery generally when ruptured can be effectively strengthened and solidified by cementation work.

Amisk-Athapapuskow Lake District*

The area included in the Amisk-Athapapuskow Lake district is situated 50 miles north of the Saskatchewan River, and consists of about 3300 square miles. The region lies along the edge of a part of the Canadian Pre-Cambrian shield, and one-half of it is underlain by Palæozoic rocks. The general elevation is about 1000 ft. above sea level. The southern part of the district, which is underlain by flat-lying Palæozoic rocks, is level, and any irregularities which may have existed have been practically obliterated by a thick deposit of lake clays. The northern end is free from such deposits and the surface is more uneven. Within the Pre-Cambrian region, the granite batholiths form resistant areas, which stand above the general level and form divides.

The older rocks form the western unit of a great anticline which pitches northwest at 45 or 50°, and on the flank there are remnants of minor synclines. The anticline has been cut off along its axis by an intrusion of gneissic granite, and massive granite has been intruded into the minor folds. Overlying this complex structure, the Ordovician dolomite forms the southern limb of a great low anticline of Palæozoic rocks, whose axis is transverse to that of the Pre-Cambrian anticline. The glacial deposits may be considered as another structural element lying unconformably over both of these.

The deposits of metalliferous minerals are of two kinds: (1) Gold quartz veins and (2) chalcopyrite-sphalerite replacements which carry small amounts of gold and silver. The material of value in the gold-quartz veins occurs chiefly as visible gold, and up to the present samples from the larger veins are not encouraging, but the gold content of small-width veins is commonly quite high. The sulphide deposits consist of pyrite-chalcopyrite-sphalerite-galena mixtures, and those that are largely pyrrhotite, although the important discoveries are of the former type. These deposits are almost solid masses of sulphides, differing only in the amounts and arrangement of the various minerals present. The sulphide deposits differ from the quartz veins in that they represent a replacement of the original rock by sulphides, whereas the gold quartz veins occupy practically the original fissures.

The first discovery of a large body of sulphides was made on the east shore of Flinflon Lake, now the Apex and Unique claims. Outcrops found at the water's edge are so near lake level that trenching is difficult. The deposit lies in a shear zone in Amisk volcanic rocks of the ellipsoidal greenstone type, and a series of trenches across the strike of the ore zone, on the north side of the point upon which the ore outcrops, show 55 ft. of sulphides, 40 ft. of barren rock, and then 30 ft. more of sulphides. Four hundred feet south of these trenches, the sulphide band is unbroken and is 75 ft. in width. Some disseminated material is found on the borders of the main mass of ore, and 800 ft. to the north of the main trenches ore has again been found, but here the lens is narrower. Assuming that the ore found in the most northerly trench belongs to the same lens as that shown by drill holes at the southern end, the deposit is more than 2500 ft. in length. It is probable that the lens or lenses include horses of barren rock, as indicated by the exposures, so that the actual distribution of sulphide may be irregular. The ore is definitely banded and consists mostly of pyrite, with narrow bands of chalcopyrite and zinc blende. All of the sulphides carry gold and some silver.

The group of claims comprising the Mandy mine is situated two miles from the north end of the northwest arm of Schist Lake. The deposit is on the narrow point separating the bay into which Phantom Creek empties from the main arm of the lake. It was discovered late in the autumn of 1915, and optioned to the Tonopah Mining Co. During the winter a diamond drill was installed and surface trenching undertaken. The country rock is massive greenstone and chlorite schist, which occurs in relatively narrow bands that strike parallel to the shore of the lake. The ore lens lies in the western zone of schist, protected from erosion by the massive greenstone on either side of it. Mineralization is confined to the schistose zones, the massive greenstone being almost free of sulphides.

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*Abstract of a report by E. L. Bruce, Canadian Geological Survey, Ottawa, Canada.

The lens of sulphides is 225 ft. long and 40 ft. wide. At the northwest side a two-foot vein continues northward, following the strike of the schist, and at the southwest side there is a similar vein. The ore has a composition similar to that of the Flinflon Lake deposit. The vein to the northwest is mostly pyrite; that to the southeast mostly chalcopyrite. A section across the middle of the lens shows 12 ft. of pyrite on the foot wall, and 12 ft. of high-grade chalcopyrite, 8 ft. of sphalerite and about the same width of pyrite on the hanging-wall side. All the sulphides carry gold and silver, but the value of these minerals alone is not high enough to warrant shipping. However, the segregation of the high-grade copper ore makes it possible to mine and ship that portion of the lens, even though it must bear the excessive cost of hauling by teams 35 miles to Sturgeon Lake, stocking until the opening of navigation, shipping to The Pas and then transshipping to the railway for a long haul to the smeltery.

Water Content and Concrete Strength*

For some time experiments have been in progress at the structural materials research laboratory, Lewis Institute, Chicago, to determine the effect of various quantities of water on the strength of concrete. These experiments have been directed by Duff A. Abrams, professor in charge of the laboratory. Professor Abrams has reduced his experiments to an intelligible form, which is interpreted by the accompanying diagram. This summarizes the results of compression tests on 6 x 12-in. concrete cylinders made in mixes ranging from 1 part cement and 9 parts aggregate, to 1 part cement and 2 parts aggregate, by volume. These mixes represent concretes of all qualities, from the leanest to the richest, which are generally used. The aggregate consisted of a mixture of sand and pebbles graded in size from the finest particles up to 1¼ in. Exactly the same grading was used in all experiments.

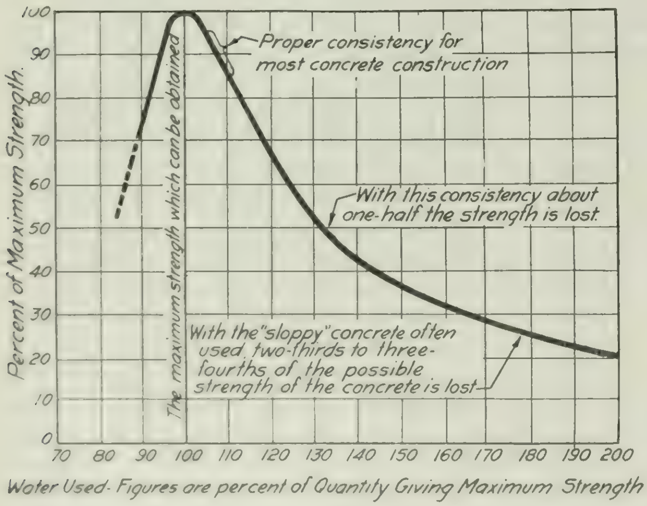

CHART OF WATER CONTENT AND CONCRETE STRENGTH

These tests show that the effect of proportional changes in the mixing water is approximately the same for all mixes of concrete; consequently, a composite curve has been drawn to show the average effect. The vertical distances represent the relative strength of concrete, expressed as a percentage of the maximum which can be secured from a given amount of cement and the same aggregates. The horizontal distances indicate the relative quantity of water used in the mix, considering the amount which gives the maximum strength as 100%. The amount of water which gives the maximum strength in concrete produces a mix which is too stiff for most purposes. It will be noted that the concrete strength increases rapidly with the quantity of water over the range indicated on the diagram. With any further increase in the amount of water, there is a rapid falling off in strength, as indicated by the curve. With an amount of water about double that required for highest strength, the concrete has only about 20% of the maximum strength.

The exact amount of water corresponding to the maximum strength of concrete will vary with the method of handling and placing the concrete. Any method which involves puddling, tamping, rolling or vibration, or the exertion of pressure in any manner, will have a tendency to increase the strength of the concrete, regardless of the amount of water used. However, it is probable that the effect produced by these methods will be more pronounced in the consistencies of approximately maximum strength.

Shaft Sinking by Freezing Process

The freezing process has been successfully employed in sinking two shafts through water-bearing ground at the Llay Hall colliery, Wrexham, England, according to the *Engineer*. Two foreshafts were sunk 12 ft. deep and 31 ft. in diameter and lined with brickwork. Concrete was placed on the bottom after inserting straight vertical guide tubes for 25 boreholes distributed around a circle 26½ ft. in diameter. In the upper strata the holes for the freezing tubes were bored by the rope method, but in the lower and harder ground percussion apparatus operated by a steam cylinder was used. The cold necessary for freezing the water-bearing ground was applied by two distinct groups of machines. The pipes and valves were arranged so that either group of machines could operate on either shaft, or on both simultaneously. Each included a belt-driven ammonia compressor with an independent horizontal steam engine having cylinders 16¾ in. in diameter and 30-in. stroke. A solution of calcium chloride was used as the freezing liquid, and was caused to circulate between the refrigerators and the freezing tubes by means of two plunger pumps. The brine pipe between plant and shaft was insulated with hair felt. The ground was frozen to a depth of 231 ft. in the first and 235 ft. in the second shaft. The diameter of the pit shafts after lining is 18 feet.

Remember the Comfort Fund of the 27th Engineers.

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*Abstracted from "Concrete in Architecture and Engineering"

Charles Richard Van Hise

DR. CHARLES RICHARD VAN HISE

THE University of Wisconsin is mourning the sudden death of its eminent president, Dr. Charles Richard Van Hise, who had led its progress during the last 14 years and had been a member of its family, as student and teacher, for 43 years. Geologists, scientists, and mining men join with the university in paying respect to its president, who died in Milwaukee on Tuesday morning, Nov. 19. Dr. Van Hise, who had been president of the University of Wisconsin since 1903, was the first alumnus of the university to become its president, the university's first Wisconsin-born president, and enjoyed the longest term. He was a Wisconsin man in birth, education, life work, and interest. He had been connected with the university faculty continuously since his graduation in 1879, and his entire energies had been devoted to the development of his native state and its university. Besides being a university president, Dr. Van Hise was one of the most eminent geologists of his time and one of the best-known thinkers on public questions, widely known for his many books, treatises, and public addresses. His great interest in geological problems, in conservation, and in regulation was well known throughout the country. In the solving of many of the nation's problems he was called into consultation or sent on special missions by the Government.

Dr. Van Hise was born at Fulton, Wis., on May 29, 1857, son of William and Mary Van Hise. He entered the University of Wisconsin in 1875, was graduated with the degree of bachelor of mechanical engineering in 1879, and later received the degrees of bachelor of science, master of science, and doctor of philosophy, The honorary degree of doctor of laws was conferred upon him by Chicago, Yale, and Harvard universities, and by Williams and Dartmouth colleges. He was instructor in metallurgy at Wisconsin, 1879-83; assistant professor, 1883-86; professor, 1886-88; professor of mineralogy, 1888-90; professor of Archæan and applied geology, 1890-92; professor of geology, and non-resident professor of structural geology of the University of Chicago, 1892-1903; inaugurated president, 1904.

Dr. Van Hise had been a member of the U. S. Geological Survey since 1883; geologist in charge of the division of pre-Cambrian and metamorphic geology and consulting geologist, 1900-08; consulting geologist for the Wisconsin Geological and Natural History Survey, 1897-1903; member of the National Conservation Committee, 1909; chairman of the Wisconsin State Conservation Committee, 1908-15; chairman of the Board of Arbitration for Eastern Railroads and Brotherhood of Locomotive Engineers, 1912; and trustee of the Carnegie Foundation for Advancement of Teaching since 1909. He was a member of the National Academy of Science, Washington Academy of Science, Scientific Society of Christiania, Royal Swedish Academy of Science, Geological Society of America (president in 1908), Geological Society of London, American Philosophical Society, Wisconsin Academy of Science, Arts and Letters (president, 1893-96), Boston Society of Natural History, American Association for Advancement of Science, (vice president of Section E, 1901, and president, 1916), American Institute of Mining Engineers, Russian Society of Mineralogy, and Geological Society of Stockholm, Cosmos Club, Washington, and University clubs, Madison and Milwaukee.

Dr. Van Hise was the author of the following books: "Archæan and Algonkian," "Principles of North American Pre-Cambrian Geology," "Some Principles Controlling the Deposition of Ores," "A Treatise on Metamorphism," "The Conservation of Natural Resources," "Concentration and Control—a Solution of the Trust Problem in the United States." He was joint author of "Penokee Iron-Bearing Series of Michigan and Wisconsin," "The Marquette Iron-Bearing District of Michigan," "The Menomonee Iron-Bearing District of Michigan," and "Geology of the Lake Superior Region." He was a contributor to many scientific, educational, and economic papers. His latest book, "Conservation and Regulation in the United States During the War," was almost completed when he died.

President Van Hise's greatest work centered in his eminence as a geologist. What his geological work has meant for the state, nation, and world was expressed on the occasion of his death, by William O. Hotchkiss, Wisconsin State Geologist, thus:

> From his student days in the university, Van Hise had been interested in the geology of his native state and the development of its natural resources. His first field work was for the former State Geological Survey in central Wisconsin as an assistant to Prof. R. D. Irving, his teacher and friend. Shortly after, he was associated with Dr. Irving in work for the U. S. Geological Survey on the Gogebic Iron Range of Wisconsin and Michigan. His studies here resulted in the discovery of the fundamental principles of the origin of the iron-ore deposits, and furnished to the iron-mining industry the ideas on which have been based all later work in searching for new orebodies. The value to the mining industry of this work and the succeeding studies of the other Lake Superior iron ranges can hardly be overestimated. The monographs in which his work is presented are the standard reference books of the mining men of this region. He was one of the small group instrumental in getting the Legislature to create the present Geological and Natural History Survey, and had been closely identified with its work ever since its organization. Since 1903 he had been president of its board of commissioners. He interested himself in all phases of geological work in the state, not only in that leading to the development of mineral resources, but just as keenly in the study of the way in which the surface of the state has been carved out through the ages by the slow-working tools of Nature. It was on his suggestion that the State Geological Survey started the present state highway work and carried it on until the state highway commission was created.
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> In his later years Dr. Van Hise's interest in mineral resources became more broadly philosophical as his widening experience taught him the tremendous part which these resources had played in the development of civilization. He saw keenly the limited nature of many of these resources and that the welfare of future generations was dependent on their possession. This led him to bend his full energies to the propaganda for wise use and curtailment of waste by the present generation—to the development of conservation in state and nation. Out of his interest in these broader considerations grew most of his many public services.

Probably the most important work of Dr. Van Hise that was interrupted by his sudden death centered in his extensive plans to aid in the reconstruction after the war. His intense interest in the war he was carrying over into enthusiastic plans for comprehensive after-war work, both through the university and through energetic advocacy of the plan of a League of Free Nations to prevent future wars. During the war, he had taken an active and helpful part in its prosecution. He had gone on many missions to Washington and elsewhere in the war's interest.

Among Dr. Van Hise's associates it is well known that he realized the danger of German aggression long before it was realized by the public of his section of the country, and was eager to see the overthrow of the German military autocracy. When America entered the war, he was full of enthusiasm over what he considered the great and almost holy enterprise which the nation had undertaken.

During the summer of 1917 Dr. Van Hise devoted his entire time to work for the Food Administration and other emergency war bodies. He was called to Washington frequently for consultation with almost every one of these special bodies, and delivered war addresses in various parts of the country. In the autumn of 1917 he wrote a series of lectures on food conservation which were used in several hundred colleges. In March, 1918, he made another lecture trip throughout the West in the interests of the war. During August and September he visited England and France as a member of a party of editors who were guests of the British government.

Dr. Van Hise returned to America full of enthusiasm over the plan of a League of Free Nations to insure permanent peace in the future, and was preparing to devote all of his leisure time to furthering the idea and creating sentiment in its support before the peace conference. It was at his instance that the League to Enforce Peace held its nation-wide convention in Madison to support the League of Nations plan. At the convention, Dr. Van Hise in the opening address presented a concrete proposal for the prospective league which has been published and quoted throughout the country.

Iron Ore and Pig Iron in Ontario

During the first nine months of 1918, a total of 154,243 tons of iron ore was shipped from Ontario, according to the Ontario Bureau of Mines. Of this, 84,886 tons was shipped to Ontario points and 69,357 tons outside of the province. In addition to the output of the Algoma Steel Corporation and Moose Mountain, Ltd., shipments were made by the Poe Mining Co. from Palmerston Township, Frontenac County, and by the Canadian Union Iron Mines Corporation, from Drummond Township, Lanark County.

In the production of pig iron, 1,083,456 tons of ore was smelted, but only 87,106 tons was of Ontario origin. Although the tonnage of pig iron produced was slightly in excess of the 1917 figures, the value shows an increase of nearly 50%. Eight furnaces were in blast and were operated by four companies. Steel production was 668,333 tons and was valued at $21,601,144.

Iron-Mining Companies at Lyon Mountain and Standish, N. Y., are deserving of credit in the showing that they have made in securing the coöperation of their employees in the purchase of Liberty Bonds. The Chateaugay Ore and Iron Co., at Lyon Mountain, George E. Bent, manager, employs 400 men, 70% of whom are foreigners. On the first and second issues they subscribed their full quota. To the Third Liberty Loan they subscribed $41,000 or over $100 per man. One workman took $1000 and his wife $2000, paying for the bonds in cash. During the Fourth Liberty Loan drive, half of the men were ill with influenza, but the remainder subscribed to $33,000 in bonds. At Standish, the Northern Iron Co., L. P. Ross, manager, employs 150 men. During the first drive, the men subscribed to $14,000 in bonds; the second, $32,500 and the third, $54,000.

Correspondence and Discussion

Co-operation Among Small Mines

Mr. Young's suggestion in the *Journal of* Nov. 9 that coöperation among small mines would be beneficial in many instances, strikes the writer as the sane solution that should have been applied in a number of instances of failure or inefficiency that have come under his notice, but old Dame Jealousy is the main drawback to the practical application of his thought. In one large camp where I have worked, and where there were a number of mills, I was practically the only mill superintendent who visited and was on good terms with all of the rest. There was no real reason for the attitude of the other mill men; they were all interested in telling me of their experiences and listening to what I could tell them. Several of them had imaginary grievances. Others felt hesitancy about going into any but their own mill; and a general lack of coöperation was always apparent where its presence might have been so useful.

I have quite come to the belief that an engineer's success as a superintendent or manager is only 50% dependent upon book-learning and that the other 50% is due to an acquired knowledge of human nature with a will to curb his own faults and a way to bring out the best in others. Coöperation, not only among those in the same occupation, but evincing the desire and will to work together, goes a long way toward making life more worth the living. I have plenty of opportunity to put this belief into practice in my present capacity as superintendent of a mine and of a boarding house. I say boarding house advisedly, as a mining crew's morale depends more upon the dining room than upon mine conditions. I have done my best to keep liquor out of the camp, but have also done my best to supply good healthy amusements to take the place of the saloon. I am loosing money on the $45 board and room rate, but am glad to do so when I can see the same men going on shift every morning for weeks without a break.

My efforts to keep things neat and clean for the unmarried men were rather resented at first, but we are together on this now, and the demand for clean sheets is as regular as is Saturday night. Taking a hint from the summer hotels where we find professional entertainers, I have found a young man who combines this office with his other duties about the mine, and my investment in his services has been profitable beyond expectation.

I run a truck back and forth between the town and the mine, a distance of a mile and a half, charging enough to pay for oil and gas only. As a result of my theory and its practice, I have almost a full crew, while my nearest neighbor is short handed. Of course, I get a share of those who cannot stand more than a month's prosperity, but I am happy to say that the number of floaters grows smaller and smaller, all through our endeavor to coöperate and make living generally worth while.

And now just one word for the women in the coöperative movement. In the old wide-open State of Nevada the women have been given the vote, with the result that at the last election the state went two to one in favor of prohibition, a conclusive proof of the improved morale and the wisdom of woman suffrage.

Henceforward the work of managers will be easier, production more satisfactory, everyone more efficient, and all more happy. NEVADA SUPERINTENDENT.

Tonopah, Nov. 21, 1918.

Influenza Epidemic in Colorado

Under editorial correspondence in the *Journal* of Nov. 9 occurs a paragraph concerning the influenza epidemic in the Silverton district, to which I beg leave to call your attention. At the time that the epidemic first broke out in Silverton, there were three regular doctors in Silverton and one in Eureka. Within ten days, this medical force had been augmented by an additional doctor in Silverton and two in Eureka, with corresponding increases in the staff of nurses in both towns. Every effort was exerted by the Sunnyside Mining and Milling Co. toward immediate relief of the community and the provision of capable nursing. The additional medical help was maintained until the last vestige of influenza had disappeared.

The paragraph cited above stated that the Sunnyside Mine was closed down. Fortunately, at no time was the mine closed. Considerable attention has always been paid to the welfare of our men, and we have erected modern bunk houses, boarding houses, and an amusement hall. We are now operating with approximately 75% of our normal force, and additional men continue to come into the camp attracted by the high wages and comfortable accommodations.

M. H. KURYLA.

Manager, Sunnyside Mining and Milling Co.

Eureka, Colo., Nov. 23, 1918.

The Adoption of Standards

The series of articles "Standardization of Mining Methods," by Charles A. Mitke, which have recently been appearing in the *Journal*, brings up the question of the definition of standardization and the reason for the adoption of standard practices. Mr. Mitke made himself clear in his first article when he defines standardization and states that "there is absolutely nothing in standardization to preclude innovation." It is not intended, as was stated in an editorial, that standard practice is the "last word."

The fact that standards are advanced in mining practice or in any industry and given publicity as such is most encouraging, for by so doing the progressive concern sets a mark for the operator who assumes indifference. He must eventually adopt changes which improve his haphazard methods or suffer the consequences, for mining, after all, is a competitive business, and costs, methods, and the manner of labor treatment cannot be unrecognized when a "standard" is set by one company. On the other hand, there is always the inducement to go the other fellow "one better."

Standardization is not a matter of guessing. The conscientious engineer does not base his estimate on one or two factors that may enter in his calculations; it is only after full consideration has been made of all the circumstances involved that his results are expressed. And so a standard should represent the results of a complete analysis and observation.

In the November issue of the *Anode*, the safety publication of the Anaconda Copper Mining Co., Robert J. Fry brings out the following in answer to the query, "Why have a standard?"

> A prescribed standard is not the only way a piece of work could be done. But it is the best way. That is why it is the standard adopted by a company for the men to use. When everyone follows it and does the work in the prescribed way, there is no friction, no interference with the labor of neighboring workmen, and there are no accidents. But when someone tries to make a "short-cut" or do it another way because it could be done that way or looks easier, he not only endangers himself but everyone around him.
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> Is a standard a "rut"? Must a worker always do the same thing in the same way, with no chance of using his brain? That is another consideration. There are the "short-cuts" or the "other ways" that are not as good as the prescribed standard. There is no foreman, superintendent, or company that will not welcome suggestions to improve the efficiency, ease, or safety with which work may be done. Practical suggestions of this sort can well be made by the men doing the work who are in position to see many things the observer may not. Helping to improve the standard of work is worth thought and effort on the part of the workman, for whatever help or advantage it may bring to others, it most of all helps him to protect his life and limb and his capacity to serve his dependent ones.

Not infrequently we hear of some practice that has existed for a considerable period, a method that has been handed down from year to year merely because no one has taken the trouble to make a sufficient study and discover that there was any fault to be found. And this has been especially true with mining methods in general. Operators accustomed themselves to certain production costs, there was little variation, and it was assumed that the best possible results were being obtained. But the older order is changing, and it is safe to say that much of this change may be attributed to the establishment of "standards" or, rather, to the encouragement thereof. D. E. CHARLTON.

New York, Dec. 2, 1918.

A Neglected Course in Mining Schools

The letter which appeared in the Nov. 30 issue of the *Journal* under the above title touches upon an important point in technical education, but does not consider the practicability of the introduction of such courses into technical schools. During the last decade considerable pressure has been brought upon the management of technical schools, mining as well as other, to introduce practical subjects. Course after course has been added, on the theory that such courses are highly desirable and necessary. The four-year curriculum has been overloaded, and an almost impossible number of hours added. The student can render only a certain return, and the net result of making the curriculum many-sided has been to cause a general thinning out of the effort upon individual courses. Fundamental courses like chemistry, geology, mathematics, physics, and English have had to yield in part to the more highly practical work. It is an open question in the minds of many mature engineers whether this result is desirable.

There appears to be too little appreciation of the fact that thorough grounding in the broad fundamentals of basic subjects and the thorough training in habits of thought and study are in themselves of greater importance than the mere acquiring of information, whether it be of a practical nature or otherwise. Too often the so-called practical subjects are given in a manner that suggests to the observer that the instructor considers his students unable to think even in an elementary way. Certainly a student, after several years at a university, may be expected to have acquired power to work independently. Many of the less important subjects might well be left to individual initiative.

Educators also neglect to consider that many common things are acquired by mere contact with life. The student swims with the current in which the university takes its place as an important incident. A bright-minded student must inevitably acquire polish and have the rough spots worn down by experience.

Having a student divide his training between class room and laboratory and the actual work in mine and reduction plant is no new thing, for it is a well-worn statement that "practice and theory go hand in hand." If too much practical work be introduced into the curriculum, the product of our schools will be as much open to criticism as it was when theory largely dominated. There is a certain halo about practical things that loses its glitter when subjected to close analysis. We must be sure that the practical things are practical.

To turn out successful managers and superintendents in the manner described by Mr. Engineer is highly desirable. He ascribes the non-success of technical schools, in this respect, to their failure to educate students in the "intelligent use of labor." It is an open question in my mind whether the product of our engineering schools has failed in managerial positions. Have they been given sufficient opportunity? What is the percentage of failures?

Now, the understanding of humanity comes from maturity and experience. Is it not expecting too much for a recent graduate to succeed at once in a managerial position? Would we not be unduly optimistic to expect that a few courses in "the intelligent use of labor," or even a large amount of time devoted to pyschology and the "human side," would supplant maturity and experience? After all, a technical graduate must proceed through a series of subordinate positions before he reaches the point where he is qualified to be a superintendent or manager. A graduate who has been taught to think clearly and to observe closely will utilize these subordinate positions to prepare himself for higher ones. Is it the part of wisdom, then, to saddle additional requirements upon the already overloaded curricula of our technical schools? Would it not be better to select a reasonable amount from the bulk of what is considered desirable, rather than to try to half do the whole? TECHNICIAN.

New York, Dec. 1, 1918.

Industrial News from Washington

By Paul Wooton, Special Correspondent

The Situation in Chrome Ore

Recent developments indicate that no portion of the appropriation allowed for the War-Minerals Act will be expended. This became the more certain when, on Nov. 27, Secretary Lane's chromite conference practically reached the conclusion that no steps to aid the domestic chromite situation could be undertaken under the War-Minerals Act. Manganese and pyrites present cases that are parallel, in that a surplus of these minerals exists. The Attorney General has been requested to render an opinion as to the application of the act to such conditions.

Steel manufacturers failed to appear at the chromite conference. Other consumers, including chemical manufacturers, were present, however, but were not disposed to take up additional stocks of chromite. Most of the consumers have supplies sufficient for periods ranging from eight months to a year.

Means of disposing of surplus chrome ores from domestic mines and the alleviation of those who embarked upon their production as a patriotic duty were discussed. It was pointed out that the War Trade Board's restriction of chromite imports could not be extended much longer. All present recognized the objections which would be raised by Congress to a duty high enough to protect the price necessary to allow domestic producers to come out whole. Such a duty, it is stated, would increase the cost of steel by 8% over the prewar price. The entire cost would be saddled upon the people of the United States, as imported chromite could be used in steel for export and the duty recovered through the drawback provision of the customs regulations. To avoid a possible loss of $1,000,000, the people of the country would be called upon to pay $17,000,000, according to one estimate.

There is no tendency on the part of officials to dodge the moral obligation incurred by the Government in urging the maximum production of chromite. It was pointed out at the conference that some obligation rests with consumers and producers, although due consideration had not been accorded that fact. When brought into conference with Government officials, consumers were emphatic in their declarations that their requirements would be no less than 160,000 tons. Producers were equally positive that the maximum amount of additional chromite that could be made available was 10,000 tons. Performance varied widely from the estimates. The consumers used only 97,000 tons, or 63,000 tons less than their estimate. Producers overshot their estimate by 15,000 tons, with an output of 25,000 tons.

Various means are to be tried by Government agencies to reduce losses as much as possible. Cancelling of restrictions will allow considerable quantities of chromite to go into refractories and into the tanning and automobile industries. Chemical manufacturers will be able to use increased amounts as soon as their export trade can be rehabilitated.

Producers in California are voicing vigorous protests because a company, which advertised for chrome ores at an attractive price, stopped buying when quantity production began to develop. There are also two sides to the matter, as numerous instances are said to be on record where producers failed to live up to contracts.

Shortening the Conservation List

The changed situation arising out of the signing of the armistice makes it possible for the War Trade Board to alter many of its regulations limiting the exportation of certain commodities, it was recently announced. In pursuance of this policy, the board is now revising, as rapidly as possible, its rules of conservation, and the Conservation List will be materially abbreviated. The board is now in a position to grant many export licenses which heretofore have been refused.

For some time the exportation of certain commodities must be carefully controlled, it was stated, because of the general world shortage, but, even for these, licenses will be granted as freely as possible. Exporters have been informed that it may become necessary to regulate the exportation of commodities essential to the rehabilitation of Europe, especially Siberia; and to restrict the exportation of bulky commodities because of the scarcity of shipping. Tonnage continues to be the controlling factor, and, when reconstruction is well under way, it may be necessary to ration certain raw materials.

War Trade Board To Continue

Most of the functions of the War Trade Board will be continued until normal trade can be resumed, it has been announced officially. Control over exports and imports must be exercised, it is pointed out, so that sufficient tonnage may be conserved to supply the needs of troops overseas and to bring them home. In addition, promises and moral obligations in the matter of food and materials for Europe must be carried out.

Potash Developments Reviewed

In turning over the chemical division to the Department of the Interior, the War Industries Board authorized a statement in regard to potash, that reads in part as follows:

> At the direction of the President, the chemicals division of the War Industries Board has turned over to the Department of the Interior the problem of increasing the potash production of the United States. This action was taken in order that an established branch of the Government may permanently set itself to the task of emancipating the American farmer from the grip of Germany's monopoly on the world's supply of fertilizer material.
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> Before the signing of the armistice, the War Industries Board had already attacked the problem. Chairman Baruch had appeared before a Congressional committee in behalf of an amendment to the revenue bill which would give encouragement to private industries which would undertake the risk of establishing potash production in this country. The chemicals division, on

[illegible] in cooperation with other departments of the Government, had turned its attention to the specific task of extracting potash from waste products. A committee of experts, representing the steel and iron industry of the country and certain scientific departments of the Government, was in process of formation, under the auspices of the chemicals division, at the time hostilities ceased. Its purpose was to determine as quickly as possible the feasibility, from a commercial standpoint, of extracting potash from the fumes of blast furnaces.

The suggestion of extracting potash from blast-furnace fumes is based on the fact that potash in varying quantities is found not only in the iron ores, but in the coke and lime used in reducing the ores. In Alabama, the ores are particularly rich in potash. At present, this potash is allowed to escape during the processes of the blast furnaces. Divided into microscopic particles of dust, it is volatilized and carried off with the waste fumes.

Several methods of saving this potash have been suggested by scientists. Of these the most feasible appears to be the electric precipitation process devised by Dr. F. G. Cottrell, of the Bureau of Mines.

Another method tried out involves the spraying of the gas fumes with water and passing them through moist bags, which retain the potash. This method has been tried in extracting potash from the fumes given off in the manufacture of cement. Its first practical application took place when a cement plant near Redlands, Calif., undertook, in response to neighborhood protests, to cut down the volume of fumes emitted from its chimneys. Other cement plants have tried it, and in the East the Security Cement and Lime Co., at Hagerstown, Md., has been foremost in the recovery of potash from cement dust. Cement mixture contains potash in proportions varying from 1% to 1½%. When calcining cement clinkers, the addition of salt to the coal that is burned in the kiln renders the potash soluble in water.

At Searles Lake, California, potash in water-soluble form has been found in small quantities, and two factories have been established there to extract it. In Nebraska, it has been possible to recover potash in fair quantities from certain alkali lakes in that state. In Utah, C. H. MacDowell (director of the chemicals division of the War Industries Board) himself established a plant at which pure potash is recovered from alunite. Elsewhere experiments have been made in recovering potash from certain byproducts such as beet-root molasses and wool scourings. Other sources of supply being studied are the potash shales of Alabama and Georgia, the green sands of New Jersey, and the leucite deposits of Wyoming. There is, in fact, a considerable development now under way in the production of potash from leucite; and production likewise has been undertaken in Utah from brines contained in salt deposits west of Salt Lake City.

Unquestionably it is going to cost much more to produce potash in Germany and Alsace, says the statement. War taxes, high food costs and other fundamentals will bring this about, so that it will be a long time before European potash is brought to this country at the low cost prevailing before 1914.

Melting of Silver Dollars Continues

Silver dollars to the extent of $137,465,554 were melted by the Treasury under the Pittman Act, up to Nov. 1. The fine silver content weighed 106,192,429.466 oz. Commenting on the melting up of these dollars, the Secretary of the Treasury, in his annual report, said:

> In pursuance of the authority of the Pittman Act, the Secretary of the Treasury arranged to sell to the government of Great Britain 200,000,000 fine ounces of silver for the use of the government of India. The bullion resulting from the melting of 1,000,000 silver dollars has been allocated to the Director of the Mint for subsidiary coinage. The demand for the shipment of silver to India was very urgent and far exceeded the current production of the world's mines. By making available the silver dollars lying in the Treasury a difficult situation in India was met. Against delivery of the bullion resulting from the melting of silver dollars, the British government agreed to pay for the silver at the rate of $1 per fine ounce, and, in addition, expenses and value of copper content.
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> The Pittman Act does not effect any change in the permanent currency structure of the country. Silver dollars are retired and replaced by Federal Reserve bank notes, and when silver dollars are in time [illegible], Federal Reserve bank notes are to be retired, thus automatically restoring the original status. Such retirement is rendered possible without friction by the fact that such Federal Reserve bank notes are in all cases secured only by short-term obligations of the U. S. Government.

The Secretary's reference to gold and to platinum is as follows:

> The gold monetary stock (coin and bullion used as money) in the United States on Nov. 1, 1918, is estimated to have been $3,079,800,000. The increase since Jan. 1, 1918, amounted to approximately $39,400,000; since the beginning of the European war, $1,192,500,000. The portion of the world's gold monetary stock held by the United States is estimated to be about one-third.
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> In January, 1918, the facilities of the New York Assay Office were placed at the disposal of the Ordnance Department and the War Industries Board for the receipt and treatment of platinum, to be used by the Government in connection with the manufacture of munitions and in other scientific operations of the War Department. The assay office at New York was designated for the purpose by the Treasury at the request of the War Department, and upon the recommendation of the Bureau of Standards, it being the one institution under the control of the Government where the difficult work of refining platinum metals could be successfully undertaken.
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> Although the force and the facilities of the New York Assay Office were severely taxed by the extraordinary increase of its regular operations on gold and silver since the outbreak of the war, the work of handling the platinum business of the Government was readily assumed.
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> Wide publicity was given to the needs of the Government for platinum to be used for war purposes, in response to which approximately 2500 deposits were received during the current calendar year. The gross weight of the deposits approached 55,000 troy ounces, which carried an estimated value of $4,200,000.
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> The deposits were received in various forms—from Russian and Colombian grains to jewelry and laboratory scrap. They were received from every conceivable source and through various agencies, such as Red Cross societies and national banks.

The metal has been prepared by the New York Assay Office in the form of platinum chloride, sponge, bars, gauze, and wire.

Steel Allocation Stopped

Allocation of steel by the War Industries Board ceased Nov. 30. In future, the Government departments and the Allies will deal directly with the trade. Maximum prices fixed for steel will not be extended beyond Dec. 31, it has been announced, unless the manufacturers should request it. It is regarded as probable that prices on no commodity will be extended beyond the period for which the price was established, unless the industry itself should request such action.

The Federal Trade Commission has instituted an investigation of the cost of production of manganese ore.

January 1 has been set as the date to wind up the affairs of the War Industries Board. It is possible that some of its activities will be continued a month longer, but Feb. 1 is named as the date on which all activities assuredly will terminate.

The ban on the exports of nickel, aluminum, and bonded lead has been lifted by the non-ferrous metal section of the War Industries Board. Action also has been taken which releases nickel and aluminum for domestic uses, which, under the stress of war, were considered less essential.

Washington officials are much pleased that the Engineering Council is to be represented in that city by a commissioner. Many of those connected with Government engineering services are of the opinion that the work should be coördinated. It is understood that this is one of the matters which the resident commissioner of the Engineering Council will strive to bring about.

November Mining Dividends

Dividends disbursed in November, 1918, by 18 United States mining and metallurgical companies making public reports amounted to $9,301,339, as compared with $9,697,493 paid by 27 companies in November, 1917. Canadian and Mexican companies paid $1,785,514, as compared with $1,509,226 in November, 1917. Dividends by holding companies amounted to $170,000 in November, 1918, none having been reported for the corresponding month last year. New Cornelia paid its initial dividend of 25c. a share.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Zinc, Lead & Sm., pfd	U. S.	$1.50	$120,810
Anaconda, c.s.g.	Mont.	2.00	4,662,500
Barnes King, c.g.	Mont.	.10	40,000
Caledonia, l.s.	Ida.	.03	78,150
Chief Cons., l.s.	Utah	.12½	110,528
Cresson Cons., g	Colo.	.10	122,000
Golden Cycle, g	Colo.	.03	45,000
Homestake, g	S. D.	.50	125,580
Internat. Nickel, pfd	U. S.-Can.	1.50	133,689
Iron Cap, c	Ariz.	.25	36,203
Miami, c	Ariz.	1.00	747,114
Mohawk, c	Mich.	2.00	200,000
Nevada Wonder, g.s.	Nev.	.10	140,840
New Cornelia, c	Ariz.	.25	351,225
New Jersey Zinc	U. S.	4.00	1,400,000
United Eastern, g	Ariz.	.05	68,150
United Verde Ex., c	Ariz.	.75	787,500
Utah Apex, c	Utah	.25	132,050
Canadian and Mexican Companies			
Amparo, g.s.	Mex.	.04	80,000
Asbestos Corpn., pfd	Que.	1.25	50,000
Coniagas, s	Ont.	.25	200,000
Granby Cons., c	B. C.	2.50	375,000
Greene Cananea, c	Mex.	2.00	1,000,000
McIntyre Porcupine	Ont.	.05	180,514
Holding Companies			
St. Mary's Min. Land, c	Mich.	1.00	160,000
White Knob Cop., pfd	Calif.	.05	10,000

The totals for the first eleven months of the year are as follows: Mining and metallurgical companies, $144,458,531; holding companies, $1,898,438; Canadian, Mexican, Central American and South American mines, $21,404,254.

Recognition of Technical Engineers

The following letter was recently sent to the Director General of Railroads:

Hon. William G. McAdoo, November 20, 1918.
Director General of Railroads,
Washington, D. C.

SIR:

Your connection with the construction and management of railroads in years gone by, as well as your present directorship, have unquestionably made you familiar with the essential functions in the construction, maintenance, development, operation and management of railroad systems performed by the professional civil, mechanical, and electrical engineers of various ranks and their technical assistants. Such knowledge must be possessed, also, at least in a general way, by your present staff. Nevertheless, a number of engineers have brought to the attention of Engineering Council the fact that, upon scanning the schedules in "Wages of Railroad Employees" and supplements thereto, no mention is found of the men performing engineering services under the Director General of Railroads. This numerically small but functionally most important group of employees is ignored; they fall under "not otherwise provided for."

There may be reasons of which Engineering Council is not informed; but it seems more likely that the failure to accord to the technical engineers suitable classification is due to accident, or even to the oversight which too often is the reward for quiet industrious modesty in competing with insistent organized demands.

Specifically it is requested that all technical engineers be given suitable separate classification, with rates of compensation in accord with their duties and the expense to which they have been put for their education and their training in preparation for their present duties and responsibilities. In many cases these technical men are now receiving less pay then men whom they direct, for whom they are responsible, and upon whom there are made no such demands for personal qualifications, expensive education, and previous training.

Without disparagement to any other class of railroad servants, and for the good of the service, Engineering Council, representing the great national engineering societies, having 35,000 members in all branches of the profession, asks early action upon the classification and compensation of civil, mechanical, and electrical engineers and their technical assistants in the staffs of the railroads. Engineering Council feels assured that, having thus been brought to your attention, the matter will be properly adjusted.

Respectfully,
ALFRED D. FLINN,
Secretary, Engineering Council

Engineering Council and the White House

The following correspondence will be of interest to engineers:

The President, November 15, 1918.
The White House,
Washington, D. C.

SIR:

I am advised that you have under consideration the appointment of a Reconstruction Commission to develop a comprehensive program for the nation's conversion from a war to a peace basis.

As chairman of Engineering Council, I respectfully ask that you consider the appointment of at least one engineer upon this commission, basing my recommendation upon the fact that all construction and practically all manufacturing is under the management of engineers.

Engineering Council is an organization of national technical societies of America, created to provide for consideration of matters of common concern to engineers, as well as those of public welfare in which the profession is interested, in order that united action may be possible. It represents the four great national engineering societies, comprising over 35,000 members, including practically all the prominent engineers of the country.

It may be pertinent to add that the personnel of Engineering Council, consisting of 24 members, is without exception men who occupy prominent positions as administrators of engineering problems or undertakings.

Respectfully submitted,
(Signed) J. PARKE CHANNING,
Chairman.

The White House, November 20, 1918.
Washington.

MY DEAR MR. CHANNING:

I have your letter of November 15th, which Mr. Rickard has been kind enough to hand me. You may rest assured that I realize what a service engineers can render in reconstruction problems from time to time. We are handling reconstruction questions just now by a process of consultation between existing instrumentalities, which I hope will prove useful and effective.

Cordially and sincerely yours,
(Signed) WOODROW WILSON.

Mr. J. Parke Channing,
Engineering Council,
29 West 39th St., New York.

Engineering Societies Employment Bureau

Chairman Channing of the Engineering Council recently presented a report of an informal and unofficial conference held at his invitation Nov. 20, at which he presided, attended by the four Founder Secretaries, representatives of committees on employment, American Engineering Service and the Secretary of Engineering Council.

There was a free and general discussion. All agreed that some form of employment activity was necessary and should be conducted by the societies represented. Important reasons were given for the establishment of a central bureau where greater possibilities for proper publicity, through advertising and other means, and greater independence in suggesting names of engineers for engagements, would be feasible. It was agreed that the activities of societies represented in

Engineering Council could be combined to advantage and conducted by the Council, although each society might still find it desirable to do more or less in the employment line for its own members.

It was agreed that the proposed employment activities could best be inaugurated and directed by the four Founder Secretaries, acting as a Board of Managers, reporting to Engineering Council. It was also the consensus of opinion that the activities should not be confined to members of the four Founder Societies, and that no distinction should be made between members and non-members. Charges for services were discussed, and it was concluded to leave this matter for later determination. It was pointed out that if regular fees were charged, incorporation under state laws would become necessary and a bond would have to be furnished. It was determined that the work be started on the basis of no charge. All agreed emphatically that the work should be started immediately.

It was the sense of the meeting that Engineering Council should establish at once an Engineering Societies Employment Bureau, of which the four Founder Secretaries should be appointed the Board of Managers, with Walter V. Brown as secretary in immediate charge; that letterheads and other printed matter required should bear the names of the supporting societies, and that suitable appropriation should be made by Engineering Council for beginning this work. On the question of constituting the four secretaries a Board of Managers, the secretaries, at their own request, refrained from voting. It was the consensus of opinion that the war work of American Engineering Service, having come practically to an end, the committee should be abolished at an early date. It was the sense of the meeting that Mr. Brown, as secretary of the proposed Engineering Societies Employment Bureau, should communicate at once by letter with all engineering societies in the country, also with managers, chief engineers, and other officials of corporations and governmental bodies employing engineers, and that such communications should thereafter be repeated periodically. Suitable and wide publicity should also be given to the services which Engineering Societies Employment Bureau would be prepared to perform for engineers and employers and clients of engineers.

It was decided that there should be established at once, and maintained, lists of engineers desiring employment or change of employment, together with such information about each individual as would be necessary for the purpose.

Engineering Societies Employment Bureau is especially necessary in this period of readjustment, or reconstruction, upon which the country is just entering. One of its most important functions will be to aid engineers who have been in military service to find suitable engagements upon their return to civilian life. It has already been announced in the newspapers that the Industrial Relations Branch of the Chemical Warfare Service at 7th and B Streets, N. W., Washington, D. C., has undertaken such services for chemists who have been in war work, the office mentioned being under the direction of Major Allen Rogers. To aid this activity, information has been gathered by the American Chemical Society through questionnaires sent out by Major F. E. Breithut, of the Chemical Warfare Service.

Comfort Fund Crosses $19,000 Mark

Nineteen thousand and still moving up. The final boost needed to push the Comfort Fund for the 27th Engineers to the new high level was given by some of the Backus & Johnston men at Morococha, Peru. "A few of the boys working here at an altitude of 15,000 ft., who like a smoke, contributed a few dollars to buy smokes for the boys over there," runs the message accompanying the gift. The contribution was made after the armistice was signed, showing that the donors properly realized that the men would need such comforts for some time to come.

Nineteen thousand received, but most of it spent. Friends should bear that in mind. The total contributed is a little over $11 for each man in the regiment throughout an entire year. When translated into smoke and other comforts, it appears exceedingly modest.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johann	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hulst	20.00
Lawrence Addicks	20.00
R. R. Boyd	25.00
E. R. Varela	5.00
W. J. Olcott	25.00
J. E. Clennell	10.00
C. M. Eye (monthly)	10.00
A. H. Hoffman	10.00
Francis Drake	25.00
Employees of Sociedad Minera Backus y Johnston del Perú	176.29
Total	$19,054.56

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Lake Superior Iron-Ore Shipments

The Lake shipping season for the Michigan and Minnesota iron ranges is complete for the year, and supplies at the consuming points are said to be sufficient to meet the furnace demands during the winter. According to *Iron Trade Review*, November shipments are between 4,500,000 and 5,000,000 tons, so that the total Lake shipments for 1918 will be about 61,500,000 tons, a decrease of 1,000,000 from last season.

Demand for ore tonnage has been less acute since the signing of the armistice. Some consumers have not been as insistent for Lake tonnage as was indicated at the opening of the month, so that the November total will not represent the maximum capacity of the Lake fleet. Grain shipments have been heavy.

The meeting to be held Dec. 11 at Washington, at which time the ore producers will present costs and average selling prices to the American Iron and Steel Institute and the War Industries Board to consider the question of Government price regulation for the first quarter of 1919, will have little effect on the ore trade. No ore is shipped by Lake from the Lake Superior district during the first quarter, so that price adjustments for that period have little meaning. Whether 1919 ore is sold in a controlled or an open market, a late buying movement is expected. This belief is based on the assumption that consumers will prefer to wait until industrial conditions can be more clearly analyzed.

Editorials

Price-Fixing

THE American Economic Association has a committee to consider the subject of price-fixing, Prof. T. N. Carver, of Harvard, being its chairman. This committee is confining itself to the general economic principles that are involved. In this connection Professor Carver has issued the following statement:

> Certain sinister interests are now actively propagating medieval economic ideas in this country. Imported lecturers are spreading these ideas, magazines are publishing them, organizations dominated largely by men from backward countries are adopting them as parts of their platform, and, in some cases at least, Government officials with their ear to what they suppose to be the ground are espousing them.
>
> For centuries before 1776, medieval governments were trying to fix prices. Much of the economic discussion among the pre-Adamites, the precursors of Adam Smith, was concerned with the question of *justum pretium*, or just price. What is a just price and how can it be determined? was a great economic problem of those times when governments were bossing everybody in all the affairs of life. The great liberal movement of the latter part of the eighteenth century and the early nineteenth century swept all these subtleties away and began to trust the people to arrange these matters for themselves in the free atmosphere of the open market. This liberating of enterprise and industry from the hampering influence of gangs of office-holders, anxious to enlarge their authority, was followed by the greatest burst of prosperity that the world has ever known. In cases of government-fostered monopoly, some kind of price- or rate-fixing is still necessary. It may be necessary in war time to extend the authority of office-holders still further. But there is now an illiberal movement in all the liberal countries to make this extension of the authority of the office-holder permanent.

The committee appointed by the American Economic Association adopted with practical unanimity a series of resolutions that are economically sound and are in the main adverse to the theory of price-fixing, but we do not think they go far enough; indeed, we think that they have overlooked some fundamental principles, which we have repeatedly discussed and may express as follows:

1. A fixed price, either in time of peace or war, may be maintained in a market monopolized either by a buyer or seller, or both, without great danger if intelligently adjusted from time to time to conform to conditions of supply and demand; but the fixing of a price by a buying monopoly is more dangerous than by a selling monopoly. The fixing of a price between a buying and a selling monopoly becomes simply a matter of mutual agreement. [Examples of these several conditions are to be found in aluminum and nickel, in peace as well as war; in wheat; and in tin.]

2. In an unmonopolized market, the fixing of a restrictive maximum price and the maintenance of the market price at that figure signify that there is not enough of the commodity, and demand must be rationed. [From the date of the fixing of the price for copper in the United States, in September, 1917, there was no day when any seller would sell any copper for less than the fixed price, for the reason that at no time could all the demand be filled. On the other hand, the fixing of a maximum price for high-grade zinc was effective only so long as the supply of it was limited. The arbitrary liberalizing of the specifications for this class of metal increased the supply overnight, and the market price immediately receded below the fixed maximum.]

3. The maintenance of a restrictive maximum price above the natural market price, with a view to preventing an excessive advance, is a deterrent of expansion in producing capacity, that may be highly dangerous. [The idea of the restrictive maximum price under these conditions is to prevent what in trade parlance is called a "runaway market." Now, such a condition is usually produced by reckless buying of frightened consumers, who usually overbuy, and the natural correction is very swift. But rarely there is an unusual and maintained advance based upon some extraordinarily powerful condition, as there was in zinc in 1915. This was based on deficient smelting capacity, and so stimulated the building of new works that we doubled the zinc production of the United States in a little more than a year—a stupendous and effective feat that would have been impossible with a restrictive maximum price within the limit that anybody could have conceived.]

4. The fixing of maximum prices under conditions when they will be effective owing to inadequate supply (see Art. 2) does not take cognizance of the organization of modern wholesale trade upon a contract basis, rather than a spot basis, and therefore causes disturbances and injustices at the times of institution and discontinuance, and at the times of changes in the meanwhile. [Serious troubles in copper have been experienced on this account.]

The consideration that the price-fixing of commodities directly required by the people, such as fuel and foodstuffs, may be defended on the ground of preventing social unrest, with the consequence of having to ration the people. (This is Mr. Hoover's position.) In this connection it may be remarked that the effects of price-fixing in the United States were masked by the wonderful exhibition of the crusading spirit by our people; while, on the other hand, price-fixing in Great Britain was largely that of a national buying monopoly, which purchased goods abroad and distributed them among the people at fixed prices, often at a loss, the taxpayers paying the difference as part of the war expense.

Surplus Supplies at High Cost

WITH the conditions, artificial and necessary, existing in warfare and industry, it was inevitable that some people should be caught with surplus supplies upon the termination of the war. Statements published last week of immense quantities of clothing, blankets, etc., in the hands of our War Department exhibited the general state of affairs to be found in governmental warehouses, and in the case of governments such an accumulation was precautionary and unavoidable. A similar or analogous position was to be expected with many branches of private business that were supplying the governments. The sudden advent of the armistice prevented any general anticipatory curtailment of production and reduction of stocks. There was bound, therefore, to be serious losses incurred by persons caught long of the market, carrying supplies at high cost that immediately became unsalable, or erecting plants for new production that would have no opportunity to produce and return the money risked in them.

Among the major metals, fortunately, the houses were fairly clean. The copper producers had no stock of refined though they held a good deal of blister. However, they profited on their stocks when the market rose in 1915, and they will neither excite nor expect any great sympathy if they lose on them in 1919. The lead producers were in a similar position. The zinc producers had some accumulation, but they had been carrying it and trying to get rid of it for a year. The tin producers were bare, but tin consumers were long through reckless overbuying earlier in the year. The tin merchants generally got out of the market, on general principles, last spring, when the price was highest.

In some of the ores and minor metals, on the other hand, the situation is quite different. In tungsten everybody—producers, importers, smelters, and manufacturers—appears to be over-stocked. At a meeting held by representatives of these interests last week they drew very long faces. Similarly do the producers of chrome ore and manganese ore feel aggrieved. Some of these people are imploring governmental relief, hoping to get it under the mischievous War-Minerals Bill that was signed on Oct. 5, 1918. The purpose of that bill was to stimulate the production of some of these minerals that were supposed to be in scant supply. As things turned out, no artificial stimulus was necessary. It is claimed, however, that Government officials made promises that led people into making investments for production on which they have lost, or are going to lose, money, and therefore ought to be indemnified.

Let us examine how much merit there is in this contention. The War-Minerals Bill was the baby, born in 1917, fathered by some well-meaning but rather hysterical gentlemen in the Department of the Interior. They secured the presidential endorsement, making it an Administration measure, and thereby disarmed friendly, experienced criticism to a large extent. They said, "We have got to have such legislation in order to win the war." Their critics therefore could only say, "We think you are mistaken, but the Administration is responsible for the conduct of the war, and if it must have this legislation, so be it"; and their efforts were therefore confined to framing the bill in the least harmful way. In the prolonged hearings on the bill in Congress it was said emphatically by numerous advisers that the high prices for chrome ore, manganese ore, etc., would be such a natural stimulus of production that there would soon cease to be any shortage of them, and that opinion was expressed repeatedly in this paper, in which there was extensive discussion of the subject. We deprecated severely the legislation from the beginning.

Now, as far back as last summer the markets for these minerals began to exhibit an easier tone. Long before the bill was passed it was clear that there was no particular need for it except to give authority to the Government to spend more of the people's money. The bill was signed and became a law on Oct. 5. Within 10 days thereafter the War Industries Board issued notices that the supplies of manganese ore, chrome ore, and pyrites had become so ample that people were advised not to enter upon further investments for their production. Considerably before that the situations in the respective markets had become so easy that no one of any market-sense could have been under any illusion.

If, therefore, any officials in the bureaus made promises or held out hopes of assistance to producers or adventurers, not only did they go counter to competent advice but also they did what they had no authority to do. For they did not even know that a law would be enacted, or, if so, what it would be. The House had passed a bill. The Senate had struck out everything after the enacting clause and written in a totally different bill. The two bodies had to go into conference over the matter, and it was near the end of September before it was settled.

It is true that high officials of the Government asked certain concerns to enter upon plans for producing some substances, giving no guarantees and making no promises, but appealing only to their patriotism. Some of these concerns were so induced to expend large sums of money for which they have had no return, and they will neither get nor expect any. They took a business chance of making large profits, influenced more or less by the spirit of patriotism, and, having lost, say nothing about it. The U. S. Steel Corporation took exactly the same chance, uninfluenced by any motives of patriotism, when it built the great Donora zinc smeltery in 1915-16. Other adventurers who built zinc works later lost more or less of their principal when the market declined. There has been nothing unusual in taking such commercial risks during the last four years. But if the unnecessary and belated War-Minerals Bill were made the vehicle of reimbursement for anybody, the people would be right in protesting against such misuse of their money. At the conference in Secretary Lane's office, Nov. 27, no assurances were given, but it was said that the opinion of the Attorney General would be obtained respecting the legality of using the appropriation carried by the War-Minerals Bill as a sort of indemnity fund.

Dodging the Issue

THE whole subject of readjustment reverts fundamentally to the question of wages. During the war wages rose to weird figures. It was all like an adventure in Wonderland. These fancy wages were not earned, that is, not in the economic sense. They were met out of taxpayers' money—the taxpayers patriotically gave it up and cheerfully saw it wasted for the sake of the great cause.

Now, the wage earners are demanding that the preposterous rates be maintained. The Administration is saying that wages must not come down until the cost of living has been reduced. This is merely dodging the issue, and does not get anywhere.

The cost of living cannot come down until the cost of labor has come down, for it is the high cost of labor that makes the high cost of living. Real readjustment cannot be started until this is recognized, for the people are unable to buy goods for peaceful purposes at war prices, which represent stupendous wastes.

Washington probably knows this as well as anybody, but apparently has visions of effecting an easy readjustment, which means the bringing about of a gradual recession of prices for everything in about the same ratio, so that nobody will suffer from irregularities. This is impossible of realization.

The simple and honest policy for Washington would be to look facts squarely in the face and tell the truth to the people. The primary problem is to discontinue the manufacture of ammunition and get the working men and women away from the powder mills, cartridge factories, etc. Let Felix Frankfurter and his colleagues cease uttering meaningless generalities and send their emissaries to the munition plants with some plain talk like this: Men and women, the Government is going to stop this work mighty quick, and you ought to find other jobs as soon as you can. Go back to the farms. Go back to domestic service. Go back to the trades in your home cities. Workers are needed for such purposes right now. Get what jobs you can, and do not expect to get as much as you have been earning lately, for there is nothing now that can pay it.

This is the inevitable, economic beginning of the readjustment. The more it is postponed the harder will conditions be. The dilatoriness of the politicians is simply creating a fester. The maintenance of superfluous production even in the case of the basic commodities is going to develop more troublesome conditions later, although the commodities themselves will eventually be needed. If nature were allowed to take its course there would be some suspensions of operations, and consequent idleness of men, now. If high-cost stocks of goods are piled up, there will be more extensive closings when the day of reckoning comes. They will be because market prices will not leave any margin for anybody, neither capitalist nor laborer. Wages can't be drawn out of wage fund that does not exist.

Stop the Waste

WITH the war ended nearly four weeks ago, the United States Government continues to squander material on making munitions and other war supplies, to squander coal in providing power for such mills and factories, to squander labor, to squander the taxpayers' money.

Was there ever such industrial and financial waste? Was there ever such economic madness? It would be cheaper by far, correctly says the *Sun*, to pay for every unfilled contract and stop at once every wheel of the war machinery. For our labor and for our natural wealth, now both being criminally wasted in prodigious quantity, it would be sounder and better to take care of the labor as well during its movement from the useless, worthless war work, to useful, essential peace work.

It does not even help producers to have this dump for their goods, least of all the producers of basic commodities like the metals. They should be indemnified promptly for losses on cancelled contracts into which they entered with good faith, incurring expense, but with such indemnification it will be better for them to carry the stocks than let the Government do so. The accumulation of metals by the Government, for example, will be an incubus upon the markets, a threat, that will weigh upon them until a disposition of the accumulations is made.

When the Boys Come Home

OF COURSE lawbreakers should not be applauded, and far be it from us to intimate approval of lawlessness. Yet we cannot escape seeing something humorous and encouraging in the recently exhibited attitude of the soldiers here toward the disingenuous socialists. While the kindly socialists of Russia and Middle Europe are having things their own way, the gentle socialists of New York, when they desire to get together to meditate and converse upon plans of robbery and rapine, find it necessary to appeal for police protection lest the soldiers "treat 'em rough." If Trotzky, in his present murderous surroundings, could have seen the line of policemen and provost-guards sweating to stave off the infuriated soldiers who were seeking to tear off the red neckties and badges and otherwise manhandle his erstwhile colleagues and present well-wishers, he would have congratulated himself upon getting out of New York while the going was good. And we should imagine that Bill Haywood might feel the cockles of his heart warming up in the happy thought that he is safely in jail. We begin to get a line on what the boys will think when they come home.

BY THE WAY

There is nothing new, not even welfare and safety work. In 1683, the inside of assay balance cases was painted green, because, as Sir John Pettus wrote, "the fire is hurtful to the eyes, and by this colour they are again quickened and refreshed."

Litigation is probable at Bisbee, Ariz., in the Federal court over a plan to organize a mining company with the name of Charlie Chaplin, the movie star. The ground to be operated by the proposed company is near the White-Tail Deer property of the Copper Queen. The suggested naming will be opposed before the State Corporation Commission by part owners of the property, resident in Montana.

John Hays Hammond, in a letter to New York *Times*, asks: "Would it not greatly facilitate an equitable settlement of the political and economic issues to be considered at the peace conference if the Allies should stipulate that, before the conference met, there should be created a tribunal to sit as a criminal court for the trial of those responsible for the unspeakable atrocities committed during the war by Germany and her allies?"

More camouflage. New York headlines recently announced an "$80,000 Clean-up, or $500 a Ton." This was not to lure investors into buying the newly popular gold stocks, but simply to inform the public that the 155 tons of waste paper dumped by way of confetti from office windows during the first peace celebration had cost $80,000 to remove. Here is an item that H. P. Gillette should put down in the next edition of "Cost Data." The cost of removing a two- or three-inch deposit from a large and irregular area might be useful to some.

Our Vancouver contemporary has swallowed "'Wilsonium" hook, line and sinker, along with that rare gas "vivious." But why did the discoverer of this new element pick on the President in naming it? It is so obviously a jest that another name would have been more patriotic and proper. Why not "creelium," seeing that publicity was the chief end sought? "Creelium and vivious" sound every bit as good as "wilsonium and helium," and the matter is one of sound more than of chemistry.

A tablet in honor of the employees of the Granby Mining and Smelting Co. who entered the service is to be placed in the company's office at Vancouver. The memorial stands over four feet high and is of Corinthian design in fumed oak. A scroll at the top displays in colors, with the Maple Leaf, the Union Jack, Canadian Ensign and Old Glory entwined. In the center are depicted the Canadian regimental flags lying on General Wolfe's tomb in Westminster Abbey while the men are fighting in France. Below this is a glass cabinet containing the honor roll, a Morocco-bound book divided into six sections representing the company's plants at Anyox, Alaska, Cassidy, Grand Forks, and Phœnix, and the Vancouver office. Over 400 employees served under the colors.

"It must not be supposed from the general character of the population that Virginia City was altogether destitute of men skilled in scientific pursuits," wrote J. Ross Browne in 1861 of his trip thither. "There were few, indeed, who did not profess to know something of geology; and as for assayers and assay offices, they were almost as numerous as barkeepers and grogeries. A tent, a furnace, half a dozen crucibles, a bottle of acid, and a hammer generally comprised the entire establishment; but it is worthy of remark that the assays were always satisfactory. Silver, or indications of silver, were sure to be found in every specimen. I am confident that some of these learned gentlemen in the assay business could have detected the precious metals in an Irish potato or a round of cheese for a reasonable consideration."

"Times 'as changed, m'son; times 'as changed," quoth Cap'n Dick. "Wy, dam-me, used to be as 'ow tha 'ol bloody crew at tha mine wuz 'appy, well content an' satisfied, an ussen didn't 'ave to 'alf try to keep things gawin'. But this 'ere prosprus business—wy, dam-me, man never naws wheer she's gawin' to stop. Las' bloody time these 'ere wobblies called strike, dost thee think any o' my men were in on un? No, m'son. Never a bloody one, and tha bal kep' gawin' jus' like one o' these 'ere jack'ammer drills. But this mornin', I tell'e I 'ad a scare. I wuz in tha h'office, pilin' in tha diggin' clos,' w'en all o' a sudden I 'ears gert growl h'outside. Dam-me, thinks I, wot's gawin' on. An h'out I gaws. 'Ere wuz 'alf tha 'ol bloody mine standin' raound an geekin', firs' to one then to h'other. 'Wot's trouble?' sez I, an up spoke Jan Trembath. 'Cap't,' sez 'e, 'we 'ave complaint to make.' 'Let's 'ave un,' sez I. 'We naws, Cap'n,' sez 'e, 'that thee's always on lookh'out for h'our comfort an welfare, but, in this 'ere h'instance, thee 'ast fallen daown 'orribly. 'Ere we are drivin' h'our bloody h'outomobiles to tha mine, jus' to work for thee, an' dam-me, when she rains we've got naw place to putten but h'out in tha wet. Bloody near time we 'ad some sort o' shanty 'ere, isn't un?' So, dam-me, m'son, we'se buildin' one o' these 'ere gayrages for tha boys. Wot's think on un?"

Owners of polonium and niobium mines, or, better still, prospects, should get in touch with the lawyer who wrote the following to a firm in Houghton, Mich.:

> Can you get for me for sale any good zinc or zinc sulphide mines or prospects anywhere? I have buyers. You know what Mark Twain once said of mines. "A hole in the ground surrounded by fools." I can't sell a poor property, and if I try, it will only hurt us both.
>
> Here is a list of mines I want: Cobalt, tungsten, fluorspar, cadmium, platinum, magnesia, chrome iron, magnetic iron, antimony, silica, quicksilver, kieselguhr, potash, alum, iron pyrites, sulphur, nickel, lime, gypsum, copper pyrites, radium-bearing ores, asbestos, pumice, glass sand, mica, graphite, cinnabar, talc, kaolin, plaster, magnesite, bismuth, soapstone, vanadium, niter, onyx, hematite, molybdenum, cement, feldspar, arsenic, zinc sulphide, zinc, chalcedony, corundum, emery, umber, ocher, lead, lead vanadate, iron, copper, garnet, molybdenite, wulfenite, pitchblende, uraninite, barium, columbite, or niobium, polonium, palladium, molybdenite, strontium, selenium, uranium, tin, sienna, thallium, crooksite, pyrrhotite, ferberite, emerald, opal, beryl, etc.
>
> This list is given for business and not for show.
>
> Don't forget good zinc, zinc sulphide, and iron pyrites mines or prospects; prospects preferred because mines are usually sold because they don't pay, else some inherent defect or other reason is given for selling.

"I think this lawyer," says a member of the firm, "instead of swallowing Blackstone got a dose of Dana's Mineralogy by mistake."

The romance of the Yukon was never better illustrated than in the career of William Scouse, who was lost en route from Alaska when the "Princess Sophia" sank on Oct. 25 last, with all on board. Scouse was a real "sourdough" and was the one to raise the first bucket of "pay" on the famous Eldorado Creek. It was in February, 1896, that with William Sloan, Jack Wilkinson, and Thomas Flack, all of Nanaimo, B. C., he set out for the Northland, to see its wonders, as well as to prospect the country, about which little was known at the time. Outfitting at Juneau, the party crossed the Chilkoot Pass into the Stewart River country, where they prospected for most of the summer without success. Running short of supplies, they decided to work into the Yukon, where rich deposits had just been discovered on Bonanza Creek. When they reached this creek, all the ground had been staked, and they turned aside to Whipple Creek, later to be known as the Eldorado. On Sept. 7, 1896, Scouse staked No. 14 Eldorado and other claims were located by the rest. Before these had been proved, the partnership was "stony broke," as Sloan expressed it, and the day the first gold was hoisted saw them step to a condition of comparative affluence. When the four Nanaimo men separated after their success, they agreed to meet again on the 25th anniversary of the Eldorado strike, all being alive, however far they might have to travel, to celebrate the days of their pioneering. Scouse's death makes the first break in the partnership.

Personals

Have You Contributed to the Association of the 27th Engineers?

E. A. Julian, of Goldfield, Nev., recently visited the Ash Peak mine, west of Duncan, Arizona.

Dr. H. B. Patton has recently completed oil investigations in Arizona, west of Phoenix.

J. K. Turner has gone to Oatman, Ariz., to inspect the property of the Oatman United Mines Co., for which he is consulting engineer.

Ray L. Dimmick has been examining the Catherine gold mine at Pyramid, Mohave Co., Ariz., for the Arizona Pyramid Mines Company.

Prof. J. C. Gwillim, Queen's University, Kingston, Ont., has been granted leave of absence for a year, which he will spend in Western Canada.

Charles A. Randall has recently been appointed manager of the Dome Lake Mining and Milling Co., Ltd., the former manager, **A. H. Brown,** having resigned.

Whitman Symmes, manager of the Northend Comstock mines at Virginia City, Nev., has been elected president of the several companies under his management.

Capt. Henry Smeddle, of the 15th Battalion, B. E. F., has been awarded the Military Cross and has been promoted to second in command of the 25th Battalion.

C. T. Orr, of Webb City, Mo., president of the American Zinc Institute, and **H. I. Young,** of Carthage, also an official of the Institute, have just recovered from influenza.

S. Ford Eaton, superintendent of the Guomoco Mining Co. of Colombia, is spending his vacation in New York. He will stay at the Rocky Mountain Club until Jan. 1.

George F. Kunz has been appointed representative of the American Institute of Mining Engineers, on the Engineering Council, succeeding **Benjamin B. Lawrence,** resigned.

E. B. Thornhill has resigned as manager of the New York office of the General Engineering Co., to become research engineer with the Chino Copper Co., Hurley, New Mexico.

L. R. Robbins, mining engineer and geologist for the Tonopah Belmont Development Co., Tonopah, Nev., has been promoted to be mine superintendent of the company's Tonopah property.

Chester A. Fulton has closed his office in Havana, Cuba, to become superintendent of the Carlota mine of the Davison Sulphur and Phosphate Co., near Cumanayagua, Province of Santa Clara.

J. R. Bartlett, foreman of the Lexington mine of the Anaconda Copper Mining Co., has been appointed foreman of the Tramway mine, to fill the vacancy caused by the promotion of **E. M. Norris.**

G. H. Dudley, formerly at the Morenci branch, Phelps Dodge Corporation, has returned to Arizona from the Organ district, New Mexico, and will operate a leased mining property near Metcalf.

Lieut. Col. Joseph Hyde Pratt is commanding officer of the 105th Engineers. This is the engineer regiment of the 30th Division, which was fighting with the British when hostilities ceased.

J. W. Powell, vice-president of the Bethlehem Steel Corporation, was elected vice-president of the National Society of Naval Architects and Marine Engineers at an annual meeting held in Philadelphia.

Dr. James L. McKee, formerly chief chemist for the British Explosives Co., whose plant at Trenton, Ont., was recently destroyed by fire, has received an appointment at Queen's University, Kingston, Ontario.

W. B. Plank, mining engineer with the U. S. Bureau of Mines, has arrived in Birmingham, Ala., to take charge of the Bureau's work in that state. He will have headquarters at the station at West End, Birmingham.

J. C. McNabb has resigned as testing and metallurgical engineer for the Consolidated Arizona Smelting Co., Humboldt, Ariz., to become assistant smeltery superintendent with the Missouri Cobalt Co., Fredericktown, Missouri.

Col. William B. Thompson has resigned as president of the Inspiration Consolidated Copper Co., and is succeeded by **C. F. Kelley. John D. Ryan,** who resigned from the board to become associated with the Government, was elected a director.

Edward P. [illegible] has resigned as superintendent of the United Verde Extension Mining Co., [illegible] Ariz., to become general superintendent of mines of the [illegible] interests, operating on the Cuyuna and Mesabi iron ranges of Minnesota.

Edgar Rickard is acting food administrator of the United States and is in full charge of food affairs, **Herbert C. Hoover** having retired, although the title of the position continues with him. Mr. Hoover is in Paris, directing the food distribution of the world.

Richard Kingdon has returned to Jerome, Ariz., where he will resume his duties as superintendent of the United Verde Extension Mining Co. He left there nearly a year ago, and has spent several months at a tungsten mine in Sonora, Mexico, of which he is part owner.

N. H. Emmons has resigned his position with the Air Nitrates Corporation. He has established himself in Lynchburg, Va., as consulting engineer in mining and other work in connection with metallurgical and chemical processes in that section. Temporarily, his address will be 309 Madison St., Lynchburg, Virginia.

A. H. Howe, of Goldfield, Nevada, for many years secretary of Goldfield Consolidated Mines Co. and vice-president and a director of the banking firm of John S. Cook & Co., of Goldfield, has severed his official connections with all Wingfield interests, and will devote his attention chiefly to operation of the Wall Street Copper Co., Luning, Nevada.

Frank P. Botsford, general superintendent in the Eastern district for Pickands, Mather & Co., at Gilbert, Minn., on the Mesabi Range, has been transferred to the Western district, with headquarters at the Bennett mine, Keewatin. **L. C. David,** his assistant, is general superintendent, and **David C. Cavan,** of the Bangor mine, is assistant superintendent.

Edmund Newton, formerly at the Lake Superior station of the U. S. Bureau of Mines, recently registered at the office of the American Institute of Mining Engineers, New York. Others who registered during the week were Arthur C. Adair, of Camp Meade, Md.; S. J. Kidder, general manager, Mogollon Mines Co., Mogollon, N. M.; Thor. Warner, Phoenix, Ariz.; H. E. Emslaw, Grand Haven, Mich.; Lieut. Col. William H. Lanagan, San Francisco; Major W. Frank Lewis; Lieut S. G. Garrett, U. S. N. R. F.; Lieut. Henry B. Taylor, and Lieut. Arthur K. Adams.

Obituary

George A. McLeod, formerly of Spokane, Wash., but in recent years of Vancouver, B. C., died in the latter city in October.

Burt Stearns, secretary-treasurer of the Stearns-Roger Manufacturing Co., died in Denver, Colo., on Nov. 25, aged 32 years.

Edwin Harper, superintendent of the International Nickel Co.'s refinery buildings, Port Colborne, Ont., died on Nov. 28 of pneumonia, aged 26 years.

B. H. Dosenbach, consulting engineer for the Butte & Superior Mining Co., and for the D. C. Jackling interests, died Nov. 26 of pneumonia following an attack of influenza.

Frederic A. Hale, Jr., mining engineer, died of pneumonia, following an attack of influenza, at Goodsprings, Nev., Nov. 18. He was born in Denver 31 years ago. For the last seven years he had resided in Goodsprings, where he became superintendent and manager of the Yellow Pine Mining Co. Mr. Hale was a member of the American Institute of Mining Engineers.

Howard Weidener Du Bois, who died Nov. 10, 1918, was born Sept. 16, 1868. He was a graduate of the Central High School, Philadelphia, Penn., and a member of the class of '92 of Lehigh University. He did some special work at Princeton in 1893. His work in connection with mining began about 1895, when, in partnership with Charles T. Mixer, he established an assay laboratory at Ispheming, Mich., but he continued to reside in Philadelphia. From 1896 to 1904 he was professor of applied mathematics at the Central High School, Philadelphia. During this period he spent many of his summer vacations in mining and geological exploratory work. From 1905 until his death, he was engaged in work of this sort in this country, but his principal activities were in British Columbia and Alaska. In connection with work in British Columbia he [illegible] a rather large hydraulic development [illegible] ditches and [illegible] delivering water under high head. He also conducted the exploration and development of a copper property in Alaska and made a prolonged study of fluctuation methods in connection with the treatment of ore. He spent the summer of 1918 in Alaska in connection with work upon this property, and had returned from the property only a short time before his death. In 1897 Mr. Du Bois married Miss [illegible] of Philadelphia. Mr. Du Bois will best be remembered by many of his friends for his interesting lectures on engineering subjects. He collected large numbers of photographs and pictures illustrating the fauna of British Columbia and Alaska, and his lectures were replete with facts of interest both to engineers and the general public. In this way he did much to popularize mining science. He was a member of the Engineers' Club of Philadelphia, Engineers' Club of New York, American Institute of Mining Engineers, Mining and Metallurgical Society of America, the City Club of Philadelphia, the Lehigh Club of Philadelphia, the Princeton Club of Philadelphia, American Society of Political and Social Science, the Photographic Society, the Geographic Society and the National Geographic Society. He is survived by his widow, a son and daughter.

Societies

American Mining Congress will hold a conference of members and the board of directors at 29 West 39th St., New York, on Dec. 10, beginning at 10 a. m., at its annual meeting.

American Society of Mechanical Engineers. A meeting was held in New York Dec. 3, at which Mortimer Elwyn Cooley was elected president. Charles T. Main, the retiring president, has sailed for Europe as representative of the society with regard to reconstruction work. Charles M. Schwab and Orville Wright were made honorary members.

American Institute of Mining Engineers, Washington Section, will hold its annual dinner, Dec. 6, in the cafeteria of the Interior Department. M. F. Chase, of the War Industries Board, will speak on reconstruction; C. K. Leith, of the Shipping and War Industries boards, will discuss international features of certain minerals; Edgar Rickard will have as his subject, "Peace and Food"; and Chester Naramore, of the U. S. Bureau of Mines, will talk on reconstruction problems in the petroleum industry.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Molybdenum and Its Alloys, Process of Obtaining. James A. Holladay, Niagara Falls, N. Y., assignor to Electro Metallurgical Co., Niagara Falls, N. Y. (U. S. No. 1,281.961; Oct. 15, 1918.)

Oil Shales—Oil Extracting and Refining Apparatus. Emil T. Erickson, Salt Lake City, Utah, assignor to Rainbow Petroleum Products Co., Utah. (U. S. No. 1,281,320; Oct. 15, 1918.)

Phosphates, Treatment of. Ellis C. Soper, Chattanooga, Tenn., assignor to Armour Fertilizer Works, Chicago, Ill. (U. S. No 1,281,681; Oct. 15, 1918.)

Platinum from Sands and Ores, Process of Extracting. Russell Thayer, Philadelphia, Penn. (U. S. No. 1,281,878-9; Oct. 15, 1918.)

Smelting—Crucible Holding Apparatus. Charles J. Goehringer, Cincinnati, Ohio. (U. S. No. 1,280,712; Oct. 8, 1918.)

Smelting—Device for Heating Metal-Casting Molds. Alfred Charles Atkinson, Wellington, New Zealand. (U. S. No. 1,280,631; Oct. 8, 1918.)

Tunnel Drier. George Hillard Benjamin, New York, N. Y. (U. S. No. 1,280,642; Oct. 8, 1918.)

Washer for Gravel, etc. Raymond W. Dull, La Grange, Ill., assignor to the Raymond W. Dull Co., Chicago, Ill. (U. S. No. 1,280,688; Oct. 8, 1918.)

Editorial Correspondence

SALT LAKE CITY—Nov. 29

The Taxation of Mines Amendment to the constitution of the State of Utah, voted on Nov. 5, was adopted by the following vote, as finally reported: Of a total of 56,773 votes cast on this measure, 35,337 were in favor of the amendment and 21,436 against it. The amendment was thus carried by a majority of 13,901 votes. It was defeated in Carbon, Piute, Salt Lake, Summit and Tovell counties. Juab County, in which the Tintic district is situated (also in part in Utah County), went for the amendment by a small vote, for which the agricultural interests in this section were responsible.

The Three Per Cent. Net Proceeds Tax on Mines, as associated with the $1 occupation and privilege tax, has been made the subject of a protest by the Salt Lake Copper Co. This company, in a communication to the State Treasurer, said: "We herewith hand you $1 in currency and a certified check on the First National Bank for the sum of $1428.96 in payment of the occupation and privilege tax of $1 and 3% on net proceeds of $47,632 for 1917, amounting to $1428.96, a total of $1429.96, as determined by the State Board of Equalization and assessed against the undersigned. But you are hereby notified that the undersigned claims that said tax of 3% on net proceeds, amounting to $1428.96 is illegal; that the statute under which the same is assessed is unconstitutional and void, and this payment is made under protest, and the undersigned will institute suit against you to recover the same." The Carbon Fuel Co. sent a messenger with a dollar, in payment of the occupation and privilege tax, to the State Treasurer, who refused to accept it, because $4382.70, assessed by the State Board of Equalization as the company's 3% net proceeds tax, was not offered with the dollar. This company will resist the net proceeds tax, and other Utah mining companies will also fight it, so that the question as to whether the statute under which this tax is assessed is unconstitutional or not should soon be determined.

Two Bingham Canyon Properties, and possibly three, may be consolidated, if present efforts succeed. They are the Utah Metal and Tunnel, Utah Consolidated, and Utah Apex companies, which at present are involved in questions of extra-lateral rights. The Utah Consolidated recently brought suit against the Utah Apex, claiming $500,000 for the illegal extraction of ore from veins or beds that apexed on the latter's property. The Utah Apex then sued the Utah Consolidated for $1,750,000 on the grounds that the veins apexed in its territory. The Utah Metal and Tunnel and the Utah Consolidated also had some questions of apex to be settled. It is understood that these questions between the two latter companies were investigated by representatives of both companies, and that the findings of the investigators were that the Utah Metal and Tunnel really had apex rights to the veins (or beds) in question and, in consequence, the Utah Consolidated agreed to purchase them. The Highland Boy limestone, as is pretty generally known, apexes in part in Utah Metal and Tunnel territory and dips about 50° north into the Utah Consolidated. Whether the Utah Metal and Tunnel apex rights have been definitely acquired by the Utah Consolidated is not known, but it is understood that these rights were desired by the latter company, in connection with its suit against the Utah Apex. The two latter properties are reported to be considering plans for a consolidation. If this is to be effected it is reported that 75% of Utah Apex's 528,000 shares of stock outstanding must be willing to enter a merger. There has been considerable activity in this stock recently on the market, it having advanced from 1¼ or 1½ to around $4 a share. It is not unprobable that the litigation between these companies may be settled out of court. Whether the Utah Metal and Tunnel would be included in the proposed consolidation is uncertain.

WALLACE, IDAHO—Nov. 29

The Capacity of the Bunker Hill Smeltery and Refinery at Kellogg, Idaho, will be almost doubled by the additional buildings and equipment now being provided. These improvements have been in progress for several months, but difficulty in getting machinery and material during the war delayed their completion. It is expected that this trouble will soon be obviated. The company will then be in position to treat all its own ore and possibly to take additional custom business. It is now handling the output of the Hecla mine, but little if any other custom ores. The foundation has been built for a 72-ft. addition to the furnace building, which will provide room for two additional blast furnaces. Two more Dwight-Lloyd sintering machines have been added recently, and preparation is being made for two more, making nine altogether. The blower house has been enlarged and a Connersville blower of 15,000 cu.ft. capacity installed. A new compressor room has been completed, and a Sullivan two-stage compressor of 1100 cu.ft. capacity added. This will be supplemented by a Laidlaw-Dunn-Gordon compressor, to be used as an auxiliary. A 72-ft. addition is also being made to the lead refinery. A new softening furnace has been built, and two desilverizing kettles will be added. Two additional railroad tracks are being built south of the sampling mill, and new bins are being constructed. One of these tracks will extend through the plant, to facilitate handling equipment. Building this track necessitated moving the machine shop, and a larger and more complete one is being built. For coarse crushing, an 18 x 30-in. Blake crusher has recently been installed. These improvements indicate that the Bunker Hill company anticipates a period of prosperity for the mining industry with the coming of peace.

BOISE, IDAHO—Nov. 29

National Potash Co., of Boise, is planning to sell the rights to use a process for recovering potash from feldspathic rocks on a royalty basis. E. B. Sherman, an officer of the company, states that the company may adapt the portland cement factories at Concrete, Colo., or Devil's Slide, Utah, for this purpose, by adding filter presses and evaporators similar to those used in the manufacture of common salt.

TUCSON, ARIZ.—Dec. 2

Indictments in Bisbee Deportation Cases were quashed by Judge William W. Morrow, of San Francisco, in a decision filed on Dec. 2 in the U. S. District Court. Twenty-five individuals were involved, including capitalists, mine operators, public officials, and citizens of Bisbee. The charges on which citizens of Bisbee were indicted resulted from the deportation from Bisbee on July 12, 1917, of 1186 striking copper-mine workers and their alleged sympathizers. The indictments charged conspiracy to deprive citizens of the United States of their constitutional rights.

DENVER—Nov. 29

Female Millworkers were among the interesting experiments tried by Colorado operators during October and the early part of November, in an effort to overcome the labor shortage. The Golden Cycle Mining and Reduction Co., which treats a large part of the output of the Cripple Creek mines in its plant at Colorado Springs, was hard hit by the labor shortage. Many of its employees left to enter military service, and it became difficult for the management to get enough competent help to operate the plant. It was decided to employ women in the plant as an experiment. In many respects the venture was a success. In certain positions the women became very competent and took serious interest in their work. Among the positions filled successfully by women were accounting, assaying ore testing, oiling machinery, and keeping certain units in adjustment. One of the amusing features of the experiment was the tendency of some of the mill women to devote the bulk of their time to cleaning house, and to try to clean up the dust and dirt, but they eventually gave up this task as hopeless. The women received a suitable wage plus a bonus for accomplishing certain results.

Reconstruction following the war, and its probable influence on the mining industry, is occupying the thoughts of Colorado mine operators, more especially those interested in the production of gold. If any mining men ever seriously entertained the hope that a bounty on new gold would be conceded by the authorities at Washington, this hope has now been dismissed. It is now assumed that the prices demanded for steel, powder, cyanide, and other mining supplies will gradually drop to a peace basis, thus decreasing to some extent the present high charges for these necessities. Further, the release of thousands of skilled miners from the Army, from munition plants, and other war activities in which high wages prevailed will increase both the supply of labor available for mining and also the efficiency of that labor. This readjustment in the labor situation will help mining, even if no immediate change be made in the scale of wages or in the hours per day. During the last year, labor in the mines has averaged only 50 to 60% of the pre-war efficiency, thus adding greatly to the cost. It is hoped that as the cost of supplies decreases, and as the efficiency of labor increases, many of the low- and medium-grade mines of the state, that were forced to close down, will gradually be able to resume operations. Another factor in the cost of mining in Colorado, which will receive considerable thought and attention during the period of reconstruction, is mine taxation. One of the radical proposals that has been made by more than one mining man is that the greatest stimulus mining could receive would be the complete removal of mine taxation for a period of five or ten years. This proposal has been defended on the ground that it is not entirely selfish on the part of the mine operators, but that the resulting increase in mining activity, with its consequent influx of population and demand for supplies of all kinds, including agricultural products of the state which could be disposed of in home markets in larger quantities and at greater profit than if they were shipped long distances into other states, would more than compensate all other interests for their small proportion of increased taxation resulting from the shifting of the burden temporarily from the shoulders of the mining industry. It has always been true in Colorado that the state is never so prosperous as when mining is flourishing. There is no more certain way to make it flourish than to reduce or eliminate taxation temporarily. However, such a radical proposal is not likely to receive consideration from Colorado's lawmaking bodies, which for some time have been controlled by agricultural interests, to the detriment of mining interests. If the former interests, now in power in the state, could appreciate the certain advantages of liberal coöperation with the latter, the benefits would be mutual.

HOUGHTON, MICH.—Dec. 2

Reduction of Present Wage Scales in Michigan is improbable in 1919. Returning soldiers have been promised old positions back. Little if any reduction in copper mining and milling costs is expected, according to leading mining men of the state. They believe that reconstruction work in Europe will call upon American industry to exert itself to the utmost, and, with the return of hundreds of former miners and trammers, an increase in production is looked for.

Labor Situation continues to improve. A stamp-mill superintendent said yesterday: "This is the first time in four years when I had men apply for work and had no work to give them. I told them to go the mine." The mines are putting on men steadily and mill tonnages are increasing. Moreover, the general efficiency of labor is improving. The return of Michigan men from other states is noticeable and continuous. The mines have not, however, secured all the men needed. Trammers are particularly in demand.

JOPLIN, MO.—Nov. 30

Although Bad Conditions in Zinc Ore Market are being met with persistent efforts to remedy them, numerous mines are closing down, temporarily or permanently, and the output of the district is steadily being curtailed. During the last week, the Coahuila Lead and Zinc Co., which has been operating for a number of years northwest of Duenweg, removed its mules from the ground and closed. It was one of the largest sheet-ground producers in the camp and one of the last to quit. The Athletic mine, situated near by, is now the only sheet-ground mine still operating in the Duenweg camp, and it is reported that it will close as soon as the present supply of coal is exhausted. It is owned by the Athletic Mining and Smelting Co., which has a smeltery at Fort Smith, Ark., and this may enable it to keep going. In the Oklahoma camp, the Montreal mine, one of the most noted producers, was closed during the week, but only temporarily. Just now the ground in this mine is said to be looking as good as ever, but the owners dislike to exhaust the ore deposits at prevailing ore prices. All the big companies, the Picher, the Skelton, the Golden Rod, and the St. Louis, are operating short shift or only a part of their plants.

Inability of Mine Operators to Coöperate has long been the bane in the Joplin district. Recently an agreement was made whereby all mines agreed not to sell their ores for the week, in order that some agreement might be made with the smelters as to allocation. On the eve of this agreement, however, the manager of one of the largest producers in the field was ordered by the owners of the property to sell 1000 tons at the market. There was nothing else for him to do, and the sale broke the plan completely, so that there was almost as much selling as in ordinary weeks. Such incidents always make it harder to arrange an agreement another time. It is considered that one of the most trying features of mining in this field is the fact that owners in many cases are non-residents and cannot be made to understand conditions as they exist.

TORONTO, ONT.—Nov. 29

The Mining Industry of Cobalt is being badly handicapped by the prevalence of Spanish influenza, from which several deaths have occurred this week. A number of extremely critical cases are under treatment at the hospitals. Among the victims was Norman Creyk, formerly of Toronto, secretary of the Grodwards Company.

A National System of Employment Offices will be established by the Canadian government to secure work for the labor released by closing down munition plants and demobilization of the army. These will be coördinated through the Department of Labor. Local offices will be opened in every important industrial center. In the larger cities, there will be separate offices for skilled and unskilled workers. These offices will report daily to a provincial clearing house the number of workers unplaced and the positions vacant, and the clearing houses will endeavor to fill vacancies in one locality with unabsorbed workers from other places, for whom jobs cannot be found in their own neighborhoods. In addition to these provincial clearing houses, there will be two Federal clearing houses, one for Eastern Canada, probably at Ottawa, and another having jurisdiction over the western provinces, which it is proposed to establish at Winnipeg. When the provincial clearing houses report a shortage or a surplus of labor for which they cannot provide within their own borders, the Federal clearing houses will take up the work in the larger area assigned them. By this system the government hopes always to have on hand accurate information as to the demand and supply of labor in all parts of the country, the extent to which private industries are absorbing those thrown out of work, and the volume of public employment that must be provided to take up any surplus. The organization will be administered by a body to be called the Employment Service Council of Canada, of which the Federal Department of Labor will appoint three members, two of whom will be women, and the provincial governments one member each. The Soldiers' Civil Reëstablishment Department, Great War Veterans, Canadian Manufacturers' Association, Labor Congress, Railway War Board, the railway brotherhools, and the Canada Council of Agriculture will also be represented. A provincial advisory council will also be appointed in each province

RIO DE JANEIRO, BRAZIL—Nov. 12

Plans for Developing Brazil's Iron Deposits are to be undertaken by the British government and the Rothschilds jointly, according to the announcement made in the London cables immediately after the armistice was signed, which has aroused much interest. These iron deposits, recognized by the outside world as of prime importance only in recent years, have been under negotiation by several strong interests. A project was made to extend the railroad from the port of Victoria to the iron district and to electrify it so that shipments might be begun on a scale of 10,000 tons daily, or more, to the English iron centers. State concessions were granted and a control of the stock of the railroad was purchased. The syndicate concerned in this plan had secured control of several billion tons of iron ore averaging from 60 to 70% metallic iron. The transportation problems had been investigated under the direction of the late James J. Hill, and the whole project accepted as feasible by some of the strongest financial interests in Europe and America. All activities were necessarily suspended by the war, except the geological and field investigations, which have been continued under the direction of a staff of American engineers. The present announcement is accepted as authentic, and the beginning of the actual work is expected to follow soon.

Plans for Electrical Smelting of Manganese Ores of the interior districts have been under consideration for some time and a concession has been secured by local interests in connection therewith. The technical and commercial phases of the matter have been under investigation by Frederick T. Snyder, of Chicago, and Kirby Thomas, of New York, for the Brazilian interests, and reports and a proposition have been submitted.

The Mining News

ALASKA

KENNEDY & CONWAY (Skagway)—Developing copper property near Haines, Alaska.

ARIZONA

Cochise County

INFLUENZA curtailed output of Johnson-Dragoon district greatly during last month. Thirty deaths in Johnson up to Nov. 18 out of 300 population; dead mostly Mexicans.

Graham County

LAUREL CANYON (Safford)—R. V. Dey, of New York, has appealed to Federal court for return of property, now leased by G. M. Ruff and A. H. Chiarson.

Mohave County

LEVIATHAN (Yucca)—Work resumed upon large deposit of molybdenum ore.

Pima County

CABABI (Tucson)—Old Spanish silver mine, 45 miles southwest of Tucson, leased from Cababi Mining Co. by S. G. McWade, a former manager.

DAILY-ARIZONA CONSOLIDATED (Tucson)—Suit for $20,000 by Joseph Chapman and C. F. Hagedorn dismissed in Superior court on payment of sum by company.

NATIONAL TUNGSTEN (Tucson)—Property, with that of Emery-Whitcomb Tungsten Co., in Arivaca district, under foreclosure suit for $25,100. Plaintiff is James H. Emery, of Elmhurst, Illinois.

Pinal County

MAGMA CHIEF (Copper Creek)—Operations closed at Superior and company's name transferred to Sombrero Butte property in Copper Creek district.

SUPERIOR ARIZONA (Superior)—Thomas Gray, lessee, shipped four carloads of 50% manganese ore to Chicago. Joint concentrator being planned to permit working lower-grade orebodies.

Yavapai County

SILVER BELT (Humboldt)—Will install 100-ton ball mill, with flotation unit.

DUNDEE-ARIZONA (Jerome)—Pumping resumed in Dundee shaft, now bottomed at 720 ft. in shattered quartz porphyry, carrying iron and manganese oxide. Dundee ground hitherto supposed to have been drained to level of Extension tunnel, which shaft passes at 960 feet.

JEROME VERDE (Jerome)—Production from Maintop workings is main activity. Diamond drilling being continued northeast of Columbia shaft.

UNITED VERDE EXTENSION (Jerome)—Portal end of 12,000-ft. haulage tunnel connected with east drift from Texas shaft, which will be used only for ventilation or hoisting men.

Yuma County

HUDSON (Quartzsite)—Gold strike near New Water Springs in northern Yuma County reported by Messrs. Brimly, Johnson and Hudson.

CALIFORNIA

Nevada County

GOLDEN CENTER (Grass Valley)—Unwatering of shaft resumed after delay due to influenza. Will explore this and old Peabody property at 1000-ft. depth.

Plumas County

FEATHER RIVER GOLD (Nevada City)—Five-mile water-ditch nearing completion and two-mile road constructed. Extensive operation in view.

UNITED STATES S. & R. (Portola)—Has developed good copper ore on its property next to Walker ground.

WALKER (Portola)—Development work being pushed by Anaconda Copper Mining Co. Drift on lowest level in 700 ft. from shaft and in ore. Tunnel, 3500 ft. long, from mill to mine, well under way. Large compressor installed. Company has realized $198,319 net from 2351 tons of concentrates shipped, in addition to profit on high-grade shipments.

Shasta County

BULLY HILL COPPER (Winthrop)—New 150-ton flotation plant recently placed in operation. Installed in old smelting building.

Sierra County

SIXTEEN TO ONE (Alleghany)—Rushing completion of 10-stamp mill.

BRANDY CITY (Brandy City)—Completing installation of new equipment and enlarging dam.

COLORADO

Boulder County

HORSFAL (Boulder)—Main shaft sunk from 300 to 550 level. Dip of vein has changed from 68 to 75° in this distance. Charles Oliver is superintendent.

WANO (Jamestown)—Mill running two shifts on fluorspar. Eight tables in operation. About three cars of concentrates being shipped per week. One carload of gold telluride ore produced from new shoot on 100 level.

CROSS (Lakewood)—Wolf Tongue tungsten property has installed new 120-gal triplex pump to raise water 400 ft. to mill supply reservoir. Driven by a 20-hp. motor. Four-inch pipe line, 1700 ft. long, laid to take water to Cross mill. More than 40 men employed at mine and mill. N. G. Olsen is superintendent.

MARSH LONG (Magnolia) — Lessees shipping tungsten ore regularly to Red Sign and Grimm mills.

Dolores County

POINDEXTER (Rico) — Reopened by David Swickhemer. New shaft sunk 50 ft. and will continue to 120 ft., where first blanket vein will probably be cut.

RICO (Rico)—Extensive development planned for winter. Power line being built to Group tunnel, where new compressor will be installed. Work also resumed at Syndicate tunnel.

San Juan County

GOLD KING LEASING (Gladstone)—Additional men being sent to this property, now operated by Gold King Extension Mines Co., of which W. Z. Kinney is general manager. Company plans to operate all winter.

SAN JUAN TUNGSTEN (Silverton)—Organized to lease North Star mine and mill. Development work in progress where tungsten ore has been opened. Mill being remodeled and placed in condition for treatment of tungsten ore. M. de Golyer is manager.

Summit County

MID-WEST (Breckenridge)—Installing hoist for sinking shaft to sulphide zone.

QUANDARY QUEEN (Breckenridge)—New milling plant of this Denver company nearing completion. Company operating in upper Blue River district.

SILVER KING (Breckenridge)—New pump installed to handle water struck in crosscutting on 195 level. Will crosscut seven veins encountered.

WELLINGTON (Breckenridge)—Milling plant running steadily and making regular shipments of lead and zinc concentrates.

CLIMAX MOLYBDENUM (Climax)—Reported to have taken over entire property of Molybdenum Products Co. Will operate latter's mine and mill with its own.

Teller County

DANTE (Victor)—Being developed by Big Toad Gold Mining and Milling Co. Diamond drilling from bottom of 600 level of No. 1 shaft to sample unexplored ground. Mill treating 75 tons of Dante ore per day.

WIDE AWAKE (Victor)—Raven Hill property being developed under lease by Porter Hedges. Drifting on Wide Awake vein.

IDAHO

Shoshone County

WASHINGTON (Burke)—Crosscut 775 ft. long reached vein at depth of 350 ft. Work suspended until spring on account of heavy snow.

INTERMOUNTAIN (Iron Mountain, Mont.)—Report for year ended Sept. 30 shows net loss. Branch railroad, 12 miles long, built by old company, too expensive to operate. Track iron sold and removed; roadbed to be used as motor truck road for transporting concentrates to main line.

NABOB CONSOLIDATED (Kellogg)—William Beaudry, manager, announces that 150-ton mill will be built at once. Control owned by Stewart Mining Co. Shipping lead-zinc ore.

TARBOX (Saltese, Mont.) — Crosscut from winze, sunk 200 ft. from 800 level, cut vein of lead-zinc-copper ore. Will drift west to get under main body. Construction of mill considered. Richard Daxon, manager, Wallace, Idaho.

KENNAN (Wallace)—Stripped tungsten vein for 70 ft.: average width, 12 ft. Ore is scheelite. Shaft being sunk on vein to prospect it further. Company owns large acreage, which includes several gold veins of proved value and extension of productive lead-silver-zinc veins. Winter work will be confined to tungsten.

SUCCESS (Wallace)—Developing orebody on 1600 level. Shows increase in lead as compared with zinc. Motor trucks being used to deliver concentrates to railroad. Mill running one shift.

MAINE

Hancock County

DOUGLASS (Blue Hill)—This old property being operated by A. S. & R. Co. Mining and milling 100-150 tons copper sulphide ore per day and shipping concentrates by schooner to Perth Amboy, N. J. Development work in progress. Ellsworth, railroad shipping point.

MICHIGAN

Copper District

HANCOCK CONSOLIDATED (Houghton)—Shipping 700 tons of rock per day. Have put on 30 more men and will increase force steadily. Expect to reach 1000 tons daily by spring.

ISLE ROYALE (Houghton)—Main pump house at Huron dam completely wrecked by dynamite. Operations of mine not interfered with.

MAYFLOWER-OLD COLONY (Houghton)—Shaft work continues slowly, labor being difficult to obtain, owing to isolation. Sinking at low cost, time apparently being negligible. Small force engaged, chiefly farmers. Hoist and other equipment second hand, being largely bought from other Fay properties.

NEW ARCADIAN (Houghton) — Will probably resume exploration work in spring. Keeping water out of workings at comparatively slight cost.

ST. LOUIS (Houghton)—Calumet & Hecla has no present intention of opening this property.

SENECA (Houghton)—Shaft now 1600 ft. deep. Sinking breaking local record. Expect to cut footwall of Kearsarge lode at 1730 ft., shaft having to go 400 ft. to reach it. Ten hammer drills at work.

WINONA (Houghton)—New flotation plant will handle 600 tons daily. Machinery on way and will be set up as men are obtained, concrete foundations being in place. New process expected to solve problem of saving more of flake copper. Labor shortage acute, but improving slightly. Rock tonnage over 300 daily.

MISSOURI

Joplin District

McGEE (Duenweg)—New mill completed on Boston-Duenweg land. Mine operating at 120 feet.

SIMS & BOND (Duenweg)—Sinking second shaft for air at mine in heart of Duenweg camp. Good output obtained with hand jigs for eight months. Output, when increased, will be sent to custom mill.

KUSTERER (Webb City)—Completed new custom mill on Boston-Duenweg land at Duenweg.

MONTANA

Jefferson County

LEGAL TENDER (Clancy)—Old 500-ft. shaft unwatered to 200 level. Drifting begun.

ECONOMY (East Helena)—New mill almost completed.

ANGELICA (Wickes)—Making daily shipments from Mount Washington tunnel.

Silver Bow County

ANACONDA (Butte)—Within week from time armistice was signed, company received word to suspend manganese shipments to Steel Corporation, automatically stopping manganese mining at Emma property of Butte Copper and Zinc Co. Condition may prove temporary, but it is said that management has no false hopes, admitting that South American manganese can probably be imported at price lower than Butte production cost.

NEVADA

Lyon County

NEVADA-DOUGLAS (Ludwig) — Production increasing from company's mines, especially from Western Nevada mine, near Mason, where it was doubled. Considerable development work planned in Ludwig mine, including sinking from 800 level.

MASON VALLEY (Thompson)—Ore receipts for week ended Nov. 20 were: Nevada-Douglas, 1331 tons; Bluestone, 2029 tons; Mason Valley, 2492 tons; miscellaneous, 454 tons. During same period four cars blister copper shipped.

Nye County

TONOPAH SHIPMENTS for week ended Nov. 23 was 8310 tons, having a gross milling value of $137,870. Producers were: Tonopah Belmont, 1919; Tonopah Mining, 2100 (for two weeks); Tonopah Extension, 2350; West End, 983; Jim Butler, 139; Montana, 170; Tonopah Divide, 300; MacNamara, 400; Rescue, 53; and miscellaneous, 96.

CYANIDE to the amount of $750,000 has been contracted for by the Nevada Mine Operators' Association for use during coming year.

TONOPAH DIVIDE (Tonopah) — Installation of electrically driven surface plant completed. Development work being pushed. Main shaft will be sunk to water level, estimated at 700 ft. To expedite this work, auxiliary hoist has been installed at 370-ft. level. Ore shipments to Goldfield Consolidated mill average 200 tons weekly. Dumps said to contain 3000 tons of $30 ore.

TONOPAH EXTENSION (Tonopah)—Dry tons milled in October, 9867 tons. Production of gold bullion, 1124 oz.; silver bullion, 122,076 ounces.

TONOPAH MINING (Tonopah)—Milled 11,460 dry tons in October. Production of gold bullion, 1004 oz.; silver bullion, 106,050 ounces.

NEW MEXICO

Grant County

BONNEY (Lordsburg)—Shipped 12 cars high grade ore to Copper Queen smeltery in November. Working 50 men. Has installed new drill equipment. J. P. Porteus is superintendent.

LAST CHANCE (Lordsburg)—New 50-ton concentrator and flotation plant started satisfactorily. B. Prescott, superintendent.

NORTH CAROLINA

Macon County

MOODY MICA (Franklin)—Property in Burning Town hills sold to Philadelphia interests for $60,000. Has produced about $40,000 worth of mica during last year, mostly from one pocket, opened last December. C. E. Bonesteel, who controls a large group of properties in locality, is negotiating a syndicate for operation.

OKLAHOMA

Joplin District

OMAHA (Hockerville, Kan.)—New shaft in lead ore. Mill which was begun several months ago and abandoned will now probably be completed.

MIAMI METAL (Miami)—Rebuilding of Buffalo mill on lease northwest of Picher almost completed. Will start by Dec. 15. Dump gives good assays.

FEDERAL (Picher)—Paying all expenses from good lead ore and stock-piling 12 tons of zinc blende per day.

LA SALLE (Picher)—New mill started Dec. 2, after successful work with hand jigs for several months. W. L. Kirby is superintendent.

ALEXANDER (Tar River)—New plant to have Standifer jigs, invented by Miami mining man. Jigs of this type, already in use at Missouri Mule mine, said to be giving satisfaction.

OREGON

Jackson County

RAINIER MERCURY (Gold Hill)—Erecting another unit of mercury retorts at Utah group of cinnabar mines, 12 miles north of Gold Hill.

COPPER LODE (Upper Applegate district)—Charles Lillie, of Los Angeles, Calif., and E. W. Liljegram, of Medford, Ore., equipping this copper property.

TEXAS

Burnet County

SOUTHWESTERN GRAPHITE (Burnet)—Has purchased flotation equipment to treat graphite dust. Present mill, started last spring, employs Huff Electrostatic method for treatment of graphite ores without preliminary concentration. Capacity 200 tons.

WISCONSIN

Zinc-Lead District

CONSOLIDATED LEAD AND ZINC (Benton)—New shaft down 120 ft., and crosscutting begun on Charles Smith land one mile south of Benton. Charles Lawyer, Platteville, Wis., is manager.

CONNECTING LINK (Cuba City)—Has purchased 100-ton Gilman mill at Linden and will move plant to Coulthard lease at Cuba City. Anton Zwack, Dubuque, Iowa, is president and manager. New property to be Connecting Link No. 2.

HARVEY LEASE (Cuba City)—Charles Wolfe has bought Lawrence mill at Hazel Green to equip new prospect on Harvey land north of Connecting Link. Four churn drills at work on tract, and shaft being sunk.

KISTLER & STEPHENS (Platteville)—Churn drill on Purl Goke farm has struck what appears to be continuation of Blockhouse range to east.

British Columbia

CANADA COPPER CORPORATION (Greenwood)—Smeltery shut down on Nov. 26. Installation of reverberatory not considered, reports to the contrary being incorrect. Work concentrated on erecting mill at Allenby to treat ores from Copper Mountain mines.

SNOWSTORM (Yale District)—International Diamond Drill Contracting Co. awarded contract by Minister of Mines of British Columbia for 10,000 lineal feet of diamond drilling on this group of claims in Highland Valley.

Ontario

COBALT SHIPMENTS during week ended Nov. 27 were 12 cars, containing 948,739 lb. Shippers were: Buffalo, 329,800 lb.; Mining Corporation, 151,200; McKinley Darragh, 149,539; O'Brien, 128,855; Peterson Lake, 102,045; and Dominion Reduction, 87,300. In same week, Mining Corporation was only bullion shipper, with 99 bars containing 99,008.68 fine ounces.

HARGRAVE (Cobalt)—Has decided to close mine.

MINING CORP. OF CANADA (Cobalt)—Ophir management notified option will be dropped Dec. 14. Ophir interests said to have arranged for continuing work.

BURNSIDE (Kirkland Lake)—Installing mill equipment and expect to start by Jan. 1.

The Market Report

SILVER AND STERLING EXCHANGE

Nov.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
28	......	....	48⅞	2	4.7585	101⅛	48⅞
29	4.7560	101⅛	48⅞	3	4.7580	101⅛	48⅞
30	4.7580	101⅛	48⅞	4	4.7575	101⅛	48⅞

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Nov. Dec.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
28	...	..	....	. ..	...
29	*26	†	8.05	7.75	8.10 @8.15
30	*26	†	8.05	7.75	8.10 @8.15
2	*26	†	7.05	6.75	8.10 @8.15
3	*26	†	7.05	6.75	8.10 @8.15
4	*26	†	7.05	6.75	8.10 @8.15

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on September 21, 1917, and July 2, 1918.[1]

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market)[1] are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

[1] *See reservation in text of review of copper in next column in this issue.*

LONDON

Nov. Dec.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
28	122	122	137	295	290	40½	39½	54
29	122	122	137	290	285	40½	39½	56
30	...	...	...	...	...	...	...	
2	122	122	137	275	270	40½	39½	56
3	122	122	137	275	270	40½	39½	56
4	122	122	137	(*a*)	(*a*)	40½	39½	56

(*a*) Not received at time of going to press.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515: £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Dec. 4, 1918

The War Industries Board intends practically to dissolve on Jan. 1, 1919.

Orders have been issued to each department of the Government prohibiting the resale of raw material in competition with private producers unless serious deterioration would result from storage or unless their release would meet a pressing public need.

In most of the markets there has been no buying. The chief features of this week were the reduction in the price for lead on Dec. 2, and the announcement on Dec. 3 of the price at which the U. S. Steel Products Co. would distribute its purchases of tin.

Copper—There was no business and no demand during the week. Producers continued to ask 26c. per lb. Since the beginning of December no new orders have been received from the Government, and upon instructions the filling of old orders has been held in abeyance. What will result from this suspension is at present unknown.

Previous to the beginning of December we have been quoting the price of 26c. for copper as "fixed by agreement between American copper producers and the U. S. Government," saying further "there is no free market." It is uncertain whether the price of 26c. is now to be regarded as being fixed by the producers only as a price asked, or whether under the terms of the agreement of Nov. 15 between the War Industries Board and the copper producers, the 26c. price is still to be regarded as being fixed by agreement between those two parties. We continue this week to represent it according to the latter interpretation, as we have been doing since September, 1917, but we reserve the right to make whatever correction in the representation since Dec. 1 we may deem proper after more deliberate consideration.

John D. Ryan has been elected chairman of the board of directors of the Anaconda Copper Mining Co. He has also been elected president of the United Metals Selling Company.

Copper Sheets—The base price of copper sheets is 35½c. per lb. Copper wire is quoted at 28½c. per lb. f.o.b. mill, carload lots.

Tin—The War Industries Board has authorized the U. S. Steel Products Company, the distributing agency for tin in this country, to sell pig tin in lots of not less than 25 gross tons at 71½c. per lb Pacific Coast ports, and at 72½c. at New York and Chicago to consumers, dealers, and jobbers, and announcement to this effect was made on Dec. 3. These prices are to rule for December and January. Dealers can resell in lots of five gross tons or over to consumers or jobbers holding purchase licenses at a profit not to exceed 2½ per cent.

It is understood that the U. S. Steel Products Co. has already advanced about $16,000,000 against purchases of tin, the amount being between 10,000 and 12,000 tons. Little if any of this tin is supposed yet to have arrived in this country. On the other hand, there is supposed to be about 20,000 tons on hand in this country, especially in the hands of manufacturers who overstocked. The London quotation of £270@275 corresponds to 57½@58½c. Reflecting the value of tin in Singapore, the metal ought to be bought there and delivered here at about 58@59c. In fact, dealers in Batavia and Australia are offering freely to sell December-January shipments, which would probably be February-March arrivals, at prices that would figure about 60c. here. Restrictions against dealings in those primary markets through any but the sole accredited agent apparently have been removed. However, this does not help matters in this country, for the reason that import licenses cannot be obtained.

Previous to the announcement by the War Industries Board, there was business in this market of resale lots of Banka, Chinese, Lamb & Flag, and A. S. & R. Co. refined, at 68½@70c., but since the announcement the market has stiffened, there being less desire to resell. However, business was done today at 71½ cents.

Lead—The lead producers unitedly on Dec. 2 reduced the price to 7.05c., New York, and 6.75c., St. Louis. Business continues to be allocated through the Lead Producers' Committee. The reduction in price resulted in bringing in a few small orders, but, speaking generally, no material stimulation of demand is yet perceptible. However, production is being curtailed in almost every important district, the curtailment probably averaging as much as 20% on the whole, with the prospect that the December production will fall under 40,000 tons.

In the meanwhile, lead manufacturers are not in a very happy situation, owing to the backing up of lead on their hands through the cancellation of orders. In many cases they do not yet know to whom to look for adjustments, whether to their customers or to branches of the Government. Such difficulties will no doubt be ironed out satisfactorily in the course of time, but in the meanwhile there is naturally more or less vexation.

The lead production of Mexico is estimated to be going on at present at the rate of about 8000 metric tons per month, compared with a maximum of about 11,500 last summer. Operations in Mexico have been undergoing curtailment since about the end of October.

Zinc—There was some further small inquiry by galvanizers, but this did not amount to much, either in quantity or significance. In general, the market was conspicuous by the absence of buyers, and quotations for the week are only nominal. Producers are endeavoring to establish a market for January-March contracts, which are freely offered at 8c., while there have been bids of 7⅞c., which have not been accepted. Producers continue delivering spelter to the Government on contracts previously made.

High-grade spelter is unsalable, and nobody knows what it would fetch. Stocks are accumulating, and producers desire to sell, but naturally do not care to show their hand in the absence of any real demand.

The zinc-ore producers of Oklahoma, Kansas, and Missouri instituted a plan of allocation on Nov. 29, so that the purchases of ore by the smelters under the joint agreement may be distributed among the participating mine operators. In other words, it is aimed to equalize curtailment of production.

The Oklahoma Ore Storage Association announced that the Picher warehouse would be ready to receive ores on Dec. 1 and that contracts had been let for the erection of warehouses at Douthat and Cardin. This association proposes to advance 90% on ore deposits, accepting the warehouse receipts as collateral on two, four, or six months' time, borrowers having the option to redeem at any time.

Large Western ore producers are finding it difficult to market their product. In some cases they have not been able to arrange smelting contracts at all, smelters being unwilling to take chances in buying ore under present conditions. Some ore producers have found that their only way of disposing of their ore was to consign it to smelters for treatment, proceeds to be accounted for after sale of the product, less a stipulated smelting charge.

Our advices from Europe are that Belgium's zinc-smelting plants are not materially damaged as a whole.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of February 4.

Other Metals

Aluminum—Unchanged at 33c. per lb., but restrictions for domestic use and export have been removed by the War Industries Board.

Antimony—This market became dull, there being scarcely any demand except from consumers who wanted to buy small lots. We quote spot at 8½@8⅝c. There is no quotation on futures.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound. Restrictions for export and domestic use have been removed by the War Industries Board.

Quicksilver—The market was dull and weaker. We quote California virgin at $120@123, while Mexican has been offered as low as $115. San Francisco telegraphs $[illegible]. Weak.

Silver and Platinum

Silver—Market for silver continues unchanged at $1.01⅛ per oz. 999 fine as the New York official. The London price, now 48⅞d., is rather higher than the parity of the New York price. Owing to the decline in insurance rates overseas, reduction in the English quotation may soon be looked for. Lack of shipping facilities from San Francisco to the Orient may make New York the port of departure for bullion shipments to the East in the near future.

Mexican dollars at New York: Nov. 28, —; Nov. 29, 77½; Nov. 30, 77½; Dec. 2, 77½; Dec. 3, 77½; Dec. 4, 77½.

Platinum—With an unrestricted market once more, there developed immediately a brisk demand, and sales were made at $105@106.

Iridium—Very scarce. Osmiridium has sold at over $200.

Palladium—Unchanged at $135, same as the Government price was.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 30—Blende, per ton, high, $75.70; basis 60% zinc, premium, $75; Class B, $65@55; Prime Western, $45@42.50; calamine, basis, 40% zinc, $40@35. Average selling prices: blende, $49.75; calamine, $38.41; all zinc ores, $48.63.

Lead, high, $102.75; basis 80% lead, $100; average selling price, all grades of lead, $99.75 per ton.

Shipments the week: Blende, 5656; calamine, 617; lead, 1370 tons. Value, all ores the week, $441,650. Shipments eleven months: Blende, 437,920, calamine, 21.043; lead, 70.128 tons. Value all ores 11 months, $30,011,390.

Sellers have slipped by the schedule and buyers have slipped by it until it was worn pretty thin this week, schedule buyers refusing to buy any more ore on a schedule price unless a better agreement could be reached, and they bought no ore this week. This week's shipment of blende represents all of last week's purchases of those buying on a schedule, but only 75% of those purchasing outside the schedule. Outside buying last week was about 1800 tons. This week it will approximate 2100 tons. News from a meeting in St. Louis today has not been received at this writing, and as the agreement on premium grades expires Dec. 21, it may be necessary to combine a new agreement on these grades. One of the largest producing companies sold 1000 tons on Wednesday on $45 basis, and it is reported that this company has withdrawn from the agreement and will sell only on the open market.

Platteville, Wis., Nov. 30—Blende, basis 60% zinc, highest settlement price reported $75; base price for premium grade $75; base price for high-lead blende $47.50 per ton. Lead ore, basis 80% lead, $96 per ton. Shipments reported for the week were 2278 tons blende, 186 tons galena, and 240 tons sulphur ore.

For the year to date the totals are 116,001 tons blende, 7527 tons galena and 39,229 tons sulphur ore. During the week 1912 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—No market. Everybody overstocked. Western producers willing to talk business at lower figures than previously.

Manganese Ore—No market.

Molybdenum Ore—Some dealers report no sales, no offers and no inquiries. Charles Hardy mentions a transaction of ore of [illegible] grade at 87½c. per pound.

Tungsten Ore—No change from the situation reported last week.

Other Minerals

Pyrites—Spanish pyrites is quoted, subject to the raising of the embargo, at 17c. on the basis of 10s. ocean freight, buyers to pay war risk and insurance. Restrictions still continue. It is predicted that they will be removed before the end of the year.

Ferroalloys

Ferroalloys—There is no market on ferromanganese or spiegeleisen, buyers being entirely absent and showing no disposition to be attracted by small cuts from former prices, which were $250, delivered, for 70% ferromanganese and $75, furnace, for 16% spiegeleisen.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept.	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	101.125	32.361	44.324	49.500
Nov.	71.604	85.891	101.125	34.192	43.584	48.969
Dec.	75.765	85.960	....	36.410	43.052	......
Year	65.661	81.417	....	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	26.000	110.000	122.000	125.000	137.000
Dec.	23.500	......	110.000	....	125.000	....
Year	27.180	......	124.892	....	138.401	....

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(*a*)	207.443	318.875
April	55.910	(*a*)	220.171	329.905
May	63.173	(*a*)	245.114	364.217
June	62.053	(*a*)	242.083	331.925
July	62.570	(*a*)	242.181	360.347
August	62.681	(*a*)	243.978	380.900
September	61.542	(*a*)	244.038	343.905
October	61.851	(*a*)	247.467	335.543
November	74.740	(*a*)	274.943	323.550
December	87.120	....	298.556	....
Av. year	61.802	....	237.563	....

(*a*) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	8.050	6.650	7.750	30.500	29.50
November	6.249	8.050	6.187	7.750	30.500	30.60
December	6.375	.....	6.312	......	30.500	.....
Year	8.787	......	8.721	......	30.500	...

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	8.491	7.672	8.141	54.000	54.100
December	7.685	.	7.510	. . .	54.000	. .
Year	8.901	.	8.813	.	52.413	. .

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry‡	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	36.60	33.95	34.40	33.95	35.40
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 3
Alaska Gold M	4¼
Alaska Juneau	1⅞
Am.Sm.&Ref.,com.	83
Am.Sm. & Ref., pf.	108
Am.Sm.Sec., pf., A.	93¼
Am. Zinc	12⅞
Am. Zinc, pf	39½
Anaconda	66⅜
Batopilas Min	1¾
Bethlehem Steel	64⅜
Butte & Superior	21
Butte Cop. & Zinc	8⅝
Cerro de Pasco	35¼
Chile Cop	20⅜
Chino	38½
Colo. Fuel & Iron	38½
Crucible Steel	56¼
Crucible Steel, pf	90
Dome Mines	12⅛
Federal M. & S.	12
Federal M. & S., pf.	39½
Greater Nor., ore ctf	31¾
Greene Cananea	49
Gulf States Steel	68½
Homestake	92
Inspiration Con.	48⅜
International Nickel	32¼
Kennecott	36⅜
Lackawanna Steel	70
Mexican Petrol	160½
Miami Copper	25⅜
Nat'l Lead, com	64½
National Lead, pf.	104
Nev. Consol	18¼
Ontario Min	7⅜
Ray Con	22
Republic I.&S.,com.	76⅛
Republic I.&S., pf.	99¾
Sloss-Sheffield	46⅜
Tennessee C. & C.	15
U. S. Steel, com	96⅝
U. S. Steel, pf	112⅛
Utah Copper	79¼
Va. Iron C. & C.	58

BOSTON CURB*	Dec. 3
Alaska Mines Corp.	‡.12
Boston Ely	.80
Boston & Mont.	.15
Butte & Lon'n Dev.	.48
Calaveras	1¼
Chief Con	3¼
Contact	‡.05
Corbin	‡.25
Cortez	.15
Crown Reserve	.20
Crystal Cop	‡.30
Eagle & Blue Bell	2½
First Nat. Cop	2½
Houghton Copper	.30
Intermountain	‡.05
Iron Blossom	.55
Iron Cap	.16
Majestic	.26
Mexican Metals	.27
Mines of America	‡1¼
Mojave Tungsten	.10
Nat. Zinc & Lead	.10
Nevada-Douglas	‡.39
New Baltic	1
New Cornelia	16¾
Oneco	.20
Pacific Mines	‡.35
Rex Cons	‡.05
Yukon Gold	1

SAN FRAN.*	Dec. 2
Alta	.03
Andes	.05
Best & Belcher	.02
Caledonia	.01
Challenge Con	.03
Confidence	.10
Con. Virginia	.12
Gould & Curry	.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.03
Mexican	.05
Occidental	.40
Ophir	.05
Overman	‡.01
Savage	‡.02
Sierra Nevada	.11
Union Con	.18
Utah Con	.01
Belmont	3.80
Jim Butler	.40
MacNamara	.23
Midway	.12
Mont.-Tonopah	‡.13
North Star	.08
Rescue Eula	.08
West End Con	1.25
Atlanta	.07
Booth	23
Comb. Frac	‡.02
Florence	.18
Jumbo Extension	.20
Kewanas	.09
Nevada Hills	.02
Nevada Packard	.36
Round Mountain	.21
Silver Pick	.08
White Caps	.14

COLO. SPRINGS*	Dec. 3
Cresson Con	4.93¾
Doctor Jack Pot	.04½
Elkton Con	.07½
El Paso	.20
Gold Sovereign	‡.02
Golden Cycle	1.74
Granite	.17
Isabella	.07
Mary McKinney	.08¾
Portland	1.08
United Gold M.	.15¾
Vindicator	.41

BOSTON EXCH.†	Dec. 3
Adventure	‡.60
Ahmeek	77
Algomah	.30
Allouez	47½
Ariz. Com	13½
Arnold	‡.20
Bingham Mines	‡9
Bonanza	‡.20
Butte-Balaklava	‡.35
Calumet & Ariz	67½
Calumet & Hecla	460
Centennial	‡13½
Copper Range	45½
Daly West	‡2½
Davis-Daly	5
East Butte	11½
Franklin	‡4½
Granby	‡79
Hancock	‡7
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	25½
Keweenaw	‡1
Lake	‡5½
La Salle	‡3
Mason Valley	3½
Mass	‡5
Mayflower	3¼
Michigan	3¼
Mohawk	55½
New Arcadian	1½
New Idria	‡13
North Butte	13
North Lake	‡.40
Ojibway	‡1
Old Dominion	40
Osceola	55
Quincy	‡67½
St. Mary's M. L.	42
Santa Fe	‡.50
Seneca	13½
Shannon	3¼
Shattuck-Ariz	‡16½
So. Lake	‡1½
So. Utah	.10
Superior	6½
Superior & Bost.	3½
Trinity	3
Tuolumne	.80
U. S. Smelting	47
U. S. Smelting, pf	46½
Utah Apex	3¼
Utah Con	8¼
Utah Metal	1¼
Victoria	‡2½
Winona	.75
Wolverine	21
Wyandot	‡.50

N. Y. CURB†	Dec. 3
Big Ledge	1 1/16
Butte & N. Y.	.50
Butte Detroit	.02
Caledonia	.33
Calumet & Jerome	.50
Can. Cop. Corpn	2 1/16
Carlisle	‡2
Cashboy	.07
Con. Ariz. Sm	1⅜
Con. Coppermines	6¼
Goldfield Con	.30
Goldfield Merger	.09½
Greenmonster	‡1/16
Hecla Min	5 1/16
Howe Sound	4½
Jerome Verde	‡.50
Louisiana	‡1/16
Magma	28½
Marsh	.03½
McKinney-Dar-Sa.	.48
Milford	‡.75
Mother Lode	.35
Nixon Nevada	.35
Ohio Cop	.75
Rawley	‡2¼
Ray Hercules	3¾
Richmond	‡.56
Rochester Mines	.52
St. Joseph Lead	14
Standard S. L.	⅜
Stewart	.16
Success	.10
Tonopah	‡3¼
Tonopah Ex	2 1/16
Tribullion	‡⅛
Troy Arizona	‡.10
United Eastern	4⅜
United Verde Ext.	‡35½
United Zinc	‡⅜
Utica Mines	‡.08

TORONTO*	Dec. 3
Adanac	.09
Bailey	.03
Beaver Con	.58
Chambers Ferland	.10
Coniagas	‡3.00
Hargraves	.02
Kerr Lake	5.75
La Rose	.31½
Lake Shore	.90
Min. Corp. of Can.	‡2.50
Nipissing	8.50
Peterson Lake	.08
Temiskaming	.31
Wettlaufer-Lor.	.03
Davidson	.65
Dome Exten.	.24
Dome Lake	.18
Hollinger	6.25
McIntyre	1.75
Newray	.12½
Porcu. Crown	.20
Teck-Hughes	.25
Vipond	.20
West Dome	.12

* Bid prices. † Closing prices. ‡ Last quotations.

Engineering and Mining Journal

December 14, 1918

Volume 106

Number 24

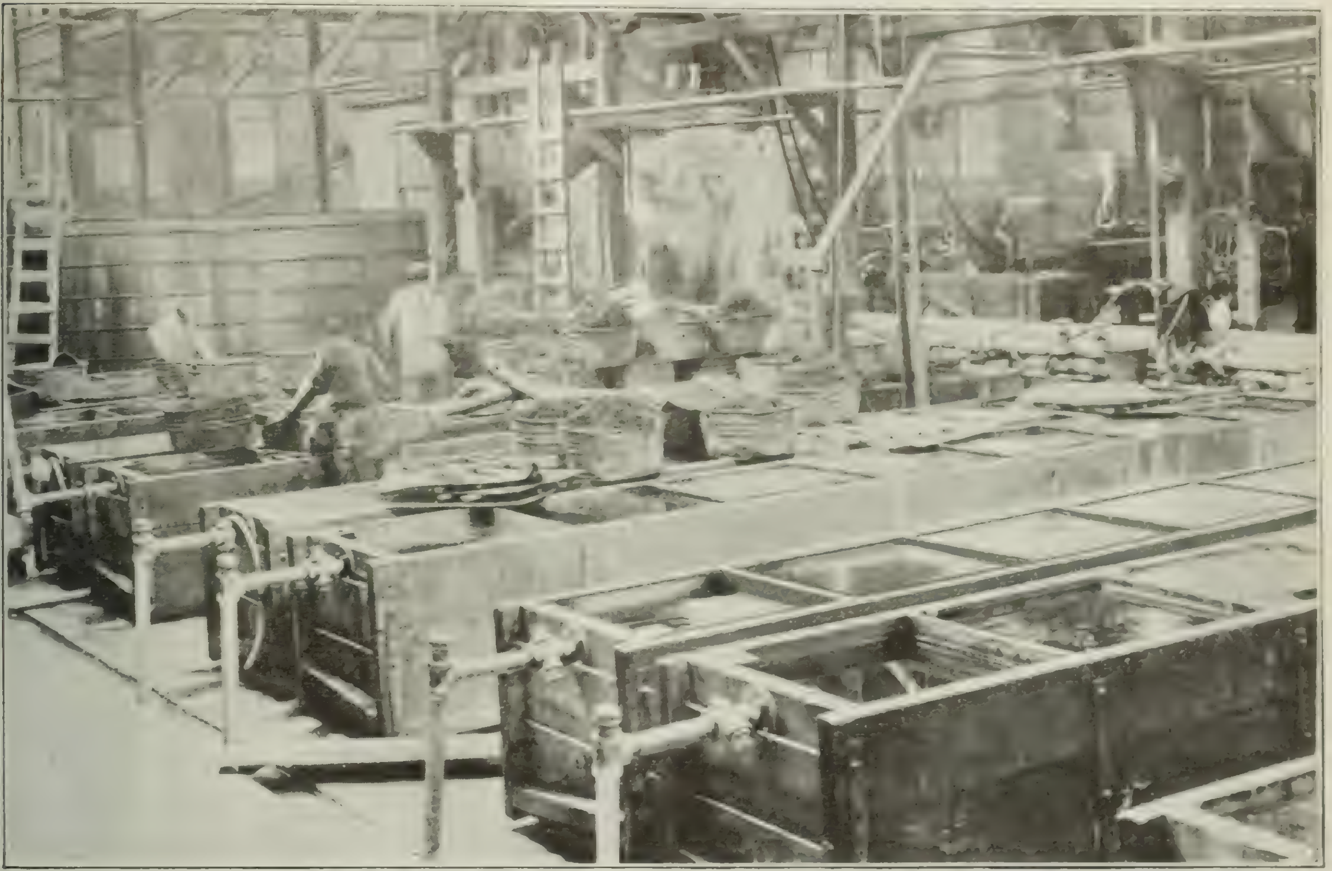

FIG. 1. CLEANING UP IN A CYANIDE PLANT

Zinc-Box Practice

By A. W. ALLEN

The continued and universal use of zinc shaving for the precipitation of gold and silver from cyanide solutions is indicative of the practicability and advantage of that method. A sound reason for its retention is that good results may be achieved without fine adjustment. High-grade bullion may be obtained by simple methods of control, one of the principal advantages of the system being that excess zinc, used in quantity to insure complete or nearly complete precipitation, may be screened off from the valuable precipitate, thus avoiding undue contamination with base metal used as a precipitant, and insuring a high-grade product without excessive refining costs. So long as the zinc-shaving method is not replaced by something even simpler and less "fool-proof," there is little likelihood of its being relegated to a position of minor importance.

THE continued utilization of zinc shaving as a precipitant of the precious metals in a pregnant cyanide solution may be adduced as a justification for epitomizing the various improvements in method which have been evolved during many years of practice. Until an even more simple method is introduced there will be ample scope for the installation of zinc-shaving plants, especially among the smaller installations. The zinc-shaving method of gold and silver precipitation was the first successful process, from both the commercial and metallurgical aspects; and was an integral part of the original MacArthur-Forrest method.

The introduction of a number of improvements in connection with the use of zinc, aluminum, and charcoal dust has resulted in the focusing of a considerable amount of attention on the use of a precipitant that may be automatically added, in proper proportion, to the solution; but it must be realized that an exact adjustment of feed, to precipitate a varying metal content, is impracticable under ordinary conditions. The alternative is to add an excess of precipitant, and so insure against fluctuations that may occur in the grade of the solution. If the ore is of variable grade, it is often found impracticable to avoid either the trouble of admixture of precious metal with excess precipitant, or the imperfect precipitation of the metal on account of occasional shortage in the supply of the precipitant. The last-mentioned result must usually be avoided at all costs, because it generally leads to an otherwise avoidable loss of dissolved gold or silver in the residue.

POWDERED CHARCOAL AS A PRECIPITANT

The use of an excess of precipitant is followed by no adverse results when gold or a gold compound may be precipitated by powdered charcoal. The excess of precipitant does not foul the solution, and, although the extra ash produced naturally increases the cost of smelting, no difficulty is found in separating the ash from the gold by means of heat and simple fluxes. With metallic precipitants, the necessity for the addition of excess base metal is often unavoidable if low-grade "barren" solution is needed; and provision must be made for fluctuation in precious-metal content. The primary cause of such excess may be fouling of the solution. The secondary effect is the fouling of the precipitate, which may be remedied by the introduction of the necessary refining plant. In large installations such a modification is often justified. In medium-sized and small plants there is a disposition to look for a simpler and equally effective solution of the problem.

COMBINATION DUST AND SHAVING PRECIPITATION

When the advantage to be gained by the use of a pulverized precipitant for the removal of the bulk of the gold and silver is recognized, it has been found practicable to precede ordinary zinc-shaving precipitation with the use of a zinc-dust process, whereby a much higher-grade product is obtained as a result of the subnormal use of the precipitant and the avoidance of an unnecessary contamination of gold and silver with excess zinc. The partly precipitated solution is then barrenized by being passed through zinc shavings, from which the metals are recovered in the usual way.

The conservative retention of zinc shavings is almost entirely due to the fact that the design and construction of the equipment present no difficulties, and operation and adjustment are exceedingly simple. The economy of the method, in many instances, may be questioned, but it possesses the great advantage of being universally applicable as a precipitant in the cyanidation of ores of almost every class, and of solutions of even the lowest grade. An immense surface of precipitant can be provided, and excess zinc can be to a large extent removed from the resulting precious-metal sludge by simple screening or other separating methods.

In cyaniding silver ores it is practicable to operate so that all excess zinc is returned to the boxes after the precipitate has been separated out by means of screening. A comparatively coarse shaving is suitable, as the problem of the elimination of excess zinc associated with the silver presents no difficulties, and 1-400 in. in thickness may be used. Even coarser cutting is often found desirable. With gold ores, on the other hand, there is usually a variable amount of "short" zinc which it is not advisable to return to the boxes. This is, therefore, either roasted or acid treated. Under such conditions it is advisable to use a fine shaving, and 1-750 in. is a thickness often adopted. Owing to the varied conditions prevailing in cyanide work, it is preferable to experiment with a number of thicknesses of shaving before deciding as to the type most desirable.

HINTS ABOUT DRESSING BOXES

One of the commonest causes for zinc-box trouble is due to cloudy solutions. For this there is no excuse. Slime can be separated by simple means, and very fine flocculent material, remaining after opportunity to settle has been provided, should be removed by means of a clarifying press. The press should be required to handle only exceedingly fine matter. The amount of this is usually small, so that crystal-clear solution is always passing through the boxes, and the filter press needs cleaning out only occasionally. Ample storage for unclarified solution is advisable; and it is usually practicable to erect the vat to carry this at an elevation, so that the gravity pressure will be sufficient to insure continuous filtration in the press. A head of from 15 to 30 ft. is usually ample, although a greater pressure may be useful if an abnormal amount of obstinate non-settling matter is found in the solution.

CALCULATING ZINC-BOX CAPACITY

Zinc-box capacity is calculated on the basis of the number of tons of solution that can be satisfactorily precipitated per cubic foot of zinc, in position, per 24 hours. This datum is found empirically, but too much reliance should not be placed on the tests usually made to determine it. Zinc boxes are cheaply constructed, and an additional two or three compartments, over and above the number actually required, will be found an invaluable aid in simplifying operations and in shortening the time of clean-up.

NUMBER OF ZINC-BOX COMPARTMENTS MAY BE VARIED

Assuming ample capacity, a great saving of labor will be effected by adopting a system which takes into consideration the fact that the precipitating efficiency of a compartment of zinc shavings gradually decreases from the time circulation begins. If no excess capacity is provided, the adjusted amount of zinc will suffice to satisfy precipitation requirements for so short a time that perpetual dressing is unavoidable. This is undesirable, and may be prevented by the exercise of a little forethought.

A seven-compartment box, such as is illustrated in Fig. 1, is one of a number of types in common use. Experimentation may indicate that complete and satisfactory precipitation is possible with four freshly packed compartments. Further empirical data should be obtained to demonstrate the period which will ordinarily elapse before the barren solution gains in metal content, on account of the disintegration and short-circuiting of the solution and the occlusion of the zinc surface with deposited gold and silver. A little investigation may show that 48 hours will elapse before there is appreciable rise in the grade of effluent solution. The fifth compartment in the box may then be packed; and, if this action staves off a rise in metal content in the effluent for 24 hours, the sixth compartment can be packed during the next day. The work of filling a clean compartment with fresh zinc is a matter of only a few minutes; and, by adopting a suitable modification of the plan outlined, a considerable saving of labor may often be effected, and the liability of mechanical loss of precious metal may be correspondingly reduced.

CONCENTRATION OF PRECIPITATE NECESSARY

An objection to the aforementioned plan—that it will involve an undesirable distribution of precious metal over the surface of a large amount of zinc—does not hold good for about half the usual time between clean-ups, that is, during that period which immediately follows one of them. With the approach of a clean-up, it becomes necessary to dress the boxes more often, and so make conditions most favorable for the disposition of the maximum amount of precious metal with the minimum amount of zinc. Therefore, fresh zinc should never be placed in the first compartment. If a layer of coarser material is needed to ensure even percolation of the solution, or to form a bed for the short zinc which has accumulated, long filaments from one of the lower compartments, which are already plated, should be used.

FIRST COMPARTMENT NEED NOT BE ALWAYS FILLED

The first compartment in a zinc box need not always be filled with precipitant. It is highly advisable that the dissolving effect of the incoming solution, always greatest at its first contact with the shavings, should be expended on short zinc, and this attacking action should be concentrated on the first compartment as much as possible before the clean-up, and the precious-metal sludge removed in a concentrated form. It is, therefore, better to reduce the depth of fine material in the first compartment, rather than to add too much coarse shavings. A considerable saving in time and expense has often been made by regulating the box-dressing operations along the suggested lines.

UNDESIRABLE FEATURES IN ZINC-BOX DESIGN

A few types of zinc boxes may be mentioned in order to discourage their further use and possible adoption. One of these has a flat, level bottom, and cannot be cleaned up without an inordinate amount of labor. The second type has either flat or sloping bottom, but no means of drainage. A third undesirable type is of such dimensions that, when dressing or cleaning up, two operators, one on each side of the compartment, cannot conveniently reach all parts. A fourth type to be avoided has the bottom of each compartment sloping to a central discharge point, which is, therefore, in an inaccessible position underneath the box. The discharges from each compartment are directly connected with a main pipe by means of T-pieces; and flow is controlled by means of wooden plugs driven from the inside of the box, which are accessible only when the solution is lowered. Apart from the difficulty, if not impossibility, of regulation at clean-up times, the trouble which must inevitably occur with heavy gold or silver precipitate in an inaccessible pipe can well be imagined.

A type of zinc box that is eminently satisfactory, economical to operate, and neat in appearance is shown in Fig. 2. It will be noticed that it is supported on an iron framework base, thus permitting absolute cleanliness underneath. A smooth concrete floor, draining to the clean-up or other sump, is, of course, a feature of construction.

CLEAN-UP PRACTICE

Previous to the clean-up it is advisable to operate the boxes with a minimum of zinc consistent with satisfactory precipitation. Periods between dressings will become less as the date approaches. The final dressing before the clean-up should include the moving up of all the zinc in the lower compartments of the box, and the cleaning out of the last three or possibly four compartments, by transferring any cloudy solution, or sludge found below the screen, to the point of solution intake, so that the gold and silver precipitate in it can be recovered at the clean-up.

Just before the clean-up it is often practicable to fill two or even three of the lower compartments with fresh zinc. These will accumulate no appreciable quantity of metal during the space of 12 hours or so. When the busy day comes, not only will it be unnecessary to touch these compartments, but it will be possible to begin the flow of solution as soon as the upper compartments have been cleaned out, and the excess zinc has been returned.

LABOR AND TIME SAVING AT THE CLEAN-UP

In most plants no extra skilled help is available at clean-up time, and attention must often be divided between the clean-up and regular routine duties. Under these conditions any plan that insures labor saving, without in any way impairing the results, should be encouraged by the superintendent. If the work connected with the monthly or semi-monthly clean-up can be distributed more evenly over the day preceding and that following, as well as over the busy day itself, operations will be found to proceed much more smoothly. The adoption of the suggestions outlined in the preceding paragraph resulted in a saving of 12 hours in cleaning-up operations in one plant, with the very reverse to impairment of efficiency. The zinc boxes were all in operation before noon on the opening day of the clean-up, whereas previous practice had invariably resulted in delays that postponed transference of unpressed precipitate, the teasing of zinc, and the packing of the boxes far into the night. When important work is afoot, attention should be paid, in preliminary planning, to that arrangement of routine which eliminates the unnecessary, so that the chaos that too often accompanies a clean-up may be avoided.

DISTRIBUTION OF ZINC AT CLEAN-UP TIME

The half-tone at the beginning of this article is an excellent illustration of what should be avoided. The boxes were erected so that the operator must stand in a back-breaking attitude to do his work; and a use for the valve placed on each of the exit pipes can be known only to the designer. The number of tubs of plated zinc standing around and piled on top of the boxes is reminiscent of the confusion that often exists when an inexperienced hand is setting out on a journey, and, as a preliminary, has surrounded himself with his numerous effects before beginning to pack his trunks.

Little or no long zinc need be removed from the box in most instances. The adoption of a logical system will obviate a great amount of labor, and save time and temper. It may be assumed that the contents of the first two compartments are fairly well down when the work begins. Immediately after the solution (or cleansing water) has been shut off, the amount of liquor in these two compartments should be reduced to a minimum, so that only sufficient remains to make the washing of any long zinc effective. The liquid may be lowered by bucketing the surplus over the edge of the first compartment, so that it passes into the bottom of the second, and so on. Any coarse zinc remaining in the first compartment is then washed, before the screen is raised, and transferred to the second compartment. As soon as practicable the valve or plug on the outlet pipe is opened, and the contents of the compartment are flushed to the clean-up sump, over which the necessary sieve is placed.

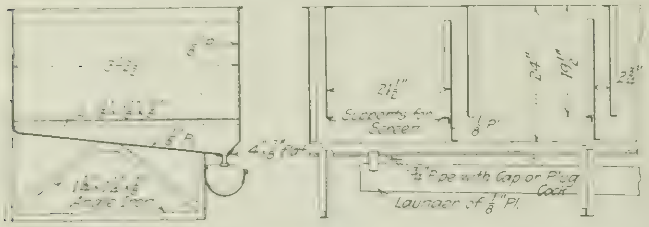

FIG. 2. CROSS AND LONGITUDINAL SECTION OF WELL-DESIGNED ZINC BOX

The screen to support the zinc is washed with a spray, and replaced; and repacking is begun. A layer of plated zinc, taken from a lower compartment, forms a suitable bed, after which the coarse zinc is replaced, and the compartment finally filled with washed zinc from the second compartment, which is then cleaned out and filled in the same way. In lowering the solution level in subsequent compartments, any slightly cloudy liquid encountered can be returned to the first compartment.

The cleaning-up of any number of units is merely a question of duplicating the method described. It is entirely unnecessary to permit trays and tubs of oxidized steaming zinc to remain exposed in the manner frequently to be observed. Except as to the treatment of the material in the first compartment, already detailed, all zinc, as soon as washed, should be immediately packed in another compartment.

New Zinc Addition Often Unnecessary at Clean-Up Time

If the practice of cleaning out and filling up the final compartments just before the clean-up is adopted, it will, unless a considerable amount of zinc is removed, obviate the necessity for the handling of new zinc, or, in any event, only a small quantity will be necessary on the day the boxes are cleaned out. One or two empty compartments may be left in the center of the box, but this is of no consequence, and the regular arrangement can be resumed as soon as the clean-up is over and there is opportunity to attend to unimportant and temporarily deferred details.

Rate of Solution Flow Through Zinc Box

An important factor in successful operation is correct rate of flow of solution through the zinc box. The supply pipe is not invariably under a constant head, so that it is impossible to adjust the amount of solution entering the box according to the position of the hand-wheel on the valve. Usually the level of the liquor in the last compartment is taken as a rough indication or the exit pipe is plugged so that only a certain amount will pass through. All these methods are unsatisfactory. A rapid method of computing, with tolerable accuracy, the rate of flow in fluid tons per 24 hours is imperative, so that this may be adjusted to conform to the condition and quantity of zinc in the box. Greater attention to this detail results in a saving of cyanide and zinc, and insures uniformity in grade of tai solution.

Rate of Flow Based on Weir Measurement Formulæ

Realizing that the ordinary compartment, with its leveled overflow, presented unusual opportunities for an estimation, by means of the ordinary weir formulæ, of solution passing, I once decided to control the flow by regulation, after measuring the height of the liquid at the back of the last compartment, as compared with the level of the partition at the point of overflow. Owing to the comparatively narrow limits of rise and fall direct estimations proved to be impracticable, but results would have been better had the overflow width fo this particular compartment been constricted to a few inches. The measurements were made by means of burette with stopper removed, placed in the compartment. Inside this there was a float indicator, on th top of which a wire finger indicated the rise or fa by means of a scale on the outside of the burette.

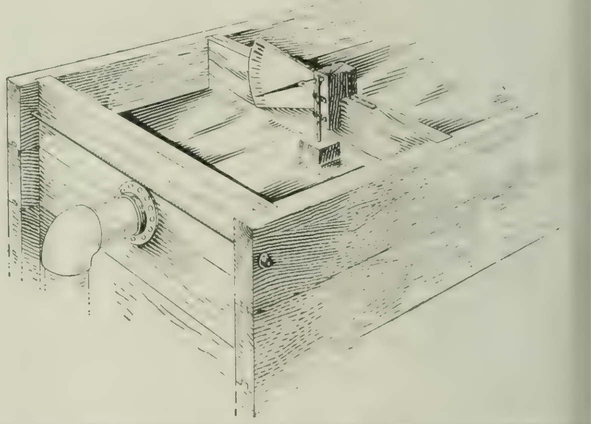

FIG. 3. RECORDER SO GRADUATED AS TO INDICATE SOLUTION FLOW

None of the well-known tables in various engineering pocket books, or treatises on hydraulics, were o any value for weir measurements of a fraction or so o an inch in water depth, and attempts to compute a ne formula which would give consistent and truthful results for very low heads were unsuccessful. It wa therefore decided to graduate the recording apparatu by means of figures obtained empirically. For this pu ose a cubic foot measure was taken and the tonnage lculated by time according to the table presented erewith. A recorder was built, as shown in Fig. 3, hich could doubtless have been improved upon had etter facilities existed.

ABLE FOR CALCULATING APPROXIMATE FLUID TONS PER 24 HOURS BY TIME TAKEN TO FILL A 1-CU.FT. MEASURE

econds	Tons per 24 Hours	Seconds	Tons per 24 Hours	Seconds	Tons per 24 Hours
1	2700	21	128	41	66
2	1350	22	123	42	64
3	900	23	117	43	63
4	675	24	112	44	61
5	540	25	108	45	60
6	450	26	104	46	59
7	386	27	100	47	57
8	337	28	96	48	56
9	300	29	93	49	55
10	270	30	90	50	54
11	245	31	87	51	53
12	225	32	84	52	52
13	207	33	82	53	51
14	193	34	80	54	50
15	180	35	77	55	49
16	169	36	75	56	48
17	159	37	73	57	47
18	150	38	71	58	47
19	142	39	69	59	46
20	135	40	67	60	45

Efficient control of solution-flow through zinc boxes s a matter of considerable importance. The quantity nd condition of the zinc varies from day to day, and utomaticity is consequently impracticable. A method f direct reading should therefore be welcomed.

Ontario Mines Production in 1918

The returns received by the Ontario Bureau of Mines from the smelteries, refining works, and metalliferous mines of the province for the nine months ended Sept. 30, 1918, are summarized in the accompanying table, which, for purposes of comparison, gives figures for the corresponding period in 1917:

SUMMARY OF ONTARIO MINES PRODUCTION, FIRST NINE MONTHS, 1918

Product	1917	1918
Gold, oz.	326,779(*a*)	332,644(*a*)
Silver, oz.	15,236,002	13,145,596
Cobalt, metallic, lb.	295,866	317,291
Copper, metallic, lb.	....	359,713
Nickel, metallic, lb.	166,921	582,992
Nickel oxide, lb.	10,831	5,592
Cobalt, oxide, lb.	276,769	397,728
Other cobalt and nickel compounds, lb.	276,217	367,923
Molybdenite, lb.	65,827	43,631
Lead, pig, lb.	1,080,000	1,291,571
Nickel in matte, tons	31,064	33,508
Copper in matte, tons	15,928	17,052
Copper ore, tons	2,658	16
Iron ore, tons	138,808	164,243
Pig iron, tons	513,232	541,564

In 1917 nickel and copper in the form of matte were valued at 25 and 20c. per lb. respectively. For 1918 the values have been placed at 30c. for nickel and 20c. for copper.
(*a*) Estimated by dividing value by $20.67.

Gold production has been well maintained for the period, considering adverse war conditions, which have been aggravated rather than improved during 1918. The signing of the armistice on Nov. 11 will have the effect of releasing men almost immediately from munition plants, and this will tend to relieve the labor shortage which the mining industry as a whole has experienced. The value of the output, $6,875,766, exceeds that for the corresponding period in 1917. This was produced from [illegible]11.185 tons of ore milled. In addition, 65,939 oz. of silver, worth $64,029, was recovered. The Hollinger and the McIntyre mines continue to be the largest producers the output respectively being valued at $4,685,586 and $1,206,875. New producers this year include the Davidson, at Porcupine; the Patricia, at Boston Creek, and the Lake Shore, at Kirkland Lake. From the last mentioned, since milling operations started in March, 11,253 tons of ore was treated, with a recovery in gold and silver of $271,265, or $24.10 per ton. At the Boston Creek a new find of gold telluride on the Miller Independence has attracted a great deal of attention to this camp.

Despite a decline in ounces produced, the output of silver for the first nine months of 1918, if maintained for the rest of the year, will probably equal in value that of any other year in the history of the Cobalt camp. The average New York price of metal for the period was 95.21 c. per oz., the present price of silver being $1.01½. Mines shipping 750,000 oz. or over are Nipissing, Mining Corporation of Canada, Kerr Lake, and O'Brien. Shippers this year to date include mines that have been idle for some time. Among them are the Edwards & Wright, Ltd., operating the Green Meehan, at North Cobalt; the Silver Eagle and Keeley mines, in South Lorrain, and Peterson Lake. Many of the mines are now treating slimes and tailing dumps by flotation methods.

The southern Ontario refineries treated 2758 tons of ore, 1208 tons of concentrates, and 1847 tons of residues, with a recovery of 3,655,975 oz. of silver, in addition to cobalt and nickel in the form of metal, oxides, and other compounds of these metals. About one-third of the output of cobalt metal by the Deloro Smelting and Refining Co. was used in the production of "stellite." Nickel metal from silver-cobalt-nickel ores was marketed to the extent of 224,787 lb., worth $89,275.

The only copper-ore shipment was a trial lot by the Hudson Copper Co., of Havilah. High operating costs, increased freight rates and smelting charges, and lack of a customs smeltery within the province contribute to make copper mining unprofitable at present. As a result of the operations at the new Port Colborne refinery of the International Nickel Company of Canada, there was a production of metallic nickel and copper from nickel-copper matte. The refinery started last July, and up to the end of September had produced 358,205 lb. of nickel and 359,713 lb. of copper. The Copper Cliff and Coniston smelteries treated 1,141,089 tons of ore, producing therefrom 64,926 tons of matte, containing 33,688 tons of nickel and 17,232 tons of copper.

The production of pig lead was in excess of the 1917 output, but a lower price prevailed. The only mine and smeltery operating is that of the James Robertson Estate, at Galetta, on the Ottawa River. The entire product is shipped to the headquarters of the company at Montreal. The output of molybdenite concentrates shows a decrease. Molybdenum is one of the war metals, and as a result of the armistice the demand has declined. Early in the year the International Molybdenum Co., of Orillia, and the Tivani Electric Steel Co., of Belleville, produced ferromolybdenum to the extent of 19,410 lb., worth $59,153. Electric Foundries, Ltd., of Orillia, produced in experimental work 1800 lb. of ferromanganese. This last-mentioned company and the Tivani company are now engaged in the electric-furnace production of low phosphorus pig iron.

Remember the Comfort Fund of the 27th Engineers.

Feeding Flotation Oil in the Coeur d'Alenes

By C. T. Rice

Some flotation oils flow freely and can be dripped by simple means into the pulp stream in even and regular quantity. In this paper various methods and contrivances adopted to insure a regular supply, of the proper quantity, of the various classes of oil, are described and comment made thereon.

As THE oils used in the Cœur d'Alenes are practically all easy-running, clean oils, such as No. 5 G. N. S. pine oil, No. 2 Cleveland-Cliffs hardwood creosote, No. 8 G. N. S., No. 350 Pensacola and pine tar oils, they are generally dropped in the pulp from a can through an ordinary cock. At a few of the mills, feeders are used. One of the best of these is the pump used at the Gold Hunter plant. Others are on the displacement idea first adopted in the district by Mike P. Dalton, at the Frisco plant, when difficulty was experienced in feeding the oil regularly and in a small enough amount. In such displacement feeders, water is dropped through a pipe that carries it underneath the oil in the can that feeds it to the pulp. Thus, by regulating the drip of the water, the feed of the oil is also regulated. When a collector oil, as a heavy creosote, is to be fed, it is often mixed with enough No. 5 pine or other light oil to make it lighter than water, and then fed to the pulp by displacement. The favorite proportion is 80% pine oil to 20% heavy creosote. Often it is not desirable to have any more of the lighter oil in the pulp than is already in it when the collector is added. When that is the case, the displacement feeder can still be used by making up a salt solution of sufficient strength to float the heavy oil. Then the oil can be displaced by dropping this solution into the oil well. This method of feeding heavy oil was used at the Bunker Hill & Sullivan plant when different oils were being tried on Bunker Hill ore.

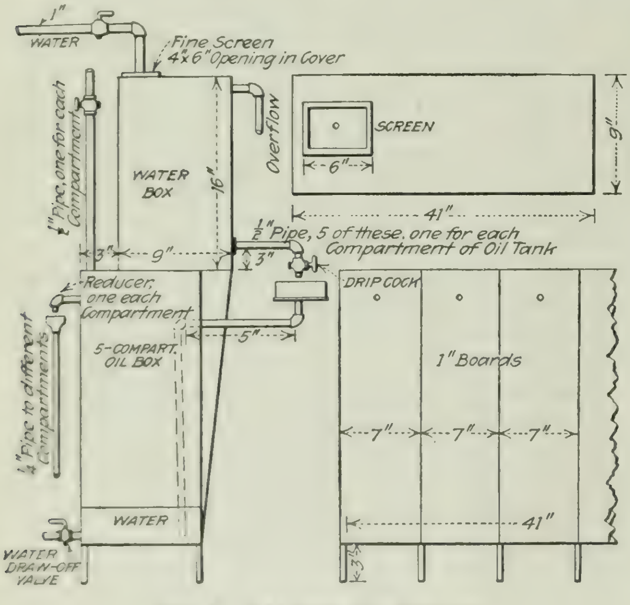

FIG. 1. DALTON OIL FEEDER

The Dalton type of feeder used at the Hercules plant to feed oil to the different compartments of the five-cell Janney machines treating granular slime is shown in Fig. 1. Sight glasses are used on the oil wells of one of the feeders to show the amount of oil that is in each of them at any time, but it has not been found to be of sufficient advantage to warrant its installation on the latest type.

A pipe carries water to an upper box, which constantly overflows so as to keep the pressure the same at all times upon the different cocks from which the water is dripped into the oil boxes below. The pipe that catches each water drip enters the oil well at the side and near the top, and then goes down through the oil almost to the bottom of the well, so as to displace the oil without mixing with it. Each oil well has a drain pipe through which the water is drawn off when more oil must be added to the well. At the Hercules plant, the oil used in the different flotation machines is piped to the feeders from a large steel tank at the top of the mill, into which oil is loaded from the upper railroad track, a tank car at a time. This is an especially convenient and economical way of handling the oil when much is used.

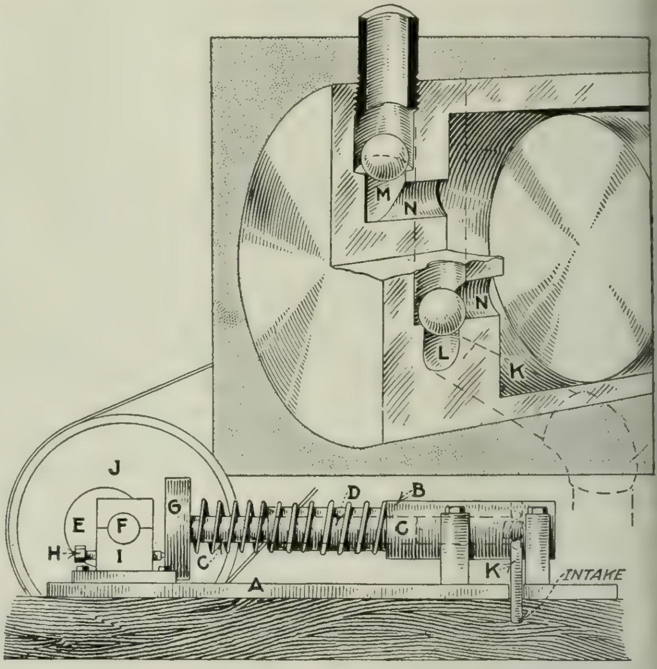

FIG. 2. OIL FEEDER USED AT GOLD HUNTER PLANT

Details of the construction of the oil feeder used at the Gold Hunter plant are shown in Fig. 2. The feeder consists of a steel base plate *A*, 10-in. long by 4 in. wide by ½-in. thick, bolted to a timber. On this is attached the brass pump cylinder *B*, and the bearings *I*, that carry the drive shaft *F*. On this shaft is bolted the pulley *J* and the cam *E*, which is nothing but a cylindrical disk mounted eccentrically on the driving shaft. This disk operates against another disk, *G*, shrunk on the end of the pump plunger *C*. The forward travel of this plunger is effected by the push of the eccentric disk against the disk end of the plunger. Its reverse motion effected by a spiral spring which surrounds the plun- er guide box *D* and seats against the end of the cyl- der. Stroke adjustment is made by the screw *H*, hich is mounted in a small pedestal carried by e base plate and which regulates the travel of the unger and the amount of the oil fed. The guide barrel is made of brass and screws into the end of the cyl- ider *B*. This cylinder is made by boring out a barrel r the plunger in one end of a brass block and then con- ecting this cylinder pocket by $\frac{5}{16}$-in. ducts, *N*, with ⅜-in. les, *L* and *M*, bored down from the top to receive ⅜-in. alls that act as valves to the pumps.

The oil enters the pump through duct *K*, $\frac{5}{16}$ in. in iameter, drilled from the side to connect with valve ocket *L* and tapped to receive a ¼-in. pipe. The oil ischarges through the top of valve pocket *M*, which is lso tapped to receive a ¼-in. pipe. Valve pocket *L* is milarly tapped, and is closed with a plug as soon as the teel ball that serves as the valve has been put into the alve pocket.

The feature of the pump is that it has no stuffing box nd uses steel balls for valves. It is simple in construc- on and design, and its parts are easily accessible. The lunger, cylinder, and guide barrel may at first seem ng, but they must be made so in order to give the pump ng life. In the absence of a stuffing box, dependence s placed entirely upon the long, tight fit between the lunger, cylinder, and barrel guide. At first this barrel uide was made much shorter than shown, but, owing to he side thrust developed by the friction between the riving disk and the end disk of the plunger, side wear vas such that in about four months the barrel guide had o be renewed. A long guide barrel was then adopted, and the pump has now run a year and a half without requiring any renewal and with little appreciable wear.

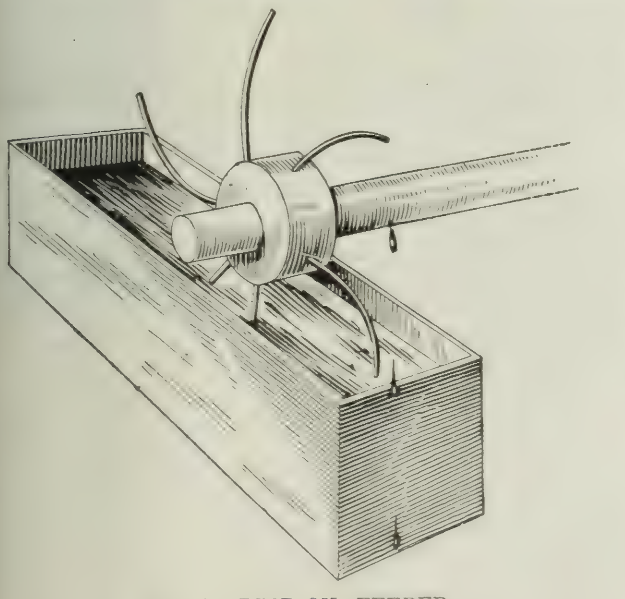
FIG. 3. DRIP OIL FEEDER

The driving shaft is belted so as to run at about 14 r.p.m., and the control screw is adjusted so that there is a travel to the plunger from ⅛ to ¼ in., according to the amount of oil needed by the pulp. Advantages in this pump are simplicity and positiveness of the feed, as well as its ease and delicacy of adjustment.

A simple and satisfactory oil feeder is the drip wheel (Fig. 3) used by H. M. Throndson at the Sweeney plant. This consists of a belt-driven wooden hub into which bent baling-wire spokes are inserted. These spokes dip into an oil pan and drop the oil as they reach the launder that feeds the pulp to the emulsifying Pachuca. This feeder is simple and effective, and the number of drops is easily changed by adding or taking out spokes or by altering the speed at which the hub rotates. The feed pan can be supplied by drip from another pan, through a cock, or in several other ways, but probably best by drip from a feed can. This wheel can be used to feed any kind of oil, light or heavy.

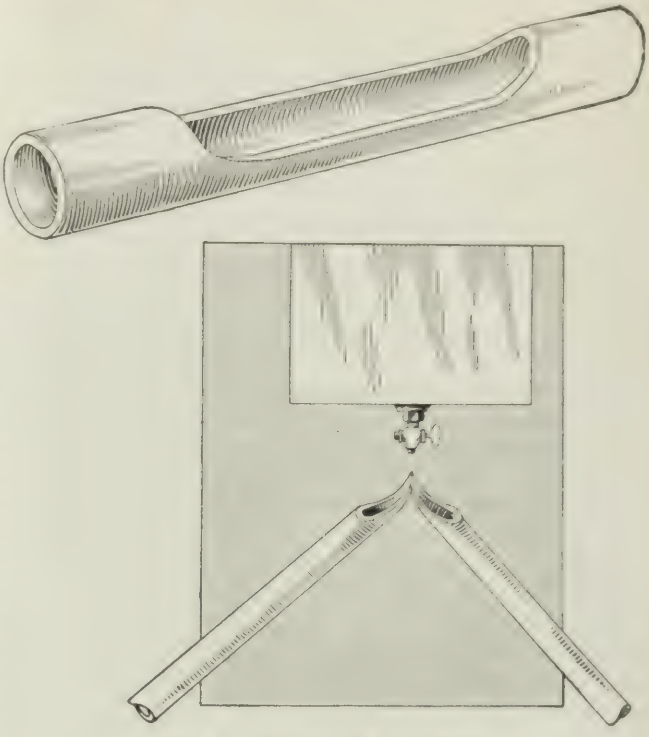
FIG. 4. OIL DROP SPLITTER

An effective way of splitting the oil feed that may prove of utility has been devised by Mr. Throndson. This drop splitter (Fig. 4) is made by taking a ½-in. pipe and cutting away half of it for a distance of about 4 in. along the middle. The pipe is then bent back so that the two legs form an angle of about 90° with each other. The edge formed by the bend is then filed to a knife edge, and the splitter is so mounted that the drop will fall on this edge and be cut in two.

Chino Copper Co.

The 28th quarterly report of the Chino Copper Co., covering the months of July, August, and September, 1918, shows that 932,000 tons of ore was treated, being an average daily tonnage of 224 more than for the second quarter. The average copper content of the ore was 1.6233%, as compared with 1.5773% for the previous quarter. The gross production of copper contained in concentrate from milling operations is given as 10,449,195 lb., but it is probable that 19,449,195 lb. is the correct figure. This compares with 19,030,992 lb. extracted during the previous quarter. Total income for the period amounted to $1,035,749.22, of which $869,980.00 was distributed as dividends.

Australian Metal Associations and Small Mines

MELBOURNE CORRESPONDENCE

Lead, zinc, copper, and, probably, tin are now being handled in Australia by the respective "Metal Associations." They arrange all exports and sales. During the scarcity of ships, these associations have been invaluable in securing f.o.b. contracts. However, through no fault of the Associations, the owners of small mines have not benefited by these f.o.b. contracts to anything like the same extent as have the operators of large mines.

The large mines have been able to join the large smelting works, and so obtain the lowest treatment charges. The small mine cannot do so. The owner of the small mine must sell his ore to one lead works, or to one copper works, as there is today only one custom plant for each kind of ore within the commonwealth. The operating costs of smelting works have risen along with all other costs, and their charges have necessarily been raised also. The owner of the small mine finds that his own costs have also risen, and that today, in spite of the high metal prices, his margin of profit is rather less than in pre-war times. As an example, a lead concentrate of 66% lead, 20 oz. silver, 14% sulphur, and 6% zinc was worth approximately £9 13s. per ton net return at works in May, 1914, and in May, 1918, it was worth £14 15s. The percentage of increase in net return is about balanced by the percentage of increase in charges, which were £4 14s. 6d. in 1914 and are now £7 5s. 3d. per ton. The owner of the small mine needs to make a larger profit than the operators of the large mine, as his quantity of material handled and general scale of operation are so much less. His costs, moreover, are higher than are those of the large mines, as his methods and equipment are necessarily less efficient. Thus, the owner of the small mine is forced to put back a far greater proportion of his profits into development than is necessary in the case of the larger mine, as his reserves of ore are small.

The future of the Australian mining industry is bound up with that of the small mines, for they are the potential "new producers." If some of them do not become large mines, the industry is bound to languish. Investors are loath to embark on new enterprises while the effect of the "peace gap" on the prices of metals is still so uncertain. They cannot see how any substantial fall in costs and returning charges can compensate for the expected fall in metal prices.

Australian Tin Production

SYDNEY CORRESPONDENCE

A review of Australian tin production during the last 25 years shows some curious fluctuations. Thus, in 1894, with tin at £68, about 5800 long tons was won, while in 1898 the yield was only 2400 tons, although the price of tin averaged £71. The maximum amount produced was in 1906, when, with tin at £180, about 6500 tons was exported. It would seem logical for the output to vary with the price of tin; nevertheless in 1910, with tin at £156, there was a production of 4500 tons; in 1916-17, with tin over £200, only about 2600 tons was produced, and last year, 1917-18, with tin nearer £400 than £300, the production was approximately 3600 tons. The last two periods are from June 30; the others are to Dec. 31.

In the period from 1894 to 1898, tin dredging, as now practiced, was unknown. New Zealand dredging methods were tried, adapted, and gradually improved, and the alluvial ground, too poor for the old methods, became valuable. The maximum yield of 1906 marked the end of the cheap dredging and hydraulicking methods, especially in the old tin fields which were formerly hand-worked by diggers. The alluvial deposits, both virgin and old, have been gradually worked out.

With tin selling at a price in excess of £200 in 1916-17, the low yield was caused by the combined effect of increased costs due to war, and decreasing alluvial areas, as well as the absence of new fields. The increase, only 1000 tons (from 2600 to 3600) in 1917-18 indicated the maximum production of the known tin deposits, under the stimulus of record prices.

Tin at a selling price of £400 per ton meant that ground yielding only half the tin per cu.yd. was profitable as compared with the conditions in 1910. One would expect under these circumstances that many alluvial and lode mines, hitherto unworkable, would come into production. No doubt, if there were any stability to the high prices, a large amount of such ground, now idle, would have been opened. It takes time to sample and equip the low-grade deposits, and capital, on any large scale, is shy, and the continuance of high prices is uncertain.

The truancy records of the public schools in some parts of New South Wales, Queensland, and Tasmania reflect the effect of high tin prices. The local boy reckons that 1s. for a jam tin of ore is well worth the risk of the cane.

Up to this year, tin has been unrestricted in Australia. In the future, the entire tin production will be handled by one Australian firm of metal buyers. The conclusion is that without new discoveries the Australian output will fall in spite of high prices. The possibility of new tin fields being discovered in the unprospected half of the continent is good. Favorable indications are not wanting, but the prospectors are few and old.

Ray Consolidated Copper Co.

The 29th quarterly report of the Ray Consolidated Copper Co., covering the months of July, August, and September, 1918, shows that 845,400 tons of ore was milled, containing 1.602% copper. The average daily tonnage is 9189, as compared with 9690 for the previous quarter. The decrease was due to floods and the shutting down of the mill for six days. The mill extraction was 75.18%, as compared with 75.81% for the previous three months. The gross production of copper contained in concentrate was 20,358,589 lb., and the total income was $883,348.34. Dividends absorbed $1,182,884.25, leaving a deficit for the quarter of $299,535.91.

The Fourth Liberty Loan—The Committee on Mining of the Rainbow Division of the Fourth Liberty Loan took third place with $55,000,000 raised in subscriptions.

Standardization of Mining Methods V—Fire Protection for Metal Mines[*]

By CHARLES A. MITKE[†]

Various causes are responsible for the 35 active mine fires that have occurred in the Southwest in recent years. The methods used by the different companies to combat fires are likewise varied, some of the features being open to question as to their efficacy. Mr. Mitke outlines a method of protection against fires, as well as of procedure when they occur, that may be found acceptable as a standard. The subjects of fires in shafts and stations and of those in workings are treated separately. Advantages of mechanical ventilation as an aid in fire fighting are again pointed out.

FIRES are the greatest hazards encountered in the development and operation of mines. The loss of life, damage to property, and utter disorganization of regular routine which frequently accompany them make them occurrences to be dreaded by mining organizations. The period of confusion immediately following their discovery and preceding the time when an organized method of attack shall have been planned is generally the most critical, due to the lack of definite working plans; men frequently expose themselves unnecessarily and often incur serious injuries, which at times prove fatal.

During recent years there have been approximately 35 active mine fires in the Southwest. Twelve of these were shaft fires, but the majority occurred in stopes, or in drifts and raises directly connected with stopes.

Causes of Mine Fires Varied

Fires result from many causes, among which are defective electric wiring, use of candles, spontaneous combustion in pyritic orebodies, and, I regret to say, incendiarism. In this connection it might be stated that 40% of the fires mentioned above were due to this latter cause.

Fires in surface buildings were formerly the cause of many disasters underground. The fire was communicated from the building to the shaft and thence to the mine workings. In recent years, however, steel headframes and other fireproof construction have come into general use, and timber connections between buildings and shaft collars have been avoided. A convenient water supply is always available, and the possibility of a mine fire from this source has practically been eliminated.

Friction, due to moving ground, intensified by caves and extreme pressure, is often the cause of fire in ores containing considerable pyrite, chalcocite or chalcopyrite, and recently it was demonstrated that a fire can exist in sulphide ores the sulphur content of which is approximately 3%. Fires in metal mines have become so frequent that almost every district has its history of them, and most companies are now taking precautions to meet such emergencies when they arise.

Various methods of fighting fires have been employed at the different mines with more or less success. The plan most generally resorted to in the past has been that of sealing up the fire or fire district, and allowing it to remain for a considerable length of time, extending in some cases over a period of years, while this portion of the workings was temporarily abandoned. This has proved fairly successful in mines containing large areas of low-grade ore, but where the mine is a high-grade producer, the removal of a large portion of the orebody from active stoping, even if only temporarily, would seriously curtail production.

At one mine, a complete mine-fan equipment has been installed on the lowest level, which may be started in case of fire by entering the workings through an adjoining mine. This, in addition to a fire-fighting equipment, consisting of portable blowers, ventilating pipe, bratticing, helmets, etc., together with a set of rules prescribing duties for the organization, makes up the fire-protection system.

Another company places entire reliance on teams of trained helmet men. It is expected that these will be able to cope successfully with any emergency which may arise.

A third mine has a system of bulkheading and patrol in force. Bulkheads are put in as seals at all stopes which are not in operation. Though the seals are not airtight, they could easily be made so in case of fire. The patrol has the specific duty of visiting every working place shortly after the men go off shift. Gates are put in at tunnel entrances to the mines and are kept locked both day and night. When the shift is going on, a watchman opens the gates and checks the men, allowing only those who have time cards to enter. When the shift goes off, the watchman again takes charge. If motors are to take timber and other supplies into the mine through the gates during the shift, it is necessary for the motorman to have a key to the gates in order to pass through. Screen gates, such as shown in Fig. 1, are also put in front of important shafts, so that it is impossible for any one to get near these shafts except when the foremen and bosses go through, or when the shift is coming on or going off. In the district in which this mine is situated there have been a number of incendiary fires which have necessitated these extreme measures.

Each Man's Duty Specified in Case of Fire

At a fourth mine a set of rules is in force which governs the actions of practically every man employed, from the one who discovers the fire right up through the organization to the operating department. For example: A miner discovers fire. He reports to the cagers, who in turn report to the hoisting engineer. The hoisting engineer telephones central and also the power plant, which flashes a general alarm and shuts off the mechanical ventilation. Central notifies the electrical, mechanical, safety, supply, and operating departments. Having notified the hoisting engineer, the cagers proceed to close all fire doors and turn water into the compressed-air lines while on surface. They then visit the different levels to see that the doors are shut, while the men who have received the alarm are coming to the shaft stations, there to be checked off by the shift boss. By this time, the men of the operating department arrive and take charge of the situation. Aside from these definite instructions to individuals, there is a complete supply of fire-fighting equipment always on hand in the mechanical department, and oxygen helmets and pulmotor are kept in stock, ready to be transported immediately.

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[*] The fifth of the series of articles which began in the Nov. 9 issue of the *Journal*. Copyright, 1918, McGraw-Hill Co., Inc.

[†] Mining engineer, Bisbee, Arizona.

At another large mine, signals are given on the lights, calling the men to the shaft stations, there to await orders. Refuge chambers are provided by means of drifts in dead ends on certain levels, where men may enter, close the door and turn on the compressed air and thus remain until the rescue party calls for them, if they are unable to leave the mine.

At practically all mines there are hoses and connections at the collar of the shaft so that a stream of water may be turned into the shaft in a short time. In some places a water line is run around the collar of the shaft so as to distribute the water properly. There is a possibility, in case of a fire, of the water not reaching it immediately by this method.

Methods Used Questionable in Some Ways

Some of the features of these fire-protection systems which are in use at the present time are commendable, while others are open to criticism. Merely turning a water line into the collar may not necessarily extinguish a shaft fire, as the water may not come in direct contact with that part of the shaft which is burning. On the other hand, a series of sprays placed at regular intervals in the shaft distributes the water in such a manner that every portion of the shaft becomes soaked in a few minutes.

Automatic sprinklers, which have been used to much advantage in buildings, are not suitable for use in shafts. These sprinklers operate when the heat of the fire becomes great enough to melt a plug, the removal of which allows the water to flow. They are extremely dangerous in shafts where there are no fire doors, for if a fire breaks out in the shaft, all the sprays begin to operate at a certain temperature and are not subject to control. This changes the draft and forces the smoke and gas into the workings, thereby endangering all the men in the mine. Consequently, if sprays of this character are to be used, they should be controlled by a valve on the surface and should be connected to a separate water line installed for this purpose.

Refuge chambers have been used to advantage in coal mines in case of explosion, but their value in metal mines is questionable, as the men have to depend on the compressed air which is piped into the chamber. Should a small cave occur near or over the compressed-air line, the pipe may be damaged and the supply of air cut off. In fact, it becomes necessary at times to turn water into the compressed-air line in order to put water on the fire, which, of course, necessitates turning off the compressed air entirely.

Chemical engines have been suggested for employment at mine fires. However, their use is accompanied by serious danger, which is apparent when one considers the large volume of gas—at least 100 cu.ft.—which is released with one charge. On the surface this would be diluted without danger to any one, but underground, it is merely another menace added to that of the gas produced by the fire.

Helmet Work Requires Careful Planning

Though helmet men are relied upon entirely at some camps, their work should always be mapped out with great caution. They should be sent into smoke or gas but a short distance. Only a limited amount of work can be expected of them, as a man wearing an oxygen helmet does only about 20% of the amount of work that he would do when working in good air without the apparatus.

Various forms of fire alarms have been suggested, such as turning off the compressed air, flashing an alarm over the electric wires, etc. The disadvantages of these are that the compressed air frequently goes off during the shift, due to other causes such as minor troubles at the power plant, and that in many cases electric wires do not extend into distant workings.

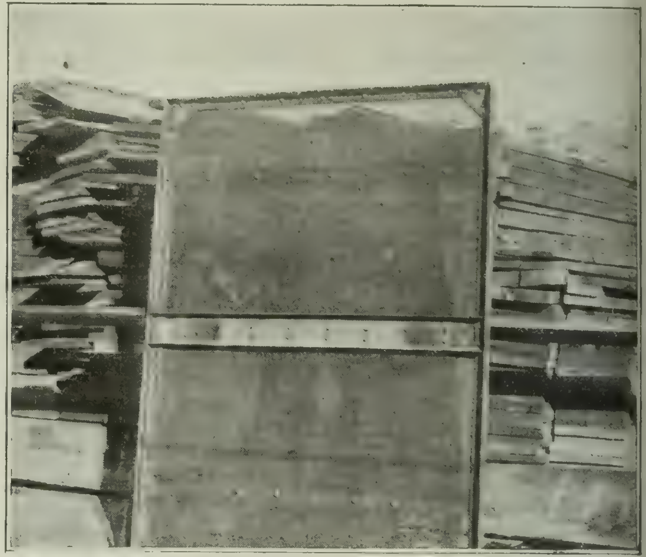

FIG. 1. TYPE OF SCREEN GATE USED IN FRONT OF IMPORTANT SHAFTS

Many working shafts are now being fireproofed by means of concrete or gunite. This is most effective but quite expensive and is not justified where the life of the shaft is comparatively short.

Standard Method Outlined for Protecting Shaft and Stations

All timbered shafts should have spraying systems installed. These act not only as a means of fire protection but may also be used to preserve the timber in dry shafts. Spraying systems should be placed in the shafts and shaft stations. They consist of a main water line, extending from the surface to the lowest level, with lines of spray on the dividers between the shaft compartments and above the timbers in the stations. The number of lines of sprays will be determined by the number of compartments in the shaft, a two-compartment shaft requiring only one line, and a three-compartment shaft two lines. The sprays, of the lawn-sprinkler type, should be placed about 25 ft. apart in the shaft and 10 ft. apart in the stations. Branch water lines, 1 in. in diameter, should connect the main line with the sprays. Small valves should be placed between the sprays and the main water line to permit regulation of the water at will. The system as a whole should be connected with the main fire-water line by a valve on the surface, from which it may also be controlled.

In case of fire in a shaft, should water be turned in, the smoke and gases are apt to be carried into the workings, as stated before, thus endangering the lives of the men. To avoid this contingency, wooden fire doors should be placed a reasonable distance from the stations, so that the draft can be controlled. Such doors serve to separate the shaft from the rest of the mine workings and should always be closed in the event of fire in the shaft.

PURPOSE OF FIRE DOORS TO CHECK THE DRAFT

Iron fire doors have been in use at many mines for a number of years, but the wooden door has proved equally satisfactory and much more economical. The purpose of all fire doors is primarily to check the draft and not to stop the progress of the fire. Should an iron door be subjected to intense heat it would warp and the draft pass through unchecked, thereby exposing the men to dangerous gases. Wooden doors should be installed far enough from the shaft so that some time will elapse before the fire reaches them.

Fig. 2 is a drawing of a wooden door, which is comparatively air-tight. It is made of double 1-in. boards with roofing paper in between, and is designed to fit against a set of timber and not into a frame. Otherwise any sag in the door or the frame or any swelling of the wood would prevent the door from closing properly. It is important that all doors should be hung in this fashion and merely overlap the timbers a distance of about 2 in. A 2-in. strip of canvas should be nailed on the timbers to make an air-tight joint.

Around the set on the sides and the back should be built a concrete stopping 8 in. thick. In the bottom of the drift no concrete should be used, but it should be built up with timber to about 2 in. above the rail, grooves being cut for the car wheels to pass. Standard iron handles should be made and heavy strap hinges used; also pulleys with 15-lb. weights to pull and hold the door tightly shut when closed.

SHAFT DOORS PROVIDED WITH AIR CONTROL

An air control, as shown in Fig. 2, should accompany each door. This is a simple and inexpensive device and affords accurate control. A 1-in. air line should be put in each shaft and connections made from it to each fire door of that particular shaft. If it be desired to close the doors on each level, a valve is shut on the surface, cutting off the compressed air, and a release valve opened, which automatically closes all the doors. These valves should be placed near the collar of the shaft, so that no time may be lost when an alarm is given.

It is important to keep the automatic closing device in good repair, as otherwise, in the event of fire, it would be necessary to send a man down to make sure that all doors had shut when the release valve was opened. An electric control of the doors would answer the same purpose admirably, but would cost more. Once closed, either by air or electricity, the doors can be reopened only by hand.

Fire extinguishers should be kept in the stations for immediate use in case of an outbreak of fire in the station or adjacent heavily timbered drifts.

FIRE RULES SHOULD BE POSTED NEAR COLLAR

A set of rules, similar to the following, should be posted on the surface near the valves which control the fire doors and spraying system, governing the actions of the men and the steps to be taken in case of a fire in the shaft:

First—Notify all men in the mine to go to a place of safety at once.

Second—Close the valve in the air line and open the release valve. This will close all fire doors.

Third—Open the water valve connected with all the sprays.

Mine telephones should be installed at important points, as they facilitate getting the men to a place of safety in the shortest time, though it is better to get all men out of the mine in case of a shaft fire. The prompt closing of the fire doors will prevent smoke and gas from entering the workings and allow an immediate attack to be made on the fire. The men will have sufficient time to make their exit through another outlet before the small amount of gas which may leak through the doors overtakes them.

FIGHTING FIRES IN WORKINGS MORE COMPLICATED

In the event of a fire in the mine workings, one of the most serious difficulties is that of removing all the men before the workings become filled with smoke and gas. For this reason it is necessary to provide means of giving a general alarm, so that all men underground may he warned as quickly as possible. Instructions should be given that upon the discovery of a fire the different sections of the mine should be telephoned and the alarm spread, and that the foreman and shift bosses be notified immediately. The men, upon warning, should go at once to the shaft station, where the shift bosses should check them and see that all have arrived.

As soon as the foreman is notified, he should take charge of the situation, instruct one man to telephone the mine office, have another put in the emergency call for the cager, and send others to the different working places to make sure that all the miners have been called to the shaft stations. He should then investigate the nature of the outbreak to decide how many men he will need to fight the fire and how many should be sent to the surface.

The mine office, as soon as informed, should notify all departments—supply, mechanical, electrical, pipe, safety, and operating departments. The cager should go to the level where the foreman is collecting his men and hoist them as fast as possible if it is found necessary to leave the mine. His duties should be to obey the foreman. It should also be understood in the organization that in case of fire, and until the arrival of the superintendent, the mine foreman should take charge of the situation, and, in his absence, the assistant mine foreman, and should he be away for any reason, then the senior shift boss. If it is found necessary to leave

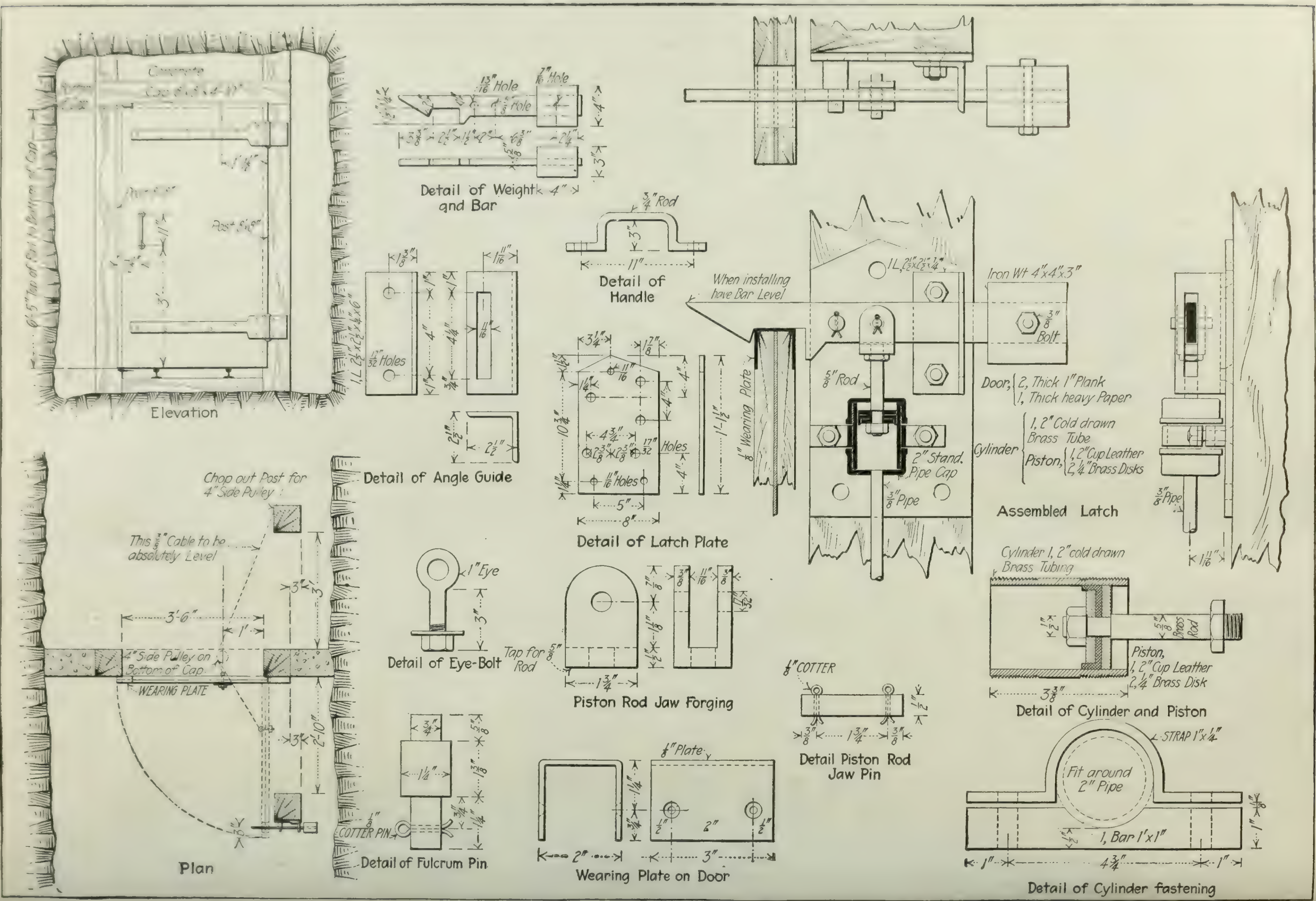

FIG. 2. DESIGN OF COMPARATIVELY AIR-TIGHT WOODEN DOOR WITH AIR CONTROL

the mine, the men should follow the regular routine and report to their timekeeper, who will check up the shift and advise the foreman if any are missing.

The compressed air should not be turned off and water turned in unless it is thought advisable by the foreman or superintendent. The same rule should apply to the ventilation. No change should be made in this except in case of fire in the shaft. Great care should be exercised in mines ventilated by mechanical means. It is seldom necessary to close down the mine fans; in fact, it is usually dangerous to do so, as the men are all accustomed to the general direction of the air currents, and, if these are changed, they are likely to go into dangerous places which were perfectly safe while the fans were running.

Fire-fighting equipment should be kept on hand at all times and ready for immediate use. As soon as it arrives, an effort should be made to extinguish the fire by putting the fire district under pressure, building brattices, etc. If the fire proves too big for these emergency measures, then a definite system of attack should be worked out under the direction of some one experienced in this line of work.

EQUIPMENT SHOULD INCLUDE FANS AND BLOWERS

Fire-fighting equipment should consist of one or more three-foot disk fans, and several 10-in. blowers, connected to 2½-hp. motors (fan and motor mounted on one base). These are necessary for providing mechanical ventilation in fighting the fire. All fans may be mounted on trucks so that they can easily be transported to the place where they are to be used and electric connections made. A roll of canvas or roofing paper should be kept on hand for bratticing; also about 300 ft. of 10-in. ventilating pipe for the blowers; 200 ft. of hose; 100 sacks of cement and sand; about 100 ft. of metal lath, 6-in. wide, which is to be used for bulkheads; and a supply of 1-in. boards, 10-penny nails, long 10-ft. nozzles, helmets, and a pulmotor.

The storage-battery blower has not proved successful as an aid to fire fighting. In the first place, the volume of air produced by the small blowers is of little consequence when attacking a large mine fire. The storage battery with blower complete is very cumbersome, especially when it is necessary to move it from one level to another. It has been found that small electric blowers, which can be transported from level to level within a few minutes, may be attached to the wires by electricians and put in operation in far less time than the storage battery kind. Moreover they can be kept in operation continuously, whereas the life of the storage-battery blower is limited.

MECHANICAL VENTILATION USEFUL IN FIRES

The advantages of mechanical ventilation as a means of preventing mine fires is apparent on noting that the cost of fighting fires in mines where it is employed is about 20% of that in mines using only natural ventilation, as has been proved in all the recent large mine fires in the Southwest. Furthermore, a large number of smaller fires have been extinguished in mines where mechanical ventilation is used before they had an opportunity to develop into big fires. This would have been practically impossible in mines where the ventilation is not controlled by mechanical means.

During recent years, when exploratory work is to be done at long distances through smoke and gas, mechanical ventilation is used to clear the atmosphere as far back as the fire district. This enables the helmet crew to maintain a station in the proximity of the fire, so that attacks can be made by going only a short distance, as, for example, 50 to 75 ft., thus ensuring safety, as it is then possible for the men to come out, even though one of the sets of apparatus should get out of order. This method also permits the largest part of the work around a mine fire to be done by men without the oxygen apparatus, so that a far more rapid attack can be made. When using mechanical ventilation to fight mine fires, fewer men have been knocked out with smoke and gas than in mines having natural ventilation.

NATURAL VENTILATION GIVES UNSTABLE CURRENTS

Another consideration of great importance is the continuity of air currents in a certain direction when mechanically controlled, as contrasted with those in mines where no mechanical system has been installed, and where the miners are subjected to the continual change of atmospheric conditions. In all cases of natural ventilation, such changes result in reversals of air currents, depending upon the season of the year, time of day, etc.

With the mechanical system, a mine in which a fire exists may be kept in continuous operation by putting the fire district under pressure and thus obviating long delays, large expenditures and curtailment of production, frequently incurred by the use of more expensive means of extinguishing the fire.

In case of fire in the mine workings, there should be no stopping of the air circulation, save in exceptional cases, when it is absolutely certain that all the men are in a place of safety and that the fire-fighting crew will not be endangered. It is the continuous circulation which makes possible the rapid attack on a mine fire, and therefore it should not be disturbed.

GOB FIRES REQUIRE SPECIAL HANDLING

A fire in a gob generally gives warning before it actually breaks out. Gases are given off which can be recognized as a sign of incipient or actual fire. A suspected district should be patrolled at least once each day, and if necessary, once each shift. When it appears likely that a fire may exist or may develop, the drifts and air courses should be opened to a separate exit, through which the smoke and gas may pass to the surface. Great care should be taken not to turn water into such a district intermittently. While this method has proved successful in leaching the heated ores, it has the disadvantage of generating a large amount of additional heat, which may prove dangerous to the surrounding district.

In dealing with such a problem, large volumes of air should be used continuously to cool the heated district before it actually takes fire. This is the most economical way of lowering the temperature of a sulphide fire district. If, however, the gases coming from the district indicate that fire actually exists, it is then necessary to keep a constant stream of water flowing over the hot area, while steps are being taken to mine out this material and send it to the surface. The waters naturally become charged with copper, and their acidity frequently damages the pumps and water lines as the water is pumped to the surface. In such cases, large quantities of iron and lime have been used to remove the copper from the water and neutralize the acid. However, the returns from the salvaged copper are usually far less than the damage done by such acid waters.

Doors should separate adjoining mines, so that a fire in one will do no damage in another. Old workings should be sealed off with screens instead of airtight bulkheads. This will allow free circulation and prevent rapid decay of timber, which results in caves.

In general, at least 10 ft. of ore or waste should be kept in all chutes. In case of fire from the stope above dropping into the chute, it can thus be checked before it burns out the bottom of the chute and caves in the entire drift beneath.

Arrows, marked "This Way Out," should be placed in all important drifts, pointing to another exit which is to be used in case the main shaft may not be used, owing to fire. This presupposes the existence of certain drifts and manways which are to be kept in good repair so that the men can climb to the surface in an emergency.

From time to time there should be conferences between the mine superintendent and his foremen and bosses, at which the question of fires in the different parts of the mine should be discussed, so that in case of emergency there will be no confusion, but each foreman and boss will know exactly what to do.

Westinghouse Electrical Equipment For Cottrell Plant

In refineries of different types there is always a possibility of some valuable byproduct being lost in the gases ascending the flue. This is particularly true in the metal-treating field, where it has now been found possible to save solid and liquid particles from the flue gases by an electrical process. This consists in passing the gases through tubes in which are suspended chains charged with high-voltage direct current, whereby the particles carried by the gases become electrified and are projected against the walls to the tubes. These tubes are grounded and thus the particles drop into hoppers below. Mechanical rectifiers convert the low-voltage alternating current into direct current.

An interesting application of this process was recently made in a copper refinery. In this particular installation there is another noteworthy feature—the size of the generating and transforming unit used. In plants of this type the electrical equipment is usually split up into a number of small units, but in this case all the current is handled by a single generator and transformer, although a duplicate set has been installed for emergency purposes. With this arrangement there is a sacrifice in flexibility of operation; but the use of large units makes the installation simpler and more compact. In all probability both arrangements will find a field where they are best suited.

The tubes containing the high-tension electrodes and through which the flue gases pass are arranged in six groups. The electrodes are suspended at the top from a rack which provides ample insulation, and are connected with the high-tension direct-current line at the bottom. Disconnecting switches permit the current to be cut off from any group during inspection and repairs. The gases from the furnaces pass through pipes 13 ft. in diameter, a Y, with valves, being provided so that the gases can be made to go either through the treater or directly to the stack, as desired. Tests show that over 90% of the flue dust can be removed, and that the value of the copper, zinc, and other metals recovered will within a short time pay for the treating equipment. It is calculated that at full load ½-ampere high-tension direct current is needed.

The generating equipment consists of two 40-kva. 60-cycle, single-phase Westinghouse generators operating at 1800 r.p.m., arranged to deliver voltage of from 150 to 250 volts. A direct-current power line supplies excitation current. A 50-hp. 230-volt, direct-current motor drives each generator. The transformers are of 40 kva. capacity, 200 volts low tension, and 100,000 volts high tension. Additional taps are provided, from which voltages of 50, 62½, 75 and 87½% of the maximum can be obtained, the full capacity of the transformer being available on each tap. The high-tension leads pass out from the transformers through condenser-type bushings, which are made up of alternate layers of metal foil and insulating material, and provide a higher degree of insulation than can be obtained from any other form of construction of the same diameter. Choke coils are located inside the transformers to smooth out the static surges liable to occur on the high-tension line. To the motor-generator shafts are coupled the rectifiers for transforming the high-tension alternating current into direct current.

The Westinghouse switchboard consists of two panels, one for each generating and transforming set. Each panel carries, from top to bottom, a circuit breaker on the line between the generator and transformer, an alternating-current ammeter and voltmeter, a switch to reverse the polarity of the high-voltage direct current, a motor field and line switches, a generator field rheostat, a five-point switch for making connections with five high-tension taps of the transformer, and the motor-starting rheostat.

The voltage of the high-tension direct current must be varied according to the condition of the flue gases being treated. The transformer taps provide the large steps for this variation, and the voltage adjustment of the generator the small steps. In addition, a bank of adjustable resistance is connected in series with the low-voltage alternating current, which acts as a ballast and permits of further adjustment of the voltage. These banks are situated on each side of the switchboard. Resistance is also provided in series with the high-tension direct-current line by resistance tubes mounted above the rectifiers.

Under ordinary operating conditions, the motor generators, as described, are employed so that there is no direct connection between the high-tension direct current and the power lines of the plant; but, in case of emergency, current from the alternating-current lines can be fed into the transformers and used to provide the high-tension operating current. Under such circumstances the rectifiers driven by the generators cannot be used, so in their place are employed auxiliary rectifiers driven by 2 hp. Westinghouse synchronous motors, which keep the rectifiers in synchronism with the current being rectified.

The Fluorspar Market and the Local Supply

BY A. L. SWEETSER

The aim of this paper is to awaken interest in the development of deposits of fluorspar which are known to exist in various parts of the country. The total production and commercial uses are described in detail, as well as the prevailing prices and the various industrial requirements.

FLUORITE, or, as it is commonly called, fluorspar, is the fluoride of calcium. Various industries last year consumed over 197,000 tons of fluorspar, an amount far greater than was produced in the United States. There are only six states now producing a commercial tonnage steadily. Isolated, undeveloped deposits are known to exist in northern New York, Vermont, and New Hampshire, yet, so far, the latter state is the only one in this vicinity that has produced a steady tonnage for the market.

Owing to the difficulty of importing fluorspar because of the war, a search for possible local deposits has created considerable interest in this non-metallic mineral. A brief description of data gathered during a recent visit to these known deposits of New York and New England should prove of interest and help in locating other similar deposits.

From a hurried examination of the outcrops in the vicinity of these deposits, it appears that the ridges surrounding them are of hornblendic gneiss, with a few included bands of pyritic schists and crystalline limestone with a series of intrusives ranging from granite to the basic varieties. The mineralized beds are for the most part covered with a two-foot layer of gravel and a three-foot granite rock capping, under which is found the fluorspar associated with calcite in such a manner as to indicate that it is of an aqueous igneous origin.

The mineral is crystalline, slightly harder than calcite, and crystallizes in the isometric system, and it is found usually in cubic crystals. In color, fluorspar varies according to purity, from a clear, glass-like, white, through various brilliant shades, to dark purple.

The ore usually occurs in irregular lenticulated masses. Small veins are found along fissure planes, where these occur, and such veins are called contact veins. In general the strike is northeast or southwest, but the dip varies greatly, anywhere from zero to 40°, depending upon the locality. Samples of the three characteristic crystal colors, taken at various places, analyzed as follows:

PERCENTAGE ANALYSES OF NEW ENGLAND FLUORSPAR

	Purple	Pink	White
Fluorine	45.85	47.81	48.15
Calcium	50.21	47.72	49.90
Silica	.71	.90	.81
Magnesia	.24	.18	.19
Alumina	.18	.79	.18
Manganese	.14	.09	.05
Iron	.47	.43	.27
Undetermined	2.20	2.08	.15
	100.00	100.00	100.00

Theoretically speaking, a pure crystal of fluorspar should contain 48.9% of fluorine and 51.1% of calcium.

The prevailing method for handling the ore, after breaking, is to clean it by means of log washers, gravity washers, washing trommels and automatically sprayed vibrating screens, whence the material is dumped on a belt conveyor for hand picking. The log washer is preferable for dirty material, though the sprayed vibrating screen is to be preferred if a cleaner product be desired.

A detailed description of milling methods for fluorspar as now practiced in the Southern and Western states will be found in Chapter V, Bulletin 9, of the Kentucky Geological Survey, which gives a well-illustrated description of such washers and mills.

METALLURGICAL, CHEMICAL AND INDUSTRIAL USES

For several years fluorspar has been extensively used as a flux, because of the fact that it saves from 2 to 5% more iron than is possible when lime alone is used for this purpose. Fluorspar also acts as a reducer of the sulphur and phosphorus content of iron and steel and increases the tensile strength. Several hundred iron, steel, and brass founderies are now using fluorspar as a flux, and it is widely used by companies in other than metallurgical lines.

The demand for fluorspar is greater than the amount produced in this country. Domestic production is, so far, confined to Illinois, Kentucky, Tennessee, Colorado, New Hampshire, and New Mexico. The production in 1917[1] was 195,000 tons, or 94% of the total amount consumed, 6% being imported, the material being shipped from England, as ballast, on returning vessels. Approximately 85% of the gravel spar is consumed as a flux in basic openhearth steel furnaces and in other branches of metallurgy. Of the ground product, 57% is used in the chemical industries and 21% in the manufacture of glass.

In addition to its use as a flux, fluorspar is valuable in the production of alumina by the Hall process and in the electrolytic refining of antimony. When combined with carbon electrodes, the lighting efficiency is increased and the current consumption reduced. If mixed with feldspar and cement dust, the volatilization of potassium is increased.

FLUORSPAR CRYSTALS UTILIZED IN THE MANUFACTURE OF LENSES

Because of its low refractive and dispersive powers, the crystals of fluorspar have been used as apochromatic lenses in the manufacture of telescopes and spectroscopes. The chemical applications include the manufacture of aluminum fluoride, iron fluoride, sodium fluoride, ferromanganese, ferrosilicon and the production of hydrofluoric acid. Fluo-apatite is made synthetically by fusing fluorspar with sodium phosphate.

Fluorspar is also employed in the manufacture of cheap jewelry, paper weights, enamels, and glazes for pottery and kitchenware and as a bonding material for emery wheels. When used with feldspar in the manufacture of glass, the product has opalescent qualities.

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[1] Congressional Record, April 23, 1918.

The tonnage consumed in the United States per year for seven years previous to entering the war, according to the authority quoted, is as follows:

CONSUMPTION OF FLUORSPAR IN THE UNITED STATES
(In long tons)

	Domestic	Imported	Total
1910	69,427	42,488	111,915
1911	87,048	32,764	119,812
1912	116,545	26,176	142,721
1913	115,580	22,682	138,262
1914	95,116	10,205	105,321
1915	136,941	7,167	144,108
1916	155,735	12,323	168,058
1917	195,000	2,695	197,695

Especially fine specimens of fluorspar, showing the structure, are sold for mineralogical collections in museums, colleges, and other exhibition purposes, and often bring as high as $60 per ton. The nominal prices, as quoted in the Nov. 15 issue of *Chemical and Metallurgical Engineering*, were $28 to $40 per ton for gravel fluorspar, f.o.b. mines, and $90 per ton for the best grade washed and pulverized.

The percentage of calcium fluoride and the objectionable impurities in the three chief grades are as follows:

CONTENT OF CHIEF GRADES OF FLUORSPAR

	Content	Per Cent.
Acid grade	CaF_2	98
	SiO_2	1
	$CaCO_3$	.5
Fluxing grade	CaF_2	95
	SiO_2	2.5
Metallurgical grade	CaF_2	85
	SiO_2	5
	$CaCO_3$	5

Lubrication of Air Compressors

By W. H. Callan*

The lubrication of the compressor, steam cylinder, main bearings, crankpin, crosshead pin and crosshead guide does not differ from that of the ordinary steam engine, which is well known and understood. This article therefore will be confined to a discussion of air-cylinder lubrication.

Some years ago I experienced considerable trouble in securing a suitable oil for the lubrication of compressor air cylinders. The matter was finally taken up with a well-known oil company, which, after examining conditions, reported that the oil being used was too light in body and of too low a viscosity to withstand the high heat of the compression, being gasified by the high temperature of the air, and passing off in vapor, leaving the cylinder wall without lubrication. Thereupon an oil which it was thought would be suitable was recommended. This particular grade was of 26° gravity Bé., with a flash point of 515° F., fire-test temperature of 555° F., and a viscosity of 130 S. at 212° Fahrenheit.

After it had been used for some time no improvement was to be noted in the operation of the machine, and the temperature of the discharge air was still high. The cylinder heads were removed, the valves taken out, and an examination was made. The cylinder wall seemed to have a sticky, plastic coating; the air passages and discharge cavity showed signs of dark deposits, and the face of the valve seats was covered with a black, hard coating. This hard formation caused leakage of the valves and increased the temperature of the discharge air. The sticky coating on the cylinder wall was responsible for the increased friction. It was then suggested that lighter oil be tried, and one with 27½ gravity Bé., flash point 450° F., burning point 500° F. and a viscosity of about 125 S. at 212° F. was recommended.

After a period of operation with this grade of oil, examination showed that though the cylinder wall appeared less foul, the valve passages and discharge cavities of the cylinder were coated with a hard deposit, which was thought to be due to the feeding of the oil, and it was suggested that the amount fed into the cylinder be reduced. This was done with great care, until only three drops a minute in a 14 x 14 cylinder, running at 150 r.p.m., were being fed, but even then the deposits in the valve passages and the discharge cavities of the cylinder continued to form.

The reason given for the coating in the passages was that the residuum of all oils is carbon, which was assumed to be responsible for the deposits. Upon recommendation, the use of this oil was still continued, although the formation in the discharge passages seemed to be building up rapidly, despite the fact that a small quantity of oil was being fed into the cylinder, and soon collected to such an extent that it was necessary to clean the passages in order to avoid the hazard of an explosion. After the passages were cleaned, some of the material that had been removed was analyzed and found to contain 1.5% free oil, 11% rust, 5% decomposed oil, 30% mineral ash, 10% coal dust, and the remainder foreign matter, or residuum. A further investigation revealed the fact that the intake was exposed to such material as coal dust, mineral ash, shavings and water, as well as some air.

After cleaning the compressor, and safeguarding the intake against dirt and dust, another grade of oil was procured. The new oil was of gravity 31 Bé., flash point 375° F., burning point 420° F. and with a viscosity of 200 S. at 100° F. At the beginning, the feed amounted to three drops a minute, but this was later reduced to two drops a minute. The compressor was operated in this condition for considerable time with practically no trouble from carbon deposits. The good results from the light oil led to a disbelief in the virtues claimed for low-gravity, high flash point and heavy viscosity oil, and another grade having a gravity of 33 Bé., 330° F. flash point, fire test of 420° F., and a viscosity of 140 S. at 100° F. was tried. Feeding two drops a minute in a 14 x 14 cylinder running 150 r.p.m., this oil was used for years without trouble resulting from faulty lubrication, valve leakage or carbon deposits.

Motor Truck Service Recorder

An instrument to record the working hours of a motor truck or other similar vehicle has recently been brought out by the Service Recorder Co., of Cleveland. The device takes advantage of the side-sway developed when a vehicle of this class is in motion, and consists, essentially, of a pendulum mass which will swing from side to side in response to the side-sway of the moving vehicle, and a chart rotating at clock speed, upon which the pendulum can mark a record, and hence denote when the vehicle is in motion. Of course, absence of this record shows that it has not been used. The pendulum records its oscillation on the chart by means of a stylus set near its point of suspension.

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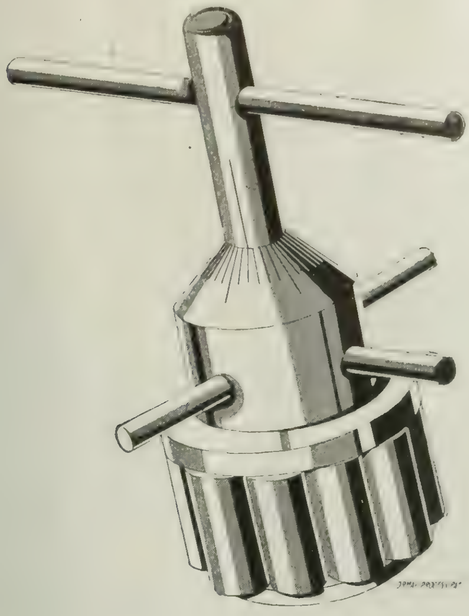
Rolling Babbitted Bearings*

The hardness of babbitt by the Brinell test shows practically no change after compression, and it may be concluded that the various methods of finishing babbitted bearings, such as peening, broaching, and reaming, do not improve the hardness of the babbitt. As, after these operations and the final scraping, it is still necessary to make a test run of bearings until the shaft is seated, it seemed possible to introduce improvement in the usual method of procedure. The so-called glass-like surface of old bearings is considered desirable. Even if the babbitt is no harder than when cast, all inequalities of the surface have been smoothed out, and friction has been reduced to a minimum. It seemed probable that, by a rolling or burnishing operation, this desirable finish could be given to babbitt linings so that a machine could be operated at full speed as soon as finished, without a trial run.



ROLLER FOR BABBITT BEARINGS

A tool, illustrated herewith, designed by I. Mills, appears to be capable of doing this work satisfactorily. It was made for securing a better seat for the ball-bearing races of a small aëroplane wireless generator. A variation of 0.0007 in. (0.018 mm.) was found in the bearings, which could not be corrected by reaming or machining. With this tool, the seats in the aluminum alloy end brackets can be rolled to suit the individual variations of the ball bearings. A girl does the rolling, and the bearings can then be inserted or removed with the fingers. If the work is done by reaming, bearings may fit tightly at first, and after having been taken out may be quite loose, because burrs and similar irregularities have been removed.

Although the Mills micrometer roller has been made only in a small size as yet, it can be made in larger units and would then be capable of exerting much greater pressures. The present instrument is made for a diameter of 1¾ in. (4.45 mm.) and has a range of 5 mils plus and minus. It consists of 10 rolls which can be expanded by a micrometer screw through the medium of two tapered cylinders which give a parallel outward movement to the rolls. The essential feature of the instrument is that the rolls are not equally spaced, as this would cause them to flute the rolled surface.

Temperature Trip Circuit Breaking

The oldest form of overload protection is electromagnetic, which cuts off the current if it reaches a point deemed dangerous. The fact that most electrical apparatus can withstand momentary overloads without danger has gradually led operators to push up the limits at which such protective devices will operate, or to dispense with them entirely, rather than undergo the inconvenience of having machinery stopped on account of momentary peaks. A method of visual protection, on the basis of temperature, was the next step toward control. Exploring coils were built into the apparatus and used to indicate the temperature of hot spots by means of electrical instruments.

The latest plan is to use a relay, Type CT, built by the Westinghouse Electric and Manufacturing Co., which automatically trips the circuit breaker when the temperature reaches the danger point. It may be used to protect any alternating-current machine from excessive heating if the apparatus is so arranged that exploring coils can be installed. The relay is intended to protect against overheating from sustained overloads. To afford this protection with the least interruption of service, the breaker should be tripped as a result of the direct effect of the temperature of the apparatus. The relay should be so arranged that it prevents the breaker from tripping if the overload is of such short duration that the temperature does not rise to a dangerous point; whereas, if the overload persists, the breaker must be tripped out as soon as the temperature rises beyond the critical degree. This is accomplished as follows:

The relay operates on the Wheatstone bridge principle. Two arms of the bridge consist of copper exploring coils, arranged to be placed in the oil or embedded in the windings of the apparatus to be protected. The other two arms are of unchanging resistance and are mounted in the relay. The current for the bridge is supplied by the current transformer connected in the circuit of the apparatus to be protected. The relay has two windings, corresponding and coöperating to produce torque in a manner similar to the current and voltage coils of a wattmeter. The main winding is a coil operated directly by the current transformer. The auxiliary coils are connected to the Wheatstone bridge arms in a similar manner to a galvanometer connection, and thus receive current of the magnitude and direction depending on the resistance of the search coils. Above a certain temperature the torque of the relay is in the contact direction, and below in the opposite direction. It will thus be noted that in order to close the contact, two predetermined conditions must exist, viz., excess current and excess temperature. Neither one alone will separately trip the relay.

Production of Platinum and Palladium in Brazil is being stimulated. Official proclamations have been issued in the now quiescent placer districts of Minas and Goyaz.

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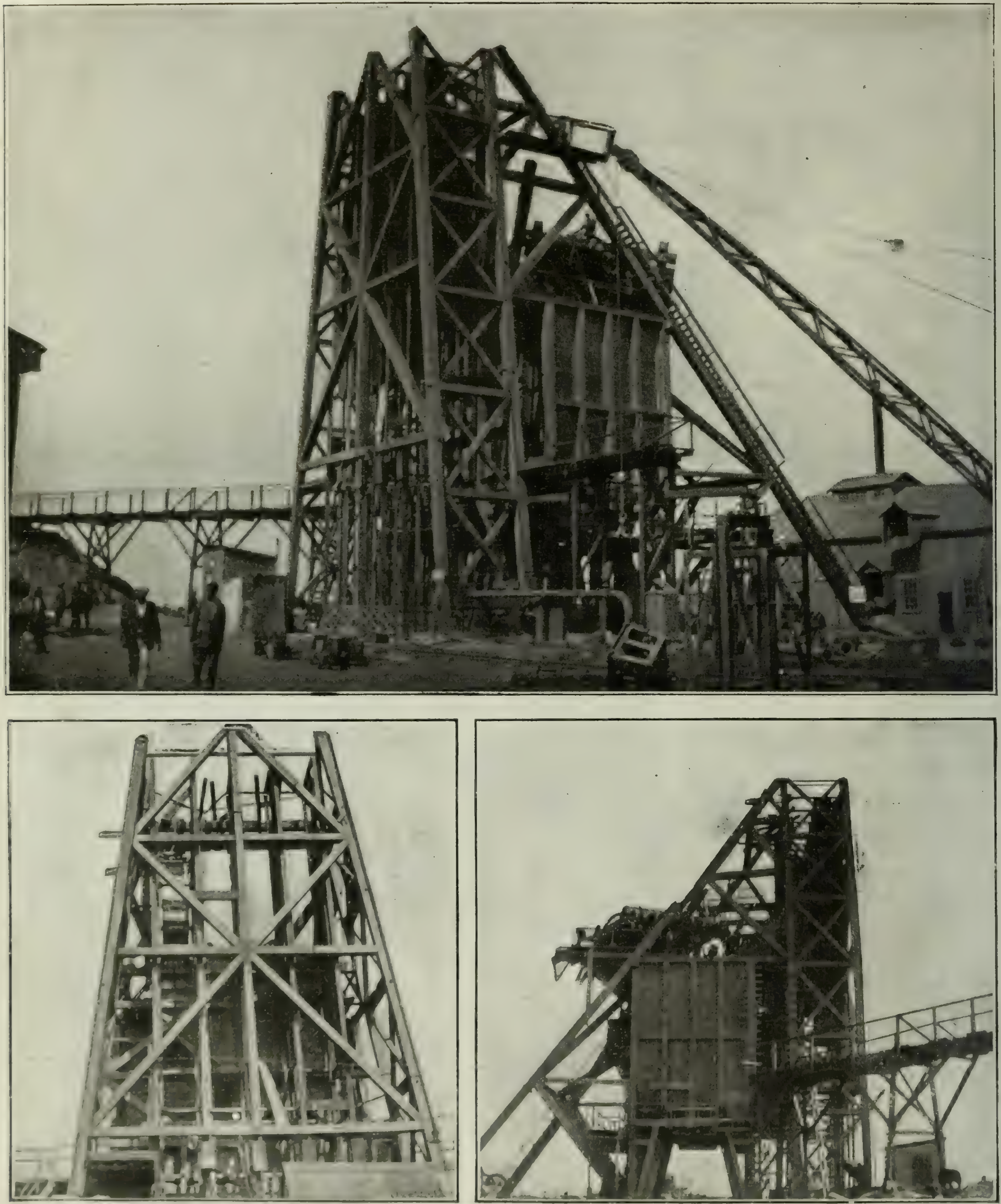
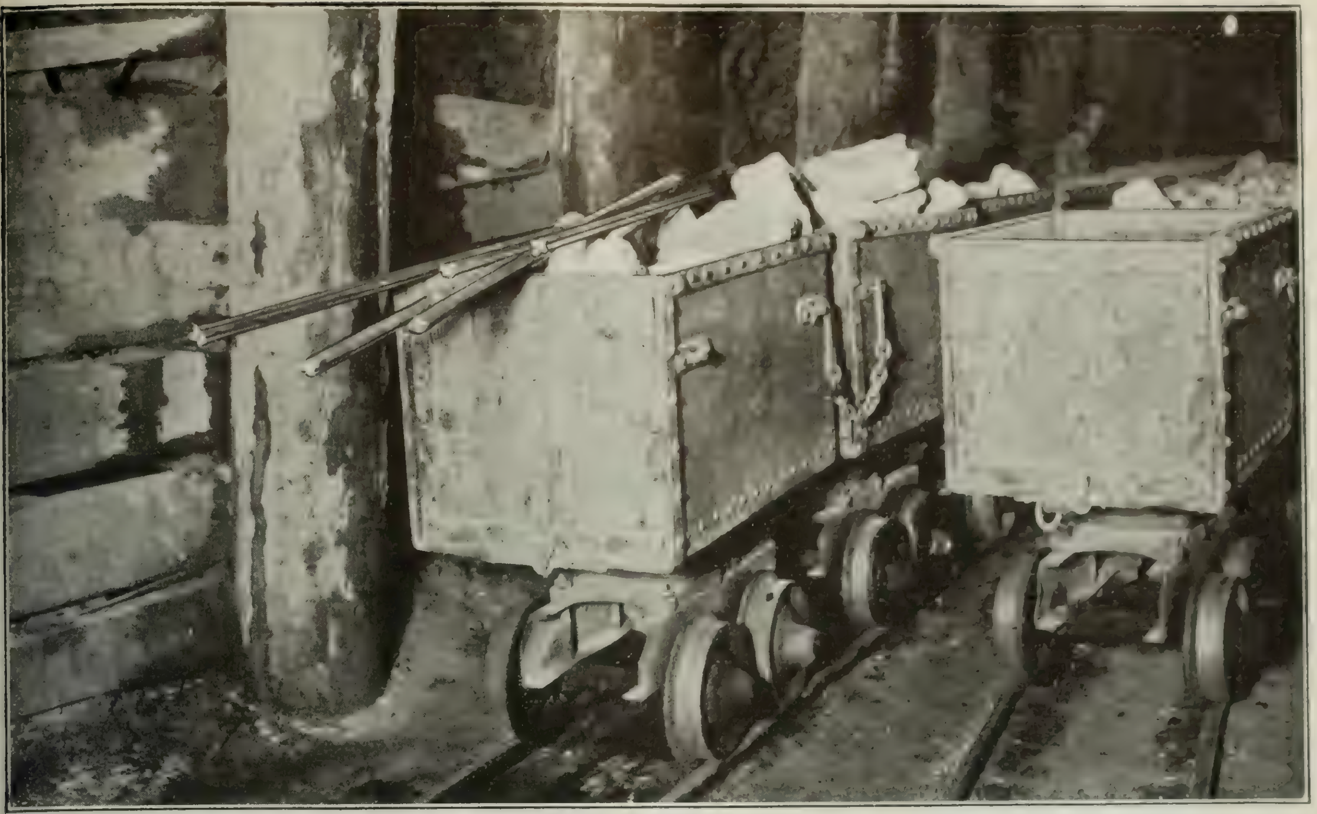
*Excerpt from a paper presented at the Milwaukee meeting of the American Institute of Mining Engineers, October, 1918.

Photographs From the Field

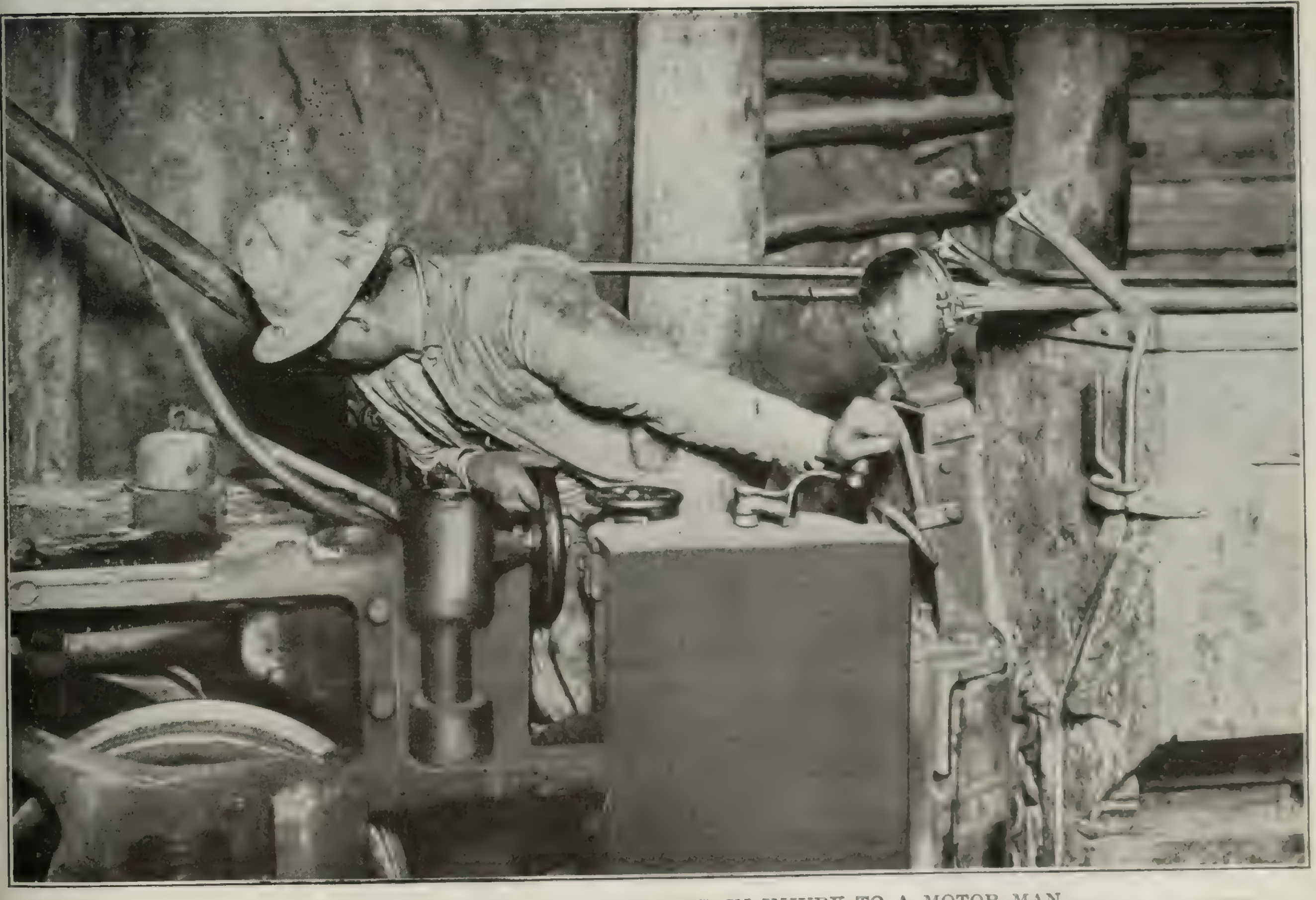


THE EFFECT OF A HOIST OVERWIND AT NO. 8 SHAFT, RANDFONTEIN CENTRAL GOLD MINES CO., TRANSVAAL

The overwind device acted too late, and the entire top of the headgear, with three sheave wheels on 14 x 14-in. timbers, was lifted bodily into the ore bins, and the skip returned to the tipping place. The picture on the left shows the skip returned to the tipping point after decapitating the headgear, and that on the right shows the top of the headgear in the ore bin.



UNSAFE PRACTICE IN CARRYING STEEL OR LEAVING IT AT UNDERGROUND STATIONS OR SWITCHES



THE ABOVE CARELESSNESS RESULTED IN INJURY TO A MOTOR MAN

These photographs, illustrating unsafe practice, are published through the courtesy of the Bureau of Safety of the Anaconda Copper Mining Co. Reproductions appeared in the October issue of the *Anode*, the company's safety publication.

Universal Membership
The Goal of the Red Cross Christmas Roll Call

The aim and underlying purpose of this campaign is to recruit under the banner of the Red Cross every loyal American, no matter where he or she may live. "A large membership in the Red Cross means more 'Over There' than money," said Chairman Henry P. Davison upon his return from a visit to every battle front. It is hoped and expected that this great ambition will be realized. It can be if every patriotic man and woman makes it his or her responsibility to get universal membership in the Red Cross. The object of the Red Cross Christmas Roll Call is to register in terms of active participation the spirit of a nation. The spirit in question is personified in Red Cross membership. Every one is urged to make it unanimous.

Joseph R. De Lamar

CAPTAIN JOSEPH R. De LAMAR, capitalist, mine owner and director in a number of important business enterprises, died at the Roosevelt Hospital of pneumonia on Dec. 1. One daughter, his only child, Alice A. De Lamar, survives him.

Captain De Lamar was born in Amsterdam, Holland, in 1848, but only the first few years of his life were spent in his native land. His bold and vigorous character displayed itself early; for, being desirous of seeing the world, he ran away from home at the age of seven years and shipped aboard an East Indian ship as cabin boy, without wages. On the homeward voyage he was promoted and given a salary of four Dutch guilders (about $1.60) per month. His first voyage completed, he continued to follow the sea, gradually working his way up through the various grades of seamanship. His early education in the elementary branches of learning—reading, writing and arithmetic—was also acquired at sea, the mates of the various ships on which he sailed teaching him, in consideration of his devoting a portion of his watches below to washing their clothes.

CAPTAIN JOSEPH R. DE LAMAR

By the time he was 21 years old, Captain De Lamar had visited the four quarters of the globe. At the age of 23 he obtained a captain's diploma, shipped for a voyage as first officer, and returned as captain. Submarine work, or diving, being very profitable at this time, so, soon after our Civil War, he concluded to leave the merchant marine service and engage in this business. For several years subsequently he was employed in this manner, raising sunken vessels in the Delaware River, off the New Jersey coast, and at St. Thomas, West Indies. He finally established headquarters at Vineyard Haven, Mass., and continued this line of work along the coast. In 1876 he succeeded in raising a cargo of 1660 tons of Italian marble from a vessel sunk off the Bermudas many years before, on which three different wrecking parties had worked without success.

Captain De Lamar was generally successful in this business and accumulated considerable money from it. Looking around for an investment for his savings, he decided to embark in the African trade, and himself assumed charge of a vessel as master and supercargo. In this venture he again met with substantial financial success, but on account of the African coast fevers, which every year cost him the lives of several of his crew, he determined to abandon such a hazardous undertaking, and in 1878 sold his interests.

About this time precious-metal mining in the Rocky Mountains was exciting renewed attention in the East, due to the wonderful bonanzas which were just being uncovered in Leadville. Attracted by the possibilities for the accumulation of great wealth in the mining business, Capt. De Lamar resolved to quit the sea for good and engage in mining. Upon his arrival in Colorado, however, he immediately realized the necessity of a thorough scientific knowledge of geology and mining for the successful prosecution of the business which he purposed to follow, and, thereupon, went to work to make good this deficiency, to the best of his ability, by studying assaying, chemistry, ore dressing, and metallurgy. He spent eight years in mining in Colorado, meeting with very fair success. Among the most important of his undertakings was the development of the Terrible lead mine of Custer County. This property he purchased when it was a mere prospect, for $3500. He opened a large body of low-grade lead carbonate ore, and finally erected dressing works of 250 tons per day capacity for its concentration. This mill, which was at the time the best equipped and by far the largest concentrating works in Colorado, proved very successful. Notwithstanding the low grade of the ore, which averaged in value only about $4.50 per ton, and the high cost of labor and supplies, the Terrible mine was operated at substantial profit, and was sold in 1886 by Captain De Lamar to the Omaha & Grant Smelting and Refining Co. at a good price.

Captain De Lamar spent the next two years in traveling, visiting during this time most of the principal mining camps in the western United States in search of another property to develop. He finally selected a prospect on a mountain, six miles west of Silver City, in Owyhee County, Idaho, where he purchased a group of mining claims for a small amount, and located others around it, so as to cover practically the whole mountain, the property secured representing a tract of mineral land about one mile long and three-fourths of a mile wide. Work was begun by driving a crosscut tunnel into the mountain, to intersect at right angles the veins which cropped at the surface.

The result of the exploration work on this property and its subsequent production proved the wisdom of Captain De Lamar's purchase. A number of parallel veins were cut carrying gold and silver. As these veins were followed on their strike toward the east they were all cut off or pinched out by a dike, at the intersection of which the ore was abnormally rich, carrying into the thousands of ounces of silver per ton.

Captain De Lamar was extremely cautious in his mining operations, venturing extensively, but not without good judgment. The Idaho property was not equipped with a mill until it had been in his hands for over a year. Then he started with two small, second-hand mills, and not until August, 1890, did he erect a modern 20-stamp mill.

During 1890 many carload shipments were made direct to the smelter which returned $1500 to $2000 per ton, while the mill worked on ore averaging over $30 per ton. This property was sold to an English company in the spring of 1891 for $2,000,000 cash. The Captain subsequently took an interest in the property in lieu of part of the cash, and for a time acted as resident director.

Prior to the sale Captain De Lamar had taken $1,500,000 from the mine. The new company paid its first dividend from the 20-stamp mill in July of 1891. From that date the mine grew steadily, until, with a larger mill, 250 to 300 tons per day was treated. Two entirely new systems of veins were found that added materially to the value of the property, but commercial ore did not extend to great depth in any of the veins, and the quality gradually diminished until about four years ago, when expenses began to exceed returns, and the property closed after an honorable career and a record in which its founder could take just pride.

Captain De Lamar took a very active part in all public affairs in Idaho. In 1891 he was state Senator and was appointed the state's sole representative at the Chicago World's Fair. Being particularly desirous that the state make a good showing at this time, he offered to duplicate from his private resources any sum that citizens of the state might raise.

The De Lamar mine of Nevada, one of the most noted mines acquired and operated by De Lamar, came into his hands in 1893. The original purchase price was $150,000, but it is said that $600,000 was expended before the property became productive. The gross yield reached a total of over $9,000,000 by the end of 1900. The metallurgical history of this property was interesting. There was first established a chlorination plant, which was not entirely successful. A small cyanide plant was next erected, and this grew by successive additions until a daily capacity of 300 tons was reached. A conspicuous feature of the plant was the use of Griffin mills for dry crushing, and zinc dust for precipitating the auriferous cyanide solutions. In 1902 options on this property were given to J. E. and S. Bamberger, of New York, and soon thereafter the property passed into their hands.

Captain De Lamar also was interested in the De Lamar Mine, of Shasta County, Calif., and established the De Lamar Refinery at Chrome, N. J., which was subsequently purchased by the U. S. Smelting Co., in 1905.

In 1900 we note the large holdings of the Captain in De Lamar's Mercur Mines Co., which up to that time had paid about $700,000 in dividends, and during that year was combined with the Mercur G. M. and M. C. to form the Consolidated Mercur Gold Mines Co., a company that has had a long and prosperous career and has been one of the main sources of the De Lamar income.

It was in Mercur that Captain De Lamar came in touch with Colonel Wall, Jackling, and Gemmel, and in 1895 his attention was first drawn to Utah Copper district. His first option on three-fourths of Colonel Wall's property called for the payment of $375,000. For a period of eight years the Captain was more or less interested in this low-grade district, but never became convinced, while the property was undeveloped, that it would be a profitable investment for the very large sum that would be required; so he disposed of his quarter interest in 1903, to those who have made a success of the Utah Copper Company.

Recently Captain De Lamar had been president of the Dome Mines, at Porcupine; vice-president of the Delta Beet Sugar Co.; vice-president of the International Nickel Co.; a director of the American Bank Note Co., Coronet Phosphate Co., Canadian Mining and Exploration Co., and the Manati Sugar Co., as well as having interest in various other organizations.

Since 1890 Captain De Lamar had made his home in the East. He built a town house at 233 Madison Ave., but took the greatest pride in his country estate near Glen Cove, Long Island. Facing the Sound toward the northwest, passers-by on steamers invariably ask whose wonderful place it is. Here he entertained lavishly, exhibiting to his guests his wonderful collections of plants and flowers, and while looking out with them toward the western sunset recalling vividly the interesting incidents of his early life in his adopted country.

Approximately half of Captain De Lamar's estate, having an estimated value of about $20,000,000, goes to Harvard Medical School, Johns Hopkins, and to the College of Physicians and Surgeons of Columbia University "for the study and teaching of the origin of human disease and the prevention thereof . . . and how to secure health by proper diet; . . . and I especially enjoin on the legatees the dissemination of the results of studies, through popular publications, public lectures and other appropriate methods, etc."

The will left by Captain De Lamar bears testimony of the spirit of the man that accumulated the fortune. The welfare of the people of his native land and of his adopted country was an ever-present thought throughout the later years of his life.

Developing a Dutch Salt Deposit

In the annual report of the Dutch Government Research Board for 1911 it was announced that around Buurse, near the German frontier, there were salt deposits at a depth of 350 meters, says *Commerce Reports*. For a time no more notice was taken of it, but the war has taught the Netherlands to develop its own resources and as far as possible to be independent of foreign assistance. In February, 1917, the Minister of Agriculture proposed a bill to develop these deposits, with the object of averting a threatened salt shortage. With some changes, the measure was passed in February, 1918.

Work started in the summer of 1918. After the erection of the necessary boring towers, engine rooms, dwellings and other essential buildings, boring began, and it has already reached a depth of 43½ meters. The boring of the first 7 meters offered no difficulties; from 7 to 80 meters clay strata are looked for, and from 80 to 320 meters it is expected that rock will be encountered. It is thought that rock salt will be found at 320 meters and that the layer will be about 20 meters thick. A deep-well pump will be inserted in the boring, by means of which it is hoped to lift 7 cubic meters (1850 gallons) of brine per hour.

Correspondence and Discussion

Chrome and Manganese Ore Producers

The situation of the producers of chrome ore and manganese ore is not dissimilar. Both have been encouraged to use every effort to find new deposits of ore and increase production from known sources. with the result that, even before November, Washington gave out the information that if foreign ores should be entirely cut off domestic supplies could, in the emergency, meet requirements. We were further informed that it would be inadvisable to open any new deposits. This advice came late, and now, with the war demand tapering off and the future demands for commercial purposes uncertain, producers find themselves in a serious situation, and we are not surprised to learn of the strenuous efforts being made on the Pacific Coast to get the Government to take some action to protect those who have answered the call for more chrome ore and more manganese ore. As demand slackens and shipping facilities increase, shall these industries be permitted to revert to their pre-war dormant condition? Shall thousands of dollars' worth of property and equipment be rendered valueless while hundreds are thrown out of employment?

What form of protection would be best and most practicable we cannot suggest, but the simplest, a high tariff on imports, we fear will not be looked upon with the favor that high tariffs met at the close of the Civil War. There are now fewer than 150 properties producing high-grade manganese ore (35% or higher) with an average output of about 200 tons each per month. We have no figures as to the number of chrome mines working, but we know that the total tonnage is not large and that the number of people interested in the production of chrome and manganese ores is relatively small compared with the number who will have to bear a tax in the event of the adoption of a protective tariff. This is one of the reasons why we doubt the expediency of tariff legislation to protect the situation.

There is another angle from which this question may be viewed. A large number of the new properties have been opened for the purpose of making money out of them. Operators took legitimate mining risks knowing full well that the day peace was declared their product would fall in price.

Though it is deeply to be regretted that a thriving business should suddenly become valueless, we believe that these speculators need no special legislation when the game turns against them. They knew the game; they took their chances, and with peace in sight they should be sufficiently good sports not to complain at the good fortune of the world and their own losses.

Other operators were, no doubt, induced to go into the mining of these metals through patriotic motives, and many of them have not yet recovered their outlay. Such should have our full sympathy, though they probably are not asking it. Having undertaken their work from a patriotic point of view, they will charge up the loss as their bit in the cost of winning the war, and enter no complaint.

If there are only these two classes of operators mining chrome and manganese ores, the speculator and the patriot, no special legislation is needed; and if the speculator is not entitled to special legislation and the patriot does not ask it, none will be forthcoming. The business of mining these ores will gradually assume its normal importance of pre-war days. Chrome and manganese operators will not occupy exactly the same position that they did four years ago, for metallurgical processes have been developing, and the demand for ores will be greater than it was in pre-war time, and there will be some properties favorably situated that will continue to produce and sell at a profit. To this extent the chrome and manganese ore business will have been benefited by the stimulus of war demands. F. F. SHARPLESS.

New York, Nov. 23, 1918.

Cost of Explosives and Production of Gold

To one who is producing gold at a cost of $21 to $22 per oz. the declaration of peace holds out some hope; indeed, it is difficult to understand why the granting of an armistice has not already been felt in some of our supply bills. What the Government can and will do to stimulate the production of a metal which we are given to understand by financiers is greatly needed is something beyond the writer's ken. It would seem that gold was a peace metal rather than a war metal. Certainly the necessity for its production has not disappeared with the cessation of hostilities, and it may be that the demand for it will grow more rapidly than we who are holding on by the ragged edge can now hope for. With the cessation of hostilities we should see a material reduction in our fuel bills, the bills for machinery, tools, steel, and explosives, and in due time, as the cost of food and clothing drops, we will hope to get more tons broken for $10 than are being broken today.

A very large item entering into our mining costs is that of explosives. I think that it would be fair to say that the increased cost of explosives has been much greater than the increased cost of their production, and now that the demand for high explosives has already fallen off, we ought to begin to benefit. If we do not, this is something on which we might call for Federal assistance.

My hope, that it will come naturally in the every-day course of business, is based, to some extent, upon an address by Col. E. G. Buckman, of the Du Pont company, delivered before that company's salesmen on June 19 last.

Colonel Buckman was not dealing directly with mine explosives, which at that time formed but a trifling portion of the output of the Du Pont company, but his remarks must certainly reflect the general policy of the organization, which could not justify the adoption of a different policy toward blasting powder, so essential to the production of raw material for war purposes and for the production of gold.

I quote a few passages from Colonel Buckman's remarks respecting prices for firearm explosives:

> We have never raised our price to a single one of our regular customers here in the United States. . . . Home military concerns have been charged throughout the period of the war our regular pre-war prices, and have also been given the benefit of every reduction.
>
> Throughout 1914, 1915, and 1916, when the price ranged $1, 90c. and 80c. to foreign governments, we furnished the U. S. Army and Navy all their requirements . . . . of smokeless powder at 50 and 53c. per pound.

Prices quoted show powder selling at $1 per lb. in October, 1914, with gradual reductions, until in April, 1917, it reached 47½c. per pound.

> Invention after invention, economy after economy, was developed for savings which more than kept pace with the rapid increase of raw material and labor.
>
> It was not costing the steel producers 100% more to produce a ton of steel, but the supply and demand enabled them to charge more, and they did it.
>
> Our price on TNT has been reduced from time to time, until now we sell at 35c. per lb., as against $1 in the beginning, which is nearly as low as the pre-war price of 29 cents.

In April, 1917, the Du Pont bid for 115,000,000 lb. of powder for the Government was 47½c. per lb. In 1913 the price had been 53c. for the same grade.

> Du Pont company enjoys the unique position of being the only concern in the United States which is today selling its product at less than pre-war prices. . . . As fast as it could do so, it has of its own volition reduced the prices.

To one who has been paying ever-rising prices for dynamite during the period of the war, these quotations do not make pleasant reading; he feels that the mines must have been singled out as legitimate game. If the Government really needs the gold, and if we are willing to mine it at little or no profit to ourselves, we should certainly not be called upon to pay large profits to those who furnish us with supplies.

We have no desire to see our Government go into the production of powder or the production of any other of our many supplies, but if Uncle Sam needs the gold it is his duty to see that we get our supplies as near cost as possible. The foregoing quotations suggest that we have recently been paying rather handsome profits to somebody. GOLD MINER.

New York, Nov. 25, 1918.

Exchange of Ideas

The ideas held by the late Dr. James Douglas respecting the exchange of information and suggestions, the free discussion of technical practice and the futility of secret practices, have become the ideas of a majority of American engineers, and arguments supporting secrecy receive scant consideration. Feeling as we do on this point, it is questionable if we are carrying out the spirit of the idea and permitting our subordinates to follow a line of which we approve.

Too frequently it is held that the place of the superintendent and foremen is on the job every day in the week and every week in the year, but "all work and no play makes Jack a dull boy," and Jack's education cannot be kept right up to date even by the best technical journals.

It is not the broader question respecting operating that the subordinates will investigate and improve, but the hundred and one little details with which they come in contact every day; not the general system of timbering, but the method of holding a heavy stull in bad ground while it is being wedged into place; not the method of concentration, but the device for getting a minute and constant amount of oil into the maelstrom at a particular point—all of the little details that go to make the success or failure of the general scheme.

If a foreman is worth having, he is one who appreciates a short vacation at company expense far more than an increase of 25c. per day in wages. Loyalty is the watchword of the day. Without it management can scarcely succeed. With it, a desperate case may be brought to life. The encouragement offered by the management in giving its subordinates an opportunity to see what is being done in other mines and works is one of the strongest stimulants to loyalty that may be administered. MINING ENGINEER.

New York, Dec. 2, 1918.

Vanner Belt Cleaner

In the *Journal* of Oct. 19, 1918, there appears a description of a vanner belt cleaner. This is a somewhat elaborate mechanism to accomplish the purpose intended. With a vanner belt properly wet and kept wet as it passes over the head drum, there should be little danger of concentrate adhering to the belt if it is properly submerged in the concentrate box. If trouble is experienced with fine, sticky concentrate, a distributed spray directed normally to the belt ought to be sufficient. I am reminded of a device, once manufactured as an attachment to the Union vanner, which was made at one time by the Union Iron Works, of San Francisco. It consisted of a wooden roller three inches in diameter and so attached to the shaking frame of the vanner as to just touch the belt about midway between the upper and lower head drums of the vanner. It was rotated by the belt. The surface of the roller touching the film of water on the belt caused both water and concentrates to take to the surface of the roller. The concentrates were neatly discharged from the lower surface of the roller. By suspending a narrow trough beneath the roller, the greater proportion of the concentrates were discharged into the trough and carried by a stream of water, which was delivered as a fine jet into the upper end of the trough, to a side discharge. By directing this discharge to a shaking launder, the concentrates from a number of vanners could be discharged to a settling box at one end of the row of machines. The lower portion of the belt dipped below the water in the concentrate box and served to catch the concentrates that escaped the trough. In this way the concentrates that accumulated in the box were small in amount and could be removed at longer intervals than is customary with the usual arrangement of head-box. By attaching the concentrate trough to the frame of the machine so as to reciprocate with the frame, little surplus water was required to keep the concentrates moving toward the discharge end of the trough. I found the device useful on a vanner used for ore testing. G. J. Y.

New York, Oct. 21, 1918.

Industrial News from Washington

By Paul Wooton, Special Correspondent

The War-Minerals Act

Full realization that the War-Minerals Act is a white elephant has come to officials of the Interior Department, and particularly to those of the U. S. Bureau of Mines. The situation has been studied from all angles, but as yet no announcement of conclusions has been made. It is realized that definite action must be taken soon, that the industries concerned may know just where they stand. It is not improbable that a small amount of the appropriations carried by the War-Minerals Act will be used to compile data and evidence by means of which an accurate report on the war-minerals situation may be laid before Congress, leaving it to that body to determine how the situation is to be met.

The present status of affairs warrants slight hope on the part of the domestic producers of war minerals for relief under the act. In fact, so many difficulties stand in the way of relief, that it is doubtful if means can be devised to bring through without loss those who followed the Government's suggestion to produce war-minerals. One view of the matter, which comes from a disinterested source, may be summed up as follows:

> The Government must accept part of the responsibility for this development, although it is not commercially obligated by contracts. The exploration and demonstration of the extent of our chrome resources has, from a national standpoint, been fully justified and worth the capital investment. Though these resources are limited, it has at least been demonstrated that the country has from two to three years' supply of this material on the ground.
>
> If any general policy of reconstruction is to be followed, by which the war activities and industries are to be gradually readjusted with the minimum of loss to producers who have helped to meet an actual necessity, then chromite certainly deserves some protective action for the producers. Since a program had to be formulated for the carrying on of the war, and the country has been saved billions of dollars by its termination, it seems justifiable that expenditures of even millions of dollars should be made in an equitable closing down of the war program.
>
> By Jan. 1, 1919, there will be approximately from 100,000 to 125,000 tons of chromite stocks in the hands of the consumers. This represents a two-year supply on the basis of pre-war consumption. Domestic production is now on the basis of 60,000 tons a year. Canadian production, which is practically all imported to the United States, is at the rate of 18,000 to 20,000 tons a year. Cuban import production is estimated at 15,000 tons. In addition to these sources, there is pressure to import additional quantities from New Caledonia and Brazil, making a total of at least 100,000 tons in sight for the coming year of new production in addition to the stocks already indicated. The situation indicates a large over-supply.

Acid Price Fixing To Cease Dec. 31

At the request of Robert S. Brookings, chairman of the price-fixing committee of the War Industries Board, the committee on acids met in his office in Washington on Dec. 3, according to a statement of the Chemical Alliance. Representatives of the different branches of the Government were present. Mr. Brookings stated clearly that though it was the desire of the War Industries Board to be of every possible assistance to the various industries in which there had been price regulation, it was felt that the need of such supervision and of price fixing no longer existed and that the industry was in position to take care of itself. He also said that it was the desire of the price-fixing committee to permit the fixing of maximum prices on acid to expire with the closing of the present period, namely, Dec. 31, 1918.

After a general discussion it was decided that price fixing with reference to sulphuric and nitric acids be discontinued and that the present prices fixed for the last quarter of 1918 should remain in effect until Dec. 31, 1918, on which date they will automatically expire by time limitation.

The Revenue Bill

Deductions for mine depletion allowed by the new revenue bill are covered in the following paragraph quoted from the text:

> In the case of mines, oil and gas wells, other natural deposits, and timber, a reasonable allowance for depletion and for depreciation of improvements, according to the peculiar conditions in each case, based upon cost including cost of development not otherwise deducted: Provided, That in the case of such properties acquired prior to Mar. 1, 1913, the fair market value of the property (or the taxpayer's interest therein) on that date shall be taken in lieu of cost up to that date: Provided further, That in the case of mines, oil and gas wells, discovered by the taxpayer on or after Mar. 1, 1913, and not acquired as the result of purchase of a proven tract or lease, where the fair market value of the property is materially disproportionate to the cost, the depletion allowance shall be based upon the fair market value of the property at the date of the discovery, or within 12 months thereafter; such reasonable allowance in all the above cases to be made under rules and regulations to be prescribed by the Commissioner with the approval of the Secretary. In the case of leases the deductions allowed by this paragraph shall be equitably apportioned between the lessor and lessee. . . . .

Exemption of gold mining from taxation under the bill is provided in the following:

> In the case of any corporation engaged in the mining of gold, the portion of the net income derived from the mining of gold shall be exempt from the tax imposed by this title, and the tax on the remaining portion of the net income shall be computed upon the basis of an invested capital which bears the same ratio to the full invested capital as such remaining portion of the net income bears to the entire net income.

Taxation on sales of mining property is covered in the following:

> In the case of a bona fide sale of mines, oil or gas wells, or any interest therein, where the principal value of the property has been demonstrated by prospecting or exploration and discovery work done by the taxpayer, the portion of the tax imposed by this title attributable to such sale shall not exceed 20% of the selling price of such property or interest.

Tin, with its alloys and compounds, was removed from the Export Conservation List on November 27.

Although the War Industries Board will cease to exist on Jan. 1, 1918, it is probable that some connection will be maintained between the existing personnel and the Government after that date.

A resolution has been introduced by Senator Jones, of New Mexico, extending the suspension of mining claim assessments to Alaska. In the resolution passed Oct. 5 it was not clear that the suspension should apply to Alaska.

Chronology of Mining, November 1918

Nov. 1—Wage increase of $1 per day for anthracite miners, authorized by Fuel Administrator Garfield.

Nov. 6—Tin Importers' Association protested to War Industries Board against the fact that U. S. Steel Products Co. should have sole direction of the import of tin.—Shipment of silver bullion to the value of $3,000,000 made from the Government Assay Office at New York to India.

Nov. 11—Armistice signed by Germany.—Licenses for importation of chrome ore, except those covering shipments from Cuba, Canada, and Brazil, revoked by the War Trade Board.

Nov. 13—Monetary system of Mexico placed on a gold basis.

Nov. 15—Agreement reached between copper producers and War Industries Board that provides for maintenance of present production, prices, and wages, and regulation of prices and allocations until Jan. 1, 1919.

Nov. 16—Restrictions on domestic uses of gold and silver for industrial purposes removed by the War Industries Board.—Zinc producers notified to suspend production on the filling of Government contracts.

Nov. 19—Dr. Charles R. Van Hise died.

Nov. 20—Meeting of quicksilver producers with the War Industries Board at Washington to consider prices.

Nov. 22—William G. McAdoo resigned as Secretary of the Treasury.—John D. Ryan resigned as Second Assistant Secretary of War and Director of Air Service.

Nov. 25—New Cornelia Copper Co. paid initial dividend of 25c. per share.

Bituminous Requisitions Canceled

All of its requisitions for the shipment of bituminous coal to industrial plants have been canceled, according to an announcement made on Dec. 5 by the U. S. Fuel Administration. The Administration's policy hereafter will be to leave to the plants themselves the work of obtaining such fuel. It believes, however, that none will have difficulty in getting sufficient supplies.

Mesabi Range Magnetic Iron Ores

The first shipment of 1800 tons of low-phosphorus sinter, produced from magnetic iron ore secured on the eastern Mesabi Range, has been made from Duluth, says *Iron Age*. The ore is to be delivered at the Midvale Steel and Ordnance Co. blast furnaces at Coatesville, Penn., and was produced at the mill at Duluth equipped some time ago by the Jackling interests for the concentration of magnetic ore from the eastern Mesabi Range. D. C. Jackling is the managing director of the enterprise, which is expected to develop to a considerable production of a low-phosphorus sinter from eastern Mesabi ores. The concentrating operations have been carried on in an experimental way for several years, and have been in charge of W. G. Swart. The possibilities of these lean magnetites were brought to the attention of the Jackling-Hayden, Stone & Co. interests several years ago by Dwight E. Woodbridge, who secured the lands now held by the operating syndicate.

The cargo analyses of the shipment just made to Coatesville, Penn., ran 63% iron and 0.008% phosphorus. The cargo thus represents the highest grade ore that has gone from Lake Superior in many years.

The wet magnetic concentrating process is followed at Duluth in a mill which has a capacity of about 100 tons a day. It involves fine grinding for the removal of a large part of the silica and phosphorus, the latter existing as apatite.

Export Restrictions Slackened

Among the commodities removed from the Export Conservation List, effective Dec. 6, 1918, as announced by the War Trade Board, are the following:

Alloys as follows: Cadmium, nickel, titanium, uranium, zirconium. Alpaca metal. Articles containing 10% or more in weight of metallic aluminum. Antimony ore and articles containing antimony. Chromium ore and any metal or ferro-alloy thereof. Cobalt ore and any metal or ferro-alloy thereof. Articles containing 10% or more in weight of copper. Copper pipe, plates, rods, sheets, scrap, tools, tubes, and wire. Crucibles of plumbago or platinum. Industrial diamonds. Ferro-alloys as follows: Ferrocerium, ferrochrome, ferrocobalt, ferromanganese, ferromolybdenum, ferrotitanium, ferrotungsten, ferro-uranium, ferrovanadium, ferrozirconium. German silver and articles containing it. Lead, pipe and sheet. Magnesite. Magnesium. Manganese ore and any metal or ferro-alloy of it. Manganese oxide. Articles containing 10% or more of nickel. Nickel silver. Oil-well drilling apparatus. Ores of radium, strontium, titanium, tungsten, uranium, and zirconium. Plumbago and articles containing it. Pyrites. Scheelite. Silver, manufactured and articles containing it. Spelter. Thorium and articles containing it. Titanium compounds. Vanadium. Brass and copper wire. Tungsten ores. Zinc. Zirconium concentrates.

The board also announced that the following items are still on the Export Conservation List, though under modified classification:

Aluminum ingots. Copper bars and pigs. Lead ingots. Nickel anodes, ingots, and shot.

Licenses for the above are not required to Canada and Newfoundland. Copper ingots and sheet lead are retained upon the list with the original classification.

Iron-Ore Restriction Modified

The War Trade Board announced on Dec. 7 that the restriction previously placed upon the importation of ocean shipments of iron ore, limiting importations to shipments from Cuba and to shipments as ballast from Sweden or Spain, has been modified to permit the issuance of licenses for the importation of calcined spathic iron ore originating in and coming from England, when shipped as back-haul cargo. A previous modification of the restriction upon iron ore was announced in W. T. B. R. 308, issued Nov. 11, 1918.

Employment for Engineers

The attention of engineers and technical men is called to the service of the Division of Engineering, 29 South La Salle St., Chicago, for the purpose of giving them free assistance in securing employment. The division also asks employers of technical men to place orders for additional help for engineering work of all kinds.

For registration blanks write to A. H. Krom, Director of Engineering, 29 South La Salle St., Chicago, Illinois.

A. I. M. E. Meeting at Washington Discusses Reconstruction

RECONSTRUCTION matters, particularly those affecting the mining industry, were discussed by the Washington section of the American Institute of Mining Engineers on Dec. 6. H. Foster Bain acted as toastmaster. The principal papers presented were by C. K. Leith, mineral adviser to the War Industries Board; M. F. Chase, head of the explosives division of the War Industries Board; Edgar Rickard, acting head of the Food Administration, and Chester Narramore, petroleum expert and technologist of the Bureau of Mines.

Officers for the ensuing year were elected as follows: Herbert Hoover, chairman; F. G. Cottrell, vice-chairman; F. L. Ransome, vice-chairman; Paul Merica, Charles Catlett, A. F. Lucas, F. W. Wood, executive committee; A. G. White, secretary.

Professor Leith was of the opinion that any economic scheme of international control concerns principally the exportable surplus and necessary imports, and not the raw materials consumed within the country of origin. It involves essentially the allocation of exportable surplus by mutual agreement, to insure that all are supplied, that no one nation gets too much, that the supply for enemy countries be controlled—that no one nation use more than its share of the world's limited shipping. Any such allocation involves some curbing of the richer and stronger nations. In regard to minerals, the sacrifice of the United States will be relatively greater than that of any other country, for in minerals the country is well able to take care of itself, in unrestricted competition for world trade, because of large and varied resources. One of the consequences of an agreement to control exportable surplus would be the abandonment of the slogan that the United States should make itself entirely independent in regard to all raw materials, even at high cost and with the aid of protective tariffs. From the standpoint of conservation of certain minerals of which domestic supplies are limited, and in the interest of the best use of the world's supplies by all countries, it is not desirable to set up artificial barriers to international reciprocity in regard to minerals.

INTERNATIONAL CONTROL OF MINERALS

Professor Leith cited arrangements for international control of certain minerals, already in effect, and indicated the minerals of the United States which would be most affected by a general agreement to control exportable surplus. He concluded that the difficulties involved in controlling international movements of minerals are many and serious, and will weigh heavily on the United States; and that it is doubtful whether this country is ready for this degree of sacrifice of national self-interest for the larger good, but urged the necessity of striving for better international arrangements of some kind for the common use of mineral raw materials. Professor Leith closed with a plea for a more comprehensive study of world mineral statistics and problems by the Department of the Interior and non-official organizations and technical papers.

Mr. Chase stated that at the time the armistice was signed at least 50% of the industries of the country were devoted to war work and at least 30% were doing nothing else. The world's shipping had been reduced and restricted, and the former peace-time trade routes had been disturbed and many of them eliminated. It was believed impossible to revert to commercial lines without serious complications, and, further, the war itself had changed the status of commercial relations to such an extent that at the cessation of hostilities a new era would begin, in which the old established methods of business would have to be completely readjusted to find markets for the products and raw materials for the factories of the United States.

This idea grew largely from the fact that in the European countries there are true reconstruction problems and questions, which during the last two or three years have been studied by commissions or committees. Thus, as early as May, 1916, France was compelled to take up the question of rehabilitating her invaded and devasted territory and of credits to aid in the resumption of agricultural and industrial life. Somewhat later, Great Britain established a Ministry of Reconstruction, which has organized 87 committees and commissions, each studying some particular problem which England, because of her economic dependence on other countries, must solve after the war. In October, 1917, Belgium, faced with the same conditions as France, created a Ministry of Economic Affairs, under which rehabilitation problems are still being investigated and worked out. Italy, too, has established a Ministry of Economic Reorganization. Similar studies have been undertaken, to a greater or less extent, by Canada, Russia, Japan, and other countries, both in Europe and in South America. Germany appointed a commission on economic transition early in August, 1916, and numerous commissions on economics were thereafter formed.

The fact that the commercial and governmental interests of these foreign countries considered reconstruction problems so vital, naturally led the same interests here to think that the United States would also have the same questions, probably differing in degree, to meet and solve.

AMERICA ONLY PARTLY CONVERTED TO WAR BASIS

It is, however, becoming evident that the people of the United States have not the problems that are confronting Europe, and that the country is rapidly going back in many industries to peace-time and commercial production without the disarrangement of business that was thought bound to occur. This in part no doubt is due to the fact that America had only partly converted the industries of the country to a war basis, and that it had been in the war for a much shorter period than its associates abroad. It is also partly due to the fact that American business methods have been such as to lend themselves more readily to quantity production of war material than those of the foreign countries. American industries have proceeded with the production of war materials along the lines of well-established American business principles, and it has not been necessary, to meet the necessity created by war, to change methods of production, or methods of factory management, radically. Consequently, as the country goes back to the production of commercial articles it has few changes to make in its industrial and political system.

RECONSTRUCTION PROBLEMS ARE FEW

When the situation is analyzed it will be seen that actual reconstruction problems are extremely few. They do embrace, of course, the disposition to be made of the railroads, steamship lines, express companies, and telephone, telegraph, and cable lines, all now under Government control. They embrace, also, the disposition to be made of war-risk insurance policies and certain matters of finance and taxation. The question that probably gave the most immediate and deepest concern was that involving the cancellation of contracts for war materials. An unsound policy in this connection might have led to innumerable complications, both financially and industrially, but this matter at the present time has proceeded to such an extent as to warrant the conclusion that complications and troubles which were expected will not come to pass, and that, aside from legislation that may be required to permit of the application of certain sound and equitable principles laid down by the different war purchasing departments, the problems involved in this question will automatically solve themselves. In this particular connection provision has been made by the War Department and other contracting agencies of the Government for a fair and equitable adjustment on all war contracts, and many of the large war contracts are already in the process of liquidation, and the demobilization of war labor is proceeding in an expeditious and orderly manner, without undue hardship either to the labor or to the industries involved. There is little doubt that, as the readjustment proceeds and the industrial and commercial life of the foreign countries is reëstablished, it will be necessary to modify or change former American methods and practices to meet, competitively, the conditions established abroad.

In most part the plans for reconstruction in foreign countries have been based on hypotheses that may or may not be true, and it is inconceivable that plans founded in this way will not require change or have to be abandoned as the true conditions are discovered; and, in attempting to meet these conditions, the wisest plan on the part of the United States will be to keep fully and completely advised as to what is actually happening, so as to be able to act quickly and intelligently to meet each situation as it develops. American institutions are not hampered by traditions and precedents, and American industries have the freedom to act as soon as the people are in possession of the facts.

At the present time the greatest service would be the establishment of such agency as will promptly and accurately give to the country full and complete information on the different situations as they arise, rather than devote time and energy to the solution of problems the existence of which is not certain. The correct statement of any problem goes far toward solving it. America's post-war problems, for the most part, cannot be clearly seen and stated now. They are still in the development stage. It would only be a fortunate guess that would visualize them correctly at this time. To know what they really are, it is essential first to know the terms and conditions of peace.

It is the part of wisdom, therefore, not to be too hasty in proposing reconstruction measures. Only possibilities surround American industry now. It is not possible to build on them. But the future will develop what the realities are. The people of the country should await them with minds that are open, and calm, and ready, confident that, possessed of the spirit of coöperation and sound business judgment and foresight, they will be able to solve the industrial problems of the future as surely as they solved the military problems of the past.

Living Up to Old Traditions

It was never in mining traditions that an effort to raise a fund for a mining regiment such as the 27th Engineers should meet with a meager response. What a scramble there would have been in the old camps and diggings to get in on such a proposition! Read Mark Twain's account of how the money ran like water back in 1861, when the miners of Virginia City were appealed to for wounded soldiers and sailors, and imagine what men like that would have done for a mining regiment all their own. There never was such a regiment before—never such a unique organization representative of the mining industry; and there will never be again—not in our time.

The reckless generosity of the past was perhaps due in part to flush times and easy money, but it still survives in a degree. The more than $19,000 given to the Comfort Fund in the last year bears witness. And it will continue, for though the war is over, there is and will be ample reason for maintaining the fund until the regiment returns and is mustered out. Those who desire to contribute may still do so, with the knowledge that their money is needed and will be well spent.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johann	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hulst	20.00
Lawrence Addicks	20.00
R. R. Boyd	25.00
E. R. Varela	5.00
W. J. Olcott	25.00
J. E. Clennell	10.00
C. M. Eye (monthly)	10.00
A. H. Hoffman	10.00
Francis Drake	25.00
Employees of Sociedad Minera Backus y Johnston del Perú	176.29
Charles Le Vasseur, monthly	5.00
F. Wartenweiler	10.00
Walter Douglas	100.00
Robert E. Dye	10.00
Total	$19,179.56

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Owing to the large volume of work involved in administering the fund, contributions are acknowledged only by publication in the *Journal*.

Reciprocity on the Part of Labor Needed To Solve Industrial Problem*

BY J. PARKE CHANNING

THE settlement of the so-called labor problems will depend, in great measure, on the way they are handled; and it is unfortunate that publicity has ecently been given to certain ill-advised remarks, made y those who were unaware of the full circumstances, hat wages must necessarily be reduced, hours lengthned, and other similar steps taken in the near future. There is nothing to justify predictions of such a haracter. No apparent reason is evident why wages hould be reduced, provided coöperation on commonense lines could be achieved, and a mutual respect stablished between the two groups. Disregarding the ctions of a handful of malcontents, it may be said, ithout fear of contradiction, that labor has stuck yally to its post through the recent international risis; and for this alone labor deserves consideration nd fair treatment.

Progress has been made in the reorganization of ocial relations and conditions among the wage earners, nd the war has led to drastic changes in England. en years ago an engineer of international repute came o the conclusion, after a careful study of the situaion, that 10% of the entire population of Great ritain were positively underfed, 10% were only able o say that what they received enabled them to keep ody and soul together, 25% were earning satisfactory ages, and 10% lived in comparative affluence. Such a tate of affairs could only be described as a sorry reflection on the attitude of all concerned, and, in itself, as sufficient to condemn the whole structure under hich such a system could exist.

The war has changed the conditions of the working lasses in England to a material extent, and a return o pre-war conditions is inconceivable. Although many eforms have been instituted as temporary measures, nd were adopted to encourage production and to meet he exigencies of situations that arose in war time, t is now being realized that there was something undamentally wrong with British sociological condiions before the war; and that to abolish those measures which have contributed so much to the contentment and lecency of the population, merely because the war was ver, would be the height of stupidity.

In the United States no similar condition has ever existed. It has been, however, only in comparatively recent times that employers have realized that conditions were not as satisfactory as they ought to have been, but there has been no delay in setting things to rights. Social matters have been vastly improved in many centers of industry; and responsible corporations have made exceptional efforts to foster a spirit of contentment, based on equitable dealing, which has done much to cement the feelings of coöperation that are now in evidence. Unobtrusive efforts have been made in many instances to assist men in owning their own homes, without raising the suspicion that any paternalistic action was being taken. Minor disabilities such as were found to arise in those cases where men refrained from interesting themselves in home ownership, because their industry happened to be operated in an isolated district, have been removed; and the personal aspect of the matter has been studied to a logical conclusion. The results have been wholly satisfactory. Unhygienic and unsanitary features have been removed; and, in the majority of cases, employers, especially those operating on a large scale, can say that everything possible has been done. Good wages are being paid, and the hours of labor have been materially reduced; general educational and living conditions have been greatly improved; and salutary efforts to promote closer contact and coöperation between employers and employees are already bearing fruit.

On the question of a minimum wage and maximum hours of labor, there is much to be said in favor of both. Men must have sufficient to be able to live up to the American standard of decency and comfort, without which it is impossible to engender the proper spirit of self-respect. A fair wage must, of necessity, be an equitable wage, and, although opinions may differ, there is ample evidence to show that profit sharing is impracticable in the majority of instances. To illustrate this one might take the case of two mines, adjoining one another, where dividends amounting to 5 and 50%, respectively, are being paid annually. If a workman does a fair day's labor in the high-grade mine he would, according to this system, receive a proportionately large bonus. His colleague in the low-grade mine, working just as loyally and just as industriously, would receive practically no bonus. The allocation would therefore be made on an inequitable basis, it would lead to as much dissatisfaction as satisfaction, and the system would ultimately defeat its own ends.

With regard to maximum working hours, there was a gradual accumulation of opinion that the eight-hour day was the logical sequence of a general betterment of conditions. Not only would it give the employees a fuller opportunity to enjoy the benefits they can obtain from the higher wage they can earn, but the general adoption of the eight-hour day must inevitably lead to an appreciable increase in the efficiency of operations. Experiments have been made in connection with which a logical excuse might be proferred for the extension of working hours above the limit mentioned, but results have been invariably of a nature to confirm the conviction that there is nothing to be gained by an adherence to the older system.

The maintenance of high war-time wages, maximum working hours, and the vast expenditures involved in modern welfare work are real concessions of incalculable value to the employees. There is one fundamental requirement which is essential to success in an undertaking where the various units are so interdependent as employers and employees are to one another in industrial work. *There must be reciprocity.* The men must respond; and if they mean to support their side of the bargain they must be prepared to show an unfailing high efficiency in their work. It is only under these conditions that the continuance of high war-time wages is feasible—it is the secret of future success—it is the keystone on which will rest America's greatness in industry, and the contentment of her people.

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*Abstracted from an address delivered at the Reconstruction Conference, Atlantic City, N. J., on Dec. 4.

To achieve the complemental attitude of employer and employee, more attention must be paid to the study and application of human engineering—more time must be spent in the sympathetic perception of the personal aspect of the matter, as viewed from the worker's standpoint. A frequent fault among employers is their inability to realize that their workers are not always keen witted, and that infinite patience and unremitting perseverance are needed before what may be termed the obvious logic of a change in economic conditions, really to the benefit of both parties, can be understood and viewed as desirable.

Large corporations are often unwieldy, and the personal contact between employer and employee is a thing of the past. This being the case, it is imperatively necessary to see that foremen and others who have the direct handling of men should be educated to appreciate the other man's personal and often biased point of view. Those in immediate control should be ready to coöperate and help, rather than to order; and to restrain their authority for those rare occasions when it is really needed. The study of human engineering will have an important effect on the future relations between employer and employee, especially in such times as the present, when calm reasoning is an essential to ultimate success.

November Pig-Iron Production

Pig-iron production during November was 3,354,074 gross tons, or an average of 111,802 tons a day, according to *Iron Age.* This is a net loss of 860 tons a day, compared with October production, and is due to a considerable extent to banking and blowing out stacks on account of coal shortage. On Dec. 1, 360 furnaces were in blast, as against 366 on Nov. 1, five having been blown in and 11 blown out during the month. The estimated daily capacity in blast Dec. 1 is 111,330 gross tons, as compared with 113,500 tons estimated Nov. 1. The production of ferro-alloys amounted to 59,638 gross tons for November, of which 33,545 tons was ferromanganese and 26,093 tons spiegeleisen.

Australian Copper Contracts

SYDNEY CORRESPONDENCE

The last contract made with the Imperial Munitions Department was planned to expire on Dec. 31, 1918. As the contract is only for transactions in refined copper, the blister produced in November and December will not come upon the market as refined copper until January and February, 1919. There being no news to date of an extension of the copper contract into 1919, the federal government announces that it will finance copper companies for the first three months of 1919. The method of accommodation will be, no doubt, by advances against the refined copper as produced. On present outputs this means advancing o about two months' production, which is about 650 tons. Considerable benefit will result to the copper producers, who already have had to make heavy financia arrangements for themselves during 1918.

Foreign Trade in Metals and Ores

Imports and exports of the more important metal and ores, as reported by the Department of Commerc for October, 1918, and the figures for October, 1917, a finally revised, are as follows:

IMPORTS, OCTOBER, 1917, AND 1918

(In pounds, unless otherwise stated)

Metal and Ore	Oct., 1917	Oct., 191
Antimony ore, contents	227,329	36,27
Antimony matte, regulus or metal	3,518,968	3,025,60
Copper:		
Ore, contents	10,854,432	2,908,75
Concentrates, contents	3,351,840	4,046,73
Matte, regulus, etc., contents	125,659	3,156,87
Imported from (in part):		
Canada	2,543,466	917,16
Mexico	3,082,950	5,742,61
Cuba	2,140,190	1,959,06
Chile	5,124,818	713,34
Peru	1,277,726	1,65
Venezuela	162,781	352,73
Unrefined, black, blister, etc	23,089,950	33,884,11
Refined, in bars, plates, etc	20,127	2,080,76
Old, etc., for remanufacture	1,583,587	43,86
Composition metal, copper chief value	31,002	....
Lead:		
Ore, contents	2,049,030	2,247,67
Bullion, contents	2,722,284	11,252,41
Imported from (in part):		
Canada	64,929	1,654,00
Mexico	3,941,213	11,846,08
Pigs, bars and old	1,087,179	9,81
Pyrites, long tons	94,119	35,05
Imported from:		
Spain, long tons	68,764	....
Canada, long tons	25,355	35,05
Zinc:		
Ore, contents	7,614,633	4,104,71
Imported from:		
Canada	1,333,925	190,00
Mexico	4,702,033	3,914,71
Australia	1,578,675	....
Blocks or pigs, and old	15,447	......
Manganese ore, long tons	60,649	48,91
Imported from (in part):		
Cuba, long tons	2,498	6,17
Brazil, long tons	54,685	37,88
British India, long tons	1,700	....
Tungsten ore, long tons	431	95

EXPORTS OF COPPER, LEAD AND ZINC

(In pounds)

	Oct., 1917	Oct., 191
Copper:		
Ore, contents	435,700	364,00
Concentrates, contents	137,541	15,40
Unrefined, black, blister, etc	4,256,707	110,06
Refined, in ingots, bars, etc	81,316,000	31,088,59
Exported to (in part):		
France	38,807,313	7,906,15
Italy	15,267,052	7,404,97
Russia	9,795,720	....
United Kingdom	13,393,535	7,579,08
Canada	2,902,126	5,561,52
Composition metal, copper chief value	8,951	5,44
Old and scrap	60,542	33
Pipes and tubes	522,975	257,29
Plates and sheets	9,942,509	301,02
Wire, except insulated	2,008,119	2,439,99
Lead:		
Pigs, bars, etc., produced from domestic ore	5,329,000	3,687,14
Pigs, bars, etc., produced from foreign ore	21,039,360	3,551,41
Exported to (in part):		
Denmark	111,923	....
Canada	44,028	199,03
United Kingdom	7,009,740	4,182,24
Argentina	1,388,197	....
Japan	....	2,464,00
France	1,733,916	....
Brazil	1,367,739	336,10
Zinc:		
Dross	2,450,885	2,373,23
Spelter:		
Produced from domestic ore	10,202,224	12,888,24
Produced from foreign ore	4,901,762	2,927,36
Exported to (in part):		
France	7,112,722	672,00
Italy	2,850,014	158,05
United Kingdom	3,278,121	13,069,28
Canada	1,814,784	1,008,38
Mexico	110	2,11
Japan	....	628,09
Australia		224,00
In sheets, strips, etc	1,912,448	4,268,02

Editorials

The Situation in the Metals

AS PRODUCERS get their bearings through partial lifting of the fog that enshrouded them upon the sudden advent of the armistice they begin to get views that are not very cheerful.

The copper producers find themselves with about 800,000,000 lb. of crude copper on hand and in transit, which was very costly to produce. Although there is no great stock of refined copper, it is now beginning to accumulate. Australia and Japan also have stocks of copper. Great Britain does not apparently need to buy any copper right away. Germany can't.

Lead manufacturers are experiencing unexpected cancellations, and lead is backing up on them and is also accumulating on the hands of the producers. The reduction by the latter of the price to 7.05c. did not stimulate any buying worth mentioning. The lead producers are facing the facts better than anyone else and are curtailing their outputs. The Mexican output is also being curtailed. The disposition of that supply, which must go abroad, is a matter of concern, as also is the rise of the London price to £40, on which basis some of the Mexican ore is bought.

Zinc, having had a free market, is less disturbed than copper or lead, but the situation with respect to high-grade metal, which is increasing in supply, affords food for thought. Great Britain seems to be well supplied with zinc, but France probably has need of some for immediate requirements, and it is the hope of selling to her that has in part bolstered up our market for common spelter. However, we cannot be sure that France will buy all her spelter from us and not any from Japan. Of one thing we can be sure, and that is that Australian ore is going to be delivered to Europe for smelting just as soon as shipments and smelting arrangements can be managed.

In the Joplin district the mining of zinc ore has become pretty unprofitable, and production is largely curtailed. The sliding scale arrangement between miners and smelters, with allocation of sales among the ore producers, has been abandoned as a fiasco. It could hardly have resulted otherwise. Western ore producers find it difficult to sell their ore, for smelters, already well stocked, do not like to load up with more.

In iron and steel the business seems to be in such things as nails, fencing, etc., that people must have anyhow. There is no buying for new construction, and the railroads are not buying. Judge Gary talks of reductions in prices.

Ores—manganese, tungsten, chrome, pyrites, etc.—are unsalable. Everybody is overstocked.

Silver maintains its price, and platinum, as we forecast, even has risen, but both these precious metals possess especially favorable conditions. In the base-metal markets readjustment downward is inevitable and is to be welcomed, for there will not be any large buying at present prices. The longer the day is put off that will lead to the entire elimination of interference and to restoration of free markets, the longer and more troublesome will be the period of readjustment. And by the elimination of interference we do not mean only Government interference, but also the inpediments by producers, who by joint actions, curtailments for exaction of arbitrary prices, and other uneconomic measures seek to continue artificial and unhealthful conditions.

Among the major metals, the situation in copper is the most awkward. It is being aggravated by the mischievous agreement with the War Industries Board *to maintain production* and the unholy sanctioning of an agreement among the producers to maintain an asking price which they cannot get and which none of them thinks he can get. This has temporarily abolished a market and is producing a mounting financial burden. The sooner the producers dissolve their agreements and let a natural market create itself, the better will proceed the inevitable readjustment in their industry.

Reconstruction Labor Problems

WIDE publicity has been given to and considerable interest has been aroused in the address of John D. Rockefeller, Jr., which was delivered at the recent Reconstruction Conference at Atlantic City. Those who had the privilege of hearing him were unanimous in their recognition of the sincerity of his attitude and the deep significance of his words. There could be little opposition to his contention that the primary purpose of industry is to advance social wellbeing rather than to afford a means for the accumulation of individual wealth. With this idea in view Mr. Rockefeller has formulated what has been termed a "labor creed" to which he proposes that industry should subscribe. Its principles met with general approval at the conference, and it was adopted unanimously as a resolution at the closing session.

Mr. Rockefeller spoke almost entirely in the interest of labor. His creed, if accepted, will insure the continuance of those concessions which have been made by capital during recent years; it will help toward the establishment of that new era of peace and prosperity that we will all welcome. Taken by itself, however, no subscription to the lofty idealism of Mr. Rockefeller will necessarily insure success. For this can come only by coöperation, and coöperation from reciprocity of consideration. Concessions must be mutual, and self-interest must be waived. History has shown that although, as Mr. Rockefeller says, the application of right principles never fails to effect right relations, there have been times when a literal interpretation of the attitude of passivity enjoined in the Sermon on the Mount, in the face of repeated imposition, has led to the reverse of an amicable settlement of the difficulty.

An abstract from J. Parke Channing's address, which was made at the same conference, when he spoke to the group embracing engineering and other industrial professions, is given in this issue, and is a fitting supplement to Mr. Rockefeller's pronouncement. It is appropriate that attention should be drawn to the fundamental requirement of reciprocal consideration on the part of labor. If capital is prepared to go the length that Mr. Rockefeller proposes to insure the happiness, comfort, and contentment of the great majority, then labor must be prepared to maintain that state of efficiency and loyalty without which there is little possibility of coöperative success. It is only on such conditions that a high standard of wages can be considered practicable.

Beware the Metric Propaganda

A NEW and dangerous attempt to make the metric system compulsory in the United States is now being launched. It has been made an Administration measure. A bill has already been introduced in Congress. There is talk of working it into the clauses of the peace treaty or in the program for a league of nations. The arguments are the same old fallacies, which survive repeated exposures. It is impudently reiterated that a majority of the nations of the world use the metric system, which is true, and the majority will be even larger if the new nations of middle Europe be counted. But the minority includes the greatest industrial nations—America and Great Britain and her colonies—and the majority of the industrial people of the world do not use the metric system. If uniformity is what is wanted, the metricists would better work for the universal adoption of the English system.

Then there is the old phantom theory about South American trade, although Mr. Halsey showed in a conclusive paper presented to the American Society of Mechanical Engineers last week, that the export trade with South America is mainly done by the English system, and that the South American countries, after many decades of trial, have not even been able to adopt the metric system more than partially in their own internal business.

If this thing comes up in Paris are we going to have to depend upon Great Britain to safeguard the welfare of American industry? Fortunately the adoption of the metric system by Great Britain was exhaustively considered by a British government commission, which this year reported adversely. On the other hand, Lenine and Trotzky recently decreed the compulsory adoption of the metric system in Russia on Jan. 1, 1919!

The *Journal* used to be in favor of the metric system, and for certain special purposes—international statistics, for example—still uses it. But study of it and experience with it convinced us that any attempt to force it upon the United States would be calamitous. The metric system has been for a long time *legal* in the United States, and those who for any reason find it advantageous are free to use it and do so. But its *compulsory* adoption would bring industry to a standstill and would even hamper thought. Experience in every foreign country, however, has shown that *compulsory* national adoption is impossible, wherefore the result is confusion, which in the cases of Great Britain and the United States would be calamitously costly. It is our mature judgment that a Congressional enactment that on and after a certain date no business in this country would be legal unless it were transacted in the French language would be less harmful than the compulsory transaction of business by the metric system of weights and measures.

It may be asked why that was not so in Germany when she adopted the metric system. Simply for the reason that her adoption of it happened before she had any great industrial development and her infant industries could relatively easily be taught to think in terms of the new units, and use them; just as children are easily, notoriously easily, taught to speak a foreign language. The forcing of the metric system upon Great Britain and the United States would now be playing into the hands of Germany. Lenine and Trotzky, proved German agents, do that in Russia as part of the program.

Helping Russia

THREE vessels laden with commodities have already been sent by the War Trade Board to Siberia for the new United States Russian Bureau, incorporated, which was organized at the direction of the President for the purpose of helping the Russians to help themselves in stabilizing the economic situation in that country. More vessels will be sent, and the board asks that persons interested in shipments and Russian trade address the Russian Bureau for detailed information. The company will engage in the business of exporting to Russia and Siberia agricultural implements, shoes, clothing, and other commodities which the Russian population need, bringing back Russian and Siberian raw materials in return. The Russian Bureau has a capital stock of $5,000,000, all of which has been issued and fully paid in cash out of Government bonds. The stock of the Russian Bureau is owned in its entirety by the United States Government.

We are glad that this excellent start has been made in a very important matter. Let us suggest that our Government ship promptly to Russia a large part of the immense surplus stocks of clothing and other material that our War Department has on hand. We do not need them. The Russians do.

Freedom of the Seas

WE HAVE heard for several years, especially since the Germans started the war, the expression "Freedom of the Seas." We are hearing a good deal about it now.

We have assiduously endeavored to ascertain the meaning of that expression. We have inquired vainly of many persons. Nobody could, or would, explain.

Before the war, ships of any flag used to sail the seas, wherever they would, without hindrance. We thought therefore that the seas were free. We could not understand Germany's complaint. We cannot understand present references to this abstraction.

BY THE WAY

Birmingham, England, is the center of a number of manufacturing industries, many of which are metallurgical or have to do with metals. The close association of the people with these industries is reflected by the use of such street names as Brasshouse Lane, Foundry Lane, Muntz Street, Steelhouse Lane, Irons Lane, and many others of like character.

"Now that the war is over, it is time to talk mining," writes a mineral expert. "Don't forget that I am versed in mineral deposits both in the U. S. A., Central America, and Mexico, and am the pet of the prospector, so that I am next to stuff that Big Money can't even buy. All I ask is a decent chance." The way these dollar-a-year men are getting back into private life is certain proof that the war *is* over.

The current Russian budget, some details of which have been published in London, reveals an estimated expenditure on the public services, including posts and telegraphs, of 916,000,000 rubles ($458,000,000), and the receipts from these services are placed at 357,000,000 rubles, or $178,500,000. The Putiloff locomotive works absorbed 92,000,000 rubles ($46,000,000), turning out only five locomotives.

While the Stock Exchange stagnates, a really tremendous boom is in progress elsewhere, says the writer of "Wall Street Paragraphs" in the *Evening Post*. Out on the curb, the "penny mining stocks" have come into their own, with advances in price of thousands per cent. The "big board" never had anything to compare with such movements. It is the turn of the gold-mining shares. One which a fortnight ago was selling for 3c. a share is now up to 36 or thereabouts; others have gone from 2 to 30. These booms are accompanied by talk of striking pay dirt on one or two of the properties, the curb having no need of the finespun economic theory that, with the presumptive approaching increase in the purchasing power of gold, gold mines should be more valuable to their owners. One of the most impressive things about the movement is the fact that the outside market bothers itself so little about bankers' restrictions on loans for speculation.

Away back in the early years of the twentieth century, there entered a barber shop in Globe, Ariz., an individual whose general get-up resembled that of Abe Lincoln on one of his absent-minded days. With a preoccupied air, he passed his large hand over sturdy but camouflaged jaws, thus conveying to the mind of the tonsorial artist the hint that he desired a shave and did not wish to be annoyed by any gossip and chatter, which would tend to interrupt his meditations. Scarcely had the lather been applied, however, when the professor began his customary clatter. "Stranger in town, ain't ye?" The victim stirred slightly, grunting "Uh-huh," in a manner intended to hang up the receiver, as it were. "Got a job at the O. D. smelter?" A similar response was forthcoming, accompanied by a feigning of drowsiness and a readjustment of the long limbs in a more comfortable position. The affirmative responses became fainter and fainter, to the queries of "Good pay?" "Do you like the company?" "Has the new big boss arrived yet?" etc., until a change of tactics to "Do you work on the charging floor, tapping floor, or around the stockpile?" brought results in the form of a drawling "Oh, I kind of look around here and there and hang around the office some." A look of compassion spread over the barber's countenance as he said, as gently as he could, "Oh, I see. You're the new watchman. There ain't much pay in that, but if you're steady there's chances. Say, bo, I got a lot of influence with some of the foremen, and maybe I can help you. Now what might your name be?" This roused the sleeper from his lethargy. Stretching a bit, he responded: "Me? Oh, my name is Ricketts."

Cap'n Dick was interested in watching the mine surveyor as he and his assistant were measuring up the underground contracts. A few quick movements, a few notations in the notebook, and the men were off to the next stope. "M'son," says Cap'n Dick, "w'en thee comes to think on un, this 'ere edication is a gert thing. Never naws to w'ere she'll lead, an tha moor thee gets, tha moor thee wants. Naow, dam-me, w'en I firs' wuz minin', we 'ad none o' these 'ere fancy tape-lines, an' I tell 'e, man wuz lucky if 'e 'ad bit o' compass to tell w'ere 'e wuz gawin. O' coorse, 'e nawed 'ow 'e wuz gawin, but, m'son, 'e never could tell the 'ow 'e nawed. Mus' 'a bin this 'ere h'intuition, I guess. As to this 'ere measurin', I mus' h'admit some 'ead work wuz needed. For h'instance—Tom Broad an self are 'ere workin' in this bloody stope, with Tom up on 'igh. Tom shouts daown to me, ''Ere, Richard, gos along do! Get Jan Kevern an 'and us up bit of a bloody stull, will 'e?' ''Ow long dost thee want this 'ere bloody stull, Thomas?' shouts I. 'A h'axe 'andle, a 'ammer 'andle an a gert flat rock,' sez 'e. So figger un h'out, son; 'ow much is un?

All hearts respond to the following poem, which was found written on a powder box used for a cupboard in an old prospector's cabin near Neihart, Montana:

About six miles from Neihart, that city of great strife,
There was a silver-lead mine, rich and free,
Where an honest-hearted miner
Ust to lead a happy life,
Contented at his work as he could be.
He walked the earth quite proudly,
A Bonanzie King for sure,
And he thot know disappointment could befall;
But he left his work one evening,
His sad heart knew the truth,
For the pay streak had gone off into the wall.

There is a name that is never spoken,
There is a miner's heart that's broken,
For he thot he'd be invited to the inauguration ball,
And there is still a memory living
Of how prospects are deceiving,
When the pay streak wanders off into the wall.

Now he sits without his cabin
Thinking of the coming years, and
Wondering what the future has in store.
The demon of despondence is wailing in his ear,
And the hungry wolf is howling at his door.
Still his heart is in the mountains
There among the rocky seams, and he sometimes
Thinks it's gone beyond recall.
'Neath the Spangles in the rosie relm of dreams,
Lyes the pay streak that went off into the wall.

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons if so requested.

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10209—ELECTRIC FURNACES—Electrodes for Electric Furnaces: Their Manufacture, Properties and Utilization. Jean Escard. (Gen. Elec. Rev., Oct., 1918; 8 pp., illus.) To be continued.

10210—HOIST CONTROLLER—The Lilly Hoist Controller. (Eng. and Min. Journ., Nov. 30, 1918; 1½ pp., illus.) 20c.

10211—LAMPS—Acetylene and Electric Cap Lamps from a Safety Standpoint. H. M. Chance. (Paper before National Safety Council, Sept., 1918; 9 pp.)

10212—PIPE AREAS—Chart for Pipe Areas. W. F. Schaphorst. (Eng. and Min. Journ., Nov. 16, 1918; ½ p., illus.) 20c.

10213—SAFETY—Conveyor Pulley Guards. Geo. M. Douglass. (Eng. and Min. Journ., Sept. 21, 1918; ½ p., illus.) 20c.

10214—SHOVEL—Armstrong Mechanical Shovel. (Eng. and Min. Journ., Nov. 30, 1918; 1 p., illus.) 20c.

10215—WELDING—Emergency War Training for Oxy-Acetylene Welders. (Bull. 11, Federal Board for Vocational Education, 1918; 86 pp., illus.)

10216—WELDING—Notes on Electric Welding. H. K. Porter. (Eng. and Min. Journ., Nov. 23, 1918; ¾ p.) 20c.

INDUSTRIAL CHEMISTRY

10217—CHEMICAL STONEWARE INDUSTRY and the War. P. C. Kingsbury. (Chem. and Met. Eng., Sept. 27, 1918; 2 pp.)

10218—POTASH as a By-Product. J. S. Grasty. (Chem. and Met. Eng., Sept. 26, 1918; 4¾ pp., illus.) Southern iron ores and fluxes considered as a domestic source of potash in large quantities; cost of operation, notes of profits, etc.

10219—POTASH from Desert Lakes and Alunite. J. W. Hornsey. (Journ. Ind. and Eng. Chem., Oct., 1918; 1½ pp.)

10220—POTASH—Literature of the Potash Industry, 1912-1917. F. W. Bruckmiller. (Chem. and Met. Eng., Sept. 26, 1918; 2 pp.)

10221—SULPHURIC ACID—The Cottrell Processes in the Sulphuric-Acid Industry. A. A. Heimrod and H. D. Egbert. (Chem. and Met. Eng., Sept. 15, 1918; 5 pp., illus.)

MATERIALS OF CONSTRUCTION

10222—CEMENT INDUSTRY—Recent Developments in the Cement Industry. Richard K. Meade. (Chem. and Met. Eng., Sept. 27, 1918; 3½ pp., illus.) Conversion of a peace industry to the purposes of war; economies effected in fuel and labor, and recovery of potash.

10223—SAND-LIME BRICK in 1917. Jefferson Middleton. (Mineral Resources of the U. S., 1917—Part II; 2 pp.)

MISCELLANEOUS

10224—ACCIDENTS—Monthly statement of Coal-Mine Fatalities in the United States, June, 1918 Albert H. Fay. (U. S. Bureau of Mines, 1918; 29 pp.)

10225—LABOR—Engineering Possibilities of Circular Housing Plan. G. J. Lamb. (Can. Engr., Aug. 29, 1918; 3 pp., illus.)

10226—LABOR—Feeding Employees at a Steel Plant. (Iron Age, Nov. 7, 1918; 2¼ pp., illus.)

10227—LABOR—Housing at Tyrone, N. M. Chas. F. Willis. (Chem. and Met. Eng., Oct. 15, 1918; 4 pp., illus.)

10228—LABOR—Housing of Labor and Sanitation at Mines in India. J. H. Evans. (Trans. Min. and Geol. Inst. of India, Apr., 1918; 10 pp.)

10229—LABOR—How to Determine Cost of Living in an Industrial Community. Ray M. Hudson. (Industrial Management, Sept., 1918; 8 pp.)

10230—LABOR—The Human Element in the Mill. (Chem. and Met. Eng., Aug. 11, 1918; 4½ pp., illus.) Address by Hugh K. Moore at meeting of Am. Inst. of Chem. Engs.

10231—LABOR—The Life of a Mining Community. Chas. F. Willis. (Eng. and Min. Journ., Oct. 26, 1918; 2½ pp.) 20c.

10232—LABOR—What About Labor? Editorial. (Eng. and Min. Journ., Nov. 23, 1918; 1 p.) 20c.

10233—LABOR CAMP of the Minnesota Steel Co. (Eng. and Min. Journ., Nov. 23, 1918; ¾ p., illus.) 20c. Excerpt from Monthly Review of U. S. Bureau of Labor Statistics, April, 1918.

10234—NATIONAL SAFETY COUNCIL, The. (Eng. and Min. Journ., Sept. 14, 1918; 2 pp., illus.) 20c.

Personals

Have You Contributed to the Association of the 27th Engineers?

G. L. Sheldon, of Ely, Nev., is doing professional work in Boulder County, Colorado.

Dr. L. D. Ricketts, consulting mining engineer, will spend the winter at Chandler, Arizona.

Horace V. Winchell has been nominated for president of the American Institute of Mining Engineers.

O. R. Whitaker, mining engineer, of Denver, Colo., has recently returned from a professional trip to Northern Mexico.

Harry J. Wolf, of the Malm-Wolf Co., examined the Eagle silver-manganese mine near Bonanza, Colo., during the latter part of November.

J. Parke-Channing was chairman of the "Industrial Professions" group meeting at the Reconstruction Conference at Atlantic City on Dec. 4.

Louis W. Adams has been appointed manager of the new openhearth and mill department of the Ashland Iron and Mining Co., Ashland, Kentucky.

Arthur J. Hoskin, consulting engineer of Denver, Colo., has returned after a three-months' stay in Dillon, Mont., where he was engaged in installing an oil-shale plant.

F. B. Hyder, until recently with the Thane Exploration Co., with offices in San Francisco, has accepted an appointment as mining engineer with the U. S. Bureau of Mines.

A. W. Allen attended the Reconstruction Conference of the Chamber of Commerce at Atlantic City, Dec. 3 to 6, and acted as secretary at the "Non-Ferrous Metals" (major) group meeting.

William W. Lewis has resigned as superintendent of the Western Reserve works of the Brier Hill Steel Co. at Warren, Ohio. **Abner Hughes**, formerly assistant superintendent, is his successor.

Milnor Roberts, of the University of Washington, will deliver an address on "The Stimulus to Research Given by the War," at the Sigma Xi meeting to be held on June 4, 1919, at the university.

Verne W. Aubel, who recently returned from blast furnace work in Australia and New Zealand, has been appointed assistant superintendent of blast furnaces at the Clairton, Penn. plant of the Carnegie Steel Company.

H. S. Mudd, who has been connected with the U. S. Bureau of Mines work on war minerals since September, 1917, will return to the management of his own mining properties on Dec. 15. His headquarters will be in Los Angeles.

Julius S. Bache was elected president of the Dome Mines Co., Ltd., at a meeting of directors of the company, succeeding the late Capt. J. R. De Lamar. **Alfred H. Curtis** was elected treasurer and **S. Wexler** assistant treasurer.

Lieutenant-Colonel Ralph Stokes, who used to be mining engineer with the International Nickel Co. and has many friends here, is now in command of the engineers with the British Expeditionary Forces in northern Russia.

Harry E. Higgins has resigned as director and vice president of the Otis Steel Co., Cleveland, Ohio. He has been connected with the company for several years, and previously held the position of general manager of the Cleveland Steel Co., Cleveland.

Henri Jequier, chief metallurgist of the Société Minière et Metallurgique de Penarroya, which operates the chief lead mines and smelting works of Spain, sailed for home on the "Espagne" Dec. 5. Mr. Jequier spent about nine months in this country studying American metallurgical practice.

E. Gybbon Spilsbury was appointed to represent the American Institute of Mining Engineers at the Engineering Congress in Paris. The delegation from the United States, invited by the French government, is composed of members of the four large engineering societies. The delegation sailed on the "Rochambeau" Dec. 5, and expects to be away about six weeks.

Pope Yeatman, head of the non-ferrous metals section of the War Industries Board, having completed his conferences with English and French officials, sailed for the United States on Dec 7. Mr Yeatman has made no report, but has advised his office that he had an interesting trip over the battlefields, including an inspection of the iron and coal region about Lille. He also mentions a very pleasant visit with Capt. Edward S. Berry of the 27th Engineers. Through him, Mr. Yeatman learned of the very creditable work being done by the 27th Engineers, although he himself was unable to visit the mining regiment's headquarters.

T. E. Mitchell, formerly resident manager and attorney for the Burma Mines, Ltd., Namtu, Northern Shan States, Burma, registered at the office of the American Institute of Mining Engineers during the last week. Others who registered there were: E. W. Westervelt, superintendent of the Hobson Silver-Lead Co., Ymir, B. C., Canada; Timothy D. Walsh, mining engineer, Nevada Arizona Mines Co., Hackberry, Ariz.; C. S. Corbett, geologist for the E. J. Longyear Co., Minneapolis, Minn.; Rudolph Emmel, mining engineer, of Marysville, Mont.; Lieut. Allen G. Waite, Signal Reserve Corps, Aviation Section; Joseph E. Pogue, U. S. National Museum, Washington, D. C.; Henry L. Slosson, mining engineer, of San Francisco, Calif., and A. McLintock, surveyor and engineer, of Harmon, New York.

Herbert C. Hoover was the guest of honor at a reception in the Hotel de Ville, at Brussels, on Dec. 6. Burgomaster Max, in a speech welcoming Mr. Hoover to Brussels, of which city he was recently elected a citizen, said: "In greeting the friend of the Belgian nation I am interpreting the feelings of 8,000,000 human beings saved from famine, exhaustion, and death. When the torments were let loose on Belgium, our eyes turned to the United States. We knew that that great people would not allow justice to succumb nor permit civilization and the future of humanity to become the playthings of a preying race. Our country was twice saved by yours, for the intervention of the American armies which decided the result of the war and delivered our territory, would have freed nothing but a vast cemetery if it had not been preceded by the magnificent work to which the name of Hoover will forever be attached."

Obituary

Stephen L. Allyn, consulting engineer, of Arizona, at one time with the United Verde Extension Mining Co., of Arizona, died recently in Los Angeles, aged 60 years.

Hugo Hogberg, master mechanic at the Temiskaming mine, Cobalt, Ont., died on Dec. 1 from pneumonia, aged 37 years. He was born in Sweden and for the last five years had been in the service of the Temiskaming Mining Company.

Alfred Ernst, consulting engineer for steel companies in the Pittsburgh district, died on Nov. 27 at his home in that city, aged 57 years. He was a graduate of the Vienna Technical Institute, Vienna, Austria. At the time of his death Mr. Ernst was on the consulting staff of engineers of the U. S. Bureau of Mines, and one of the leading authorities in the country on technical phases of steel manufacture.

Charles P. Brooks, mining engineer of Salt Lake City, died Nov. 30 of heart disease, aged 67 years. In 1874 he settled in Salt Lake City, where he went into partnership with R. H. Browne. He later became a member of the Salt Lake City Board of Health; surveyor of Salt Lake County; consulting engineer for the Board of Public Works in the construction of the sewer system of Salt Lake; member of the Board of Public Works; and a United States deputy mineral surveyor for Utah, Idaho, Nevada, and California.

Dr. Harry P. Corliss, chemical and metallurgical engineer, died on Nov. 16, at Ray, Ariz., from pneumonia following influenza. He was 32 years old. Upon graduation from New Hampshire State College, in 1910, he received a fellowship in the Mellon Institute of Industrial Research at Pittsburgh, which he held for five years. His work during this period resulted in several improvements upon the flotation process, including the discovery of alpha-naphthylamine as a flotation agent. In 1917, he went with the Metals Recovery Co. to make larger application of his discoveries.

Societies

American Chemical Society, New York Section, held a joint meeting with the New York Section of the American Electrochemical Society, the Society of Chemical Industry, and the Société de Chimie Industrielle on Dec. 6, in Rumford Hall, 50 East 41st St. Officers for the New York Section of the American Chemical Society for the ensuing year were elected. Col. Willi H. Walker spoke on "The Manufact and Use of Toxic Gases," and Col. Bradl Dewey had for his subject "The Manufa ture of Gas-Defense Apparatus."

Industrial News

Chicago Pneumatic Tool Co., announc the appointment of L. C. Sprague as assis ant secretary of the company, with hea quarters at 52 Vanderbilt Ave., New Yo

Superior and Boston Copper Co., of A zona, has selected the following board directors: W. G. Rice; George Kingdo Garrett Mott, of Carleton & Mott; Willia F. Fitzgerald, of Fitzgerald, Hubbard Co.; J. F. Barry, representing Cleme Parker & Co.; J. B. Hardon, representi Hayden, Stone & Co., and Homer Goodw This board will represent the owners of t property as they stand on the books of t company, and it has been agreed that proxies will be cast in favor of the above.

Trade Catalogs

Halby Shoveling Machine. Lake Sho Engine Works. 9½ x 7, illustrated. A m chine for mucking anywhere undergroun

Driers. L. R. Christie Co., 307 Fourt Ave., Pittsburgh, Penn. 6 x 9, 4 pp., illu trated. Two pamphlets, one describin indirect-heat drier and the other the in proved direct-heat drier.

Universal Displayors. Universal Fixtu Corporation, 133 W. 23rd St., New Yor 9 x 11; 6 pp.; illustrated. A folder, d scriptive of map and chart displayors, a well as bulletin boards for wall and floo Full details and prices will be furnishe upon request.

New Patents

United States patent specifications liste below may be obtained from "The Engi neering and Mining Journal" at 25c. eac British patents are supplied at 40c. eac

Alloy of Gold, Platinum and Palladiu George H. Dufour, Oak Park, Ill., assigno to Marshall Field & Co., Chicago, Ill. (U. S No. 1,282,055; Oct. 22, 1918.)

Aluminum—Method of treating aluminou materials of high silica content. Charle M. Hall, Niagara Falls, N. Y.; Arthur V Davis, Pittsburgh, Penn., and Homer H Johnson, Cleveland, Ohio, executors of th will of said Charles M. Hall, deceased. (U S. No. 1,282,222; Oct. 22, 1918.)

Aluminum—Reduction of Metallic Oxides Paul R. Hershman, Chicago, Ill., assigno to the Mineral Products Co., New York N. Y. (U. S. No. 1,273,220; July 23, 1918.)

Alunite, Utilization of. Richard Moldenke, Watchung, N. J. (U. S. No. 1,282,273; Oct. 22, 1918.)

Blast Furnace, Method of Desiccating Air for Use in. Leon Goldmerstein, (now Leon Cammén), New York, N. Y. (U. S. No. 1,282,686; Oct. 22, 1918.)

Electrolytic Process. Matthew M. Merritt, Danvers, Mass., assignor to Copper Products Co., Boston, Mass. (U. S. No. 1,282,262-3-4; Oct. 22, 1918.)

Explosive. Pierre E. Haynes and Harold E. Thompson, Buffalo, N. Y., assignors to the Linde Air Products Co., Cleveland, Ohio. (U. S. No. 1,282,229; Oct. 22, 1918.)

Furnaces, Regulator for Electric. Frank W. Smith, Westfield, N. J. (U. S. No. 1,282,478; Oct. 22, 1918.)

Hoist. William Lamb, Detroit, Mich. (U. S. No. 1,282,438; Oct. 22, 1918.)

Leaching Copper Ores, Process of. Albert W. Hahn, El Paso, Tex. (U. S. No. 1,282,415; Oct. 22, 1918.)

Leaching Process and Apparatus for Extracting Metals From Ores. Frank L. Antisell, Perth Amboy, N. J. (U. S. No. 1,282,521; Oct. 22, 1918.)

Ore Dressing—Screening Apparatus. Willard D. Richardson, Hebron, N. D. (U. S. No. 1,282,127; Oct. 22, 1918.)

Ore-Screen. John Nicholls, Globe, Ariz. (U. S. No. 1,282,108; Oct. 22, 1918.)

Steel, Manufacture of. Samuel S. Wales, Pittsburgh, Penn. (U. S. No. 1,282,660; Oct. 22, 1918.)

Tungsten, Process for Producing Ductile. Carl A. Pfanstiehl, Waukegan, Ill., assignor to Pfanstiehl Co., Inc., North Chicago, Ill. (U. S. No. 1,282,122; Oct. 22, 1918.)

Editorial Correspondence

SAN FRANCISCO—Dec. 6

The Chrome Mining Industry in California has suffered a setback that in some counties and districts has caused a collapse of such moment as to send the miners and prospectors off pocket hunting and reopening hydraulic and placer mines. Word comes from Washington that imports from Australia, Brazil, and New Caledonia will be stopped, though Canada and Cuba cannot be discriminated against. It seems to be the habit of statesmen who are opposed to the development of the mineral resources of America to cry discrimination, if protection of a newly developed mineral is asked. It does not matter to this class of lawmakers how much discrimination is practiced against California or Oregon or any other Pacific Coast state or any state. Large amounts have been expended in the development of chrome and manganese deposits and the building of motor roads in the last year in California and Oregon. Some of the investors have been able to reimburse themselves and were ready to begin taking out a little profit. Others have not yet got even with the game. The seesawing of the men in charge of whatever bureau or department of the Government is responsible for the situation has been a source of discouragement to a large number of small operators and caused appreciable losses to companies working on an extensive scale. California and Oregon responded quickly when the Government sent out the chrome and manganese S. O. S. But Washington doesn't seem to see the signal when the miners' ship is to be saved.

WALLACE, IDAHO—Dec. 7

The Hercules Mining Co. and the newly incorporated Sherman Lead Co., having adjacent properties and both being controlled by the Days, have adopted a novel plan to dispose of waste rock. The Sherman is driving a long crosscut starting in the town of Burke, which lies in a narrow canyon and has buildings so compact that there is no room for a dump. The Hercules disposes of most of its waste by filling in old stopes, and the surplus has heretofore been hauled away by the railroad companies for a nominal price and used for grade fillings. Under Government control of railroads there has been delay and annoyance in handling the waste, so the Hercules joined the Sherman in a plan to secure relief. A loading station has been built below the portal of the Sherman tunnel and accessible to the Hercules. From this station a bucket tramway has been run to a point just over the mountain on the opposite side of the narrow canyon, where the waste rock is automatically dumped. This tramway is driven by electric power and seems to solve the question of dumpage, which has long been a serious problem at Burke.

SALT LAKE CITY—Dec. 5

The Mine Occupation and Privilege and Net Proceeds Taxes on Utah Mines became delinquent Nov. 30, and payment of the net proceeds tax has been refused by nearly all of the 486 mining companies in the state. Some companies have paid it under protest, with notice to the state treasurer that they will take legal steps to recover it. The mine occupation and privilege tax was not opposed. The net proceeds tax is a supplemental tax passed in March, 1917, and operative this year for the first time; it became a law too late to apply to 1917 taxes. The total amount assessed under the net proceeds tax of 3% would be $989,341. Seven companies, whose combined assessment under the tax was $695,429, tendered the occupation tax of $1, but refused to pay the amount on the net proceeds. One of these was the Utah Copper Co., against which $664,503 was assessed. Thirteen other companies, which were assessed at $91,179, paid the amount under protest. The one company to pay in full, without protest, was the Ophir Coalition Mines Co., which tendered $1 as an occupation tax and $607.53 as the assessment against the net proceeds. The Mineral Products Co., of Marysvale, Piute County, is understood to have paid 3% on its net proceeds some time ago, though the company is not solely a mining company, but more or less of a manufacturing enterprise. Some of the principal mining companies that refused payment of the 3% tax and the amount assessed against them, follow: Utah Copper, $664,504.30; Utah Apex, $12,052.40; Scofield Coal, $1,574.30; Cameron Coal, $2,497.04; Silver King Consolidated, $11,725.00; Grand Central, $3,675.65; Gold Chain, $408.38. Companies which paid both items of the tax but under protest, together with the amounts paid, include the following: Independent Coal and Coke, $5,143.69; Dragon Consolidated, $1,963.69; Colorado Consolidated, $751.72; Swansea Consolidated, $98.11; Iron Blossom Consolidated, $4,928.20; Spring Canyon Coal, $3,581.05; Bullion-Beck, $926.20; United States Fuel, $21,594.22; United States Smelting and Refining, $21,771.55; Centennial Eureka, $8,618.05; Naildriver, $85.96; Ontario Silver, $710.86; and Utah Consolidated, $21,006.43. On the third Monday in December, after delinquencies shall have been properly advertised, State Treasurer D. O. Larsen says, the properties of mining companies which have refused to pay the 3% net proceeds tax and the $1 occupation and privilege tax will be offered for sale at public auction. The penalty on the $1 occupation tax is 3%, if paid before the day of sale, plus cost of advertising. The penalty on the 3% net proceeds tax is 5% thereof, and in addition interest at 12% per annum, together with all costs of advertising and sale. Though the treasurer can sell mines for unpaid taxes the same as any other property, the owner has four years in which to redeem his property. The treasurer may also institute a suit, which would bring up the constitutionality of the act immediately, to bring it to an issue, otherwise the mining companies would probably have to seek to enjoin the sale of their property. The larger companies will, in all probability, institute a separate suit against the state treasurer to recover any taxes paid, taking such action for self-protection and to test the constitutionality of the law. Later a stipulation may be entered into to consolidate the cases and take one for a test case. Whatever way the lower courts decide, the case will be taken to the Supreme Court of the United States. Some mining attorneys hold that the state has a right to impose a tax of $1 as an occupation or license tax, but has no right to impose a tax of 3% as a revenue measure on net proceeds, in addition to the tax on the same net proceeds imposed by another statute. According to the constitution, the net proceeds are determined and assessed at their actual amount. Leading mining attorneys here hold that the act regarding net proceeds tax is unconstitutional and should have a legal adjudication as soon as possible.

PHOENIX, ARIZ.—Dec. 9

Capt. James P. Hodgson declined reëlection as governor of the Arizona Chapter of the American Mining Congress, at its recent annual meeting, an office he has filled for two terms, and, upon nomination, Norman Carmichael, manager of the Arizona Copper Co. Ltd., was chosen to the place. All other directors were reelected. The vice-governors are Robert E. Talley, of Jerome; W. B. Gohring, of Warren; and B. H. Dowell, of Bisbee. J. E. Curry, of Bisbee, was reëlected secretary, and H. J. McClung, of Phoenix, is treasurer.

DENVER—Dec. 8

Colorado Metal-Mining Association will hold its sixth annual meeting at the Brown Palace Hotel, in Denver, Jan. 2, 3, and 4, 1919, to elect directors from the various metal mining counties and to transact other business. The association urges all mining men of the state to meet with it in joint session with the Colorado Chapter of the American Mining Congress, so as to come to an agreement on concrete plans regarding matters vitally affecting the future of the mining industry in the state. Each metal mining county is entitled to five delegates with one vote each in the annual meeting, and five alternates; provided that any county may elect 10 delegates with one-half vote each, and 10 alternates; and provided, further, that if fewer than five delegates attend from any county, those attending shall have the right to vote proxies of absent delegates, the total vote not to exceed five from any county. The State Commissioner of Mines, the secretary of the State Bureau of Mines, the president of the Colorado School of Mines, the State Geologist, the chief representative of the U. S. Bureau of Mines, and the chief representative of the U. S. Geological Survey will be delegates-at-large and entitled to one vote each. Mining men of the state are holding county conventions for electing delegates to attend the annual meeting, the program for which is being arranged. Secretary Callbreath of the American Mining Congress is expected from Washington to give those present at the meeting the latest developments at the Capital concerning matters affecting the mining industry. Bulkeley Wells, governor of the State Chapter, will also be present. Among the other subjects to be discussed by prominent speakers will be the proposed changes in the Industrial Commission and Compensation Laws, proposed blue-sky laws, and Government control of labor supply. Plans are being made for several prominent speakers from without the state. Despite unfavorable conditions of the industry, the meeting promises to be one of the most important ever held in the history of the organization. George M. Taylor is president of the Colorado Metal-Mining Association, and M. B. Tomblin is secretary. The permanent office of the association is at 324 Tabor Opera House Bldg., Denver.

Colorado Producers of Tungsten, manganese, chrome, and pyrites are arranging for representation at the meeting to be held by the American Mining Congress in Washington Dec. 16 and 17, to confer with Secretary Lane on relief measures proposed by him to prevent disaster to these industries, which are threatened by imports from cheap-labor countries. Producers of the minerals think that the Government has assumed a moral obligation by making appeals to producers of so-called war minerals, and inducing them to make heavy investments. Many cases of acute personal distress have been the result. Regarding tungsten, it is well known among those most interested that foreign producers are planning to deliver to this country any quantity of high- or low-grade ores and concentrates that the market can absorb, and at prices below the cost of production in this country. The same conditions are true regarding molybdenum. Practically all hope of manganese producers has been abandoned and those who were recently interested in the development of this metal and its minerals are acting on the assumption that the market is permanently destroyed, so far as domestic operations are concerned. It is with a forlorn hope that producers view the agitation for a protective tariff on war metals, because they realize that the consumers outnumber the producers, and that if legislation is to be designed with a view to the greatest good to the greatest number, home industries based on the production of these minerals will be throttled.

Owners of Unpatented Mining Claims desiring to take advantage of the law suspending assessment work during 1917 and 1918 must file their declaration of intention again this year to hold their claims under this law. This notice must be on file with the clerk and recorder of the county in which the claims are located, not later than Dec. 31. Failure to file this notice will work a forfeiture as against a third party.

BATESVILLE, ARK.—Dec. 8

The Batesville Manganese Field is in much the same condition as other manganese fields in the United States. The market for the ore has been dull for the last three weeks. A few shipments are going out, but tonnage is light. There is no panic among operators, however. A reaction was expected at the end of the war. They look for a market again within a few weeks, and, though they do not hope to get as much for their product as they did during the war, they expect a price on which they can operate. A committee composed of Walter H. Denison, of Cushman, and A. A. Edwards and D. D. Adams, of Batesville, returned from Washington, D. C., on Dec. 7, where they were sent by manganese interests in the field to inquire into the factors which would be likely to affect the industry during the reconstruction period. They are not pessimistic, but believe that every effort should be made to secure the protection necessary to maintain the industry on a sound basis, and that this can be had by putting the War-Minerals Bill into effect. A meeting of operators will be held at Batesville soon to select a committee to go to Washington to represent the interests in this field at the American Mining Congress.

CLEVELAND, OHIO—Dec. 3

Iron-Ore Shipments from the Lake Superior ranges closed with a total Lake movement of 61,156,732 tons, according to *Iron Age*. Shipments during November amounted to 4,279,025 tons, as compared with 7,331,804 for that month last year. Only one cargo of 6836 tons was shipped in December, as compared with over 900,000 shipped during December of the two previous years. With the all-rail shipments, which will not be known until the close of the year, the movement for the season will be close to 63,000,000 tons. The movement was curtailed during the latter part of the season to divert boats to the grain trade, a number of consumers agreeing to have some of their ore carried over until next year. However, as the requirements were figured on a war-time basis, there is no question that all consumers will have an ample supply of ore to last them until next season.

TORONTO, ONT.—Dec. 10

A New Natural Gas Field for the supply of the Calgary district of Alberta has been opened up by President Eugene Coste of the Canadian Western Natural Gas, Light, and Power Co., about 30 miles east of Lethbridge. Drilling was begun in July and gas struck Nov. 7, with an initial production of 4,000,000 cu.ft. in 24 hours. The well will be connected with the main line from the Bow Island field, supplying Lethbridge, Calgary, and other places. The company is planning for an extensive development of the new field.

Metal Production of Ontario for the first nine months of 1918, according to returns to the Ontario Bureau of Mines from mines, smelteries, and refineries of the province, was as follows: Gold bullion produced, $6,875,766, an increase of $125,000 over the same period of 1917; silver, 13,145,596 oz., a decrease of 2,000,000 oz. The output of metallic cobalt, cobalt oxides, nickel oxides and other compounds of these metals showed increases in value. Molybdenum produced was 43,631 lb. Pig lead output decreased in value. Nickel in matte amounted to 33,508 tons, an increase of 2500 tons. Copper in matte was 17,052 tons, as compared with 15,928 tons for the 1917 period. The output of copper ores was negligible, and iron ore, at 154,243 tons, showed an increase of only 16,000 tons. Pig-iron production was 541,564 tons, an increase of 28,000 tons.

Rights of Prospectors are affected by a decision of importance recently given by Mining Commissioner T. E. Godson in an action brought by R. N. Austin against W. W. Cochenour, L. B. Howie, M. R. Howie, and George T. Martin, claiming an interest in the Howie-Cochenour property in the Lightning River district. By an agreement entered into with Cochenour and associates, Austin was to have an interest in claims recorded by them and all such other claims as should be staked before Oct. 1, on condition of paying the purchase price in installments, in order to enable the claim owners to perform assessment work and carry on prospecting. Austin made some payments and then fell in arrears. After the Lightning River discovery was made, he desired to pay up the amount overdue and be reinstated. The commission dismissed the case on the ground that, though the agreement contained no specific provision to that effect, the nature of the transaction implied that time was the essence of the contract, and that Austin forfeited his claim to an interest when he defaulted.

J. Forsyth Smith, Canadian Trade Commissioner at Glasgow, Scotland, reporting on the prospects for marketing molybdenum concentrates in Great Britain, says that at present all molybdenum supplies are controlled by the Ministry of Munitions and that there is rather a slump in the market—the output being in excess of requirements. In 1915 the government fixed the price at 105s. ($25.55) per unit of molybdenum sulphide per ton of 2240 lb., delivered in England, less 1% brokerage charges. The price has since been increased to 120s. ($29.20) per unit. On the basis of 85% purity this is about 4s. 6d. ($1.09) per pound. It is difficult to forecast post-war requirements for molybdenum on the British market, as it was not largely used before the war, tungsten, with which it is interchangeable for many purposes, being much better known by steel manufacturers. As a result of the unsteady demand before the war, prices were uncertain. A pre-war price of 60s. ($14.60) per unit per ton rose as high as 160s. ($38.93) per unit before controlled prices were fixed in 1915. The market for molybdenum is governed largely by the prices ruling for tungsten. In general, it is considered that one part of molybdenum is equal to two parts of tungsten. In order, therefore, to make molybdenum attractive to the steel-maker, the price per unit of metal contained in the ferro-alloy must be rather less than double the price per unit of tungsten in the corresponding alloy. In the past the price of molybdenum has greatly exceeded this ratio to that of tungsten, and this, together with the fact that tungsten is said to be more easily dealt with in the melting furnaces, has, up to the present time, given the latter the preference with steel manufacturers. Though unable to speak positively, on account of unknown factors, metal importers generally agree that there is likely to be a fair and increasing demand for molybdenum, and that, subject to the important considerations of price and dependability of supply, producers should have no difficulty in marketing reasonable quantities. Australia and Norway will be the principal competing sources of supply, the Australian product being of high grade, ranging from 90 to 95% of MoS_2. A number of British firms are producing ferromolybdenum for steel-makers' use, so that the demand for this product is likely to be less than for the concentrates. Several firms have expressed an interest in getting in touch with Canadian producers.

VICTORIA, B. C.—Dec. 7

The Consolidated Mining and Smelting Co.'s smeltery at Trail treated 271,417 tons of ore in the first 10 months of 1918, compared with 327,639 tons in corresponding period of 1917, and 415,983 tons in same period of 1916. A. C. Langley, provincial resident engineer for No. 5 Mineral Survey District, roughly compiles the tonnages sent to Trail in the first 10 months of 1918 from the several mining divisions under his supervision, as follows: Slocan, 13,097 tons; Ainsworth, 16,249; Slocan City, 157; Fort Steele, 81,528; Windermere, 2339; Nelson, 3934; Golden, 803, and Trail Creek, 105,897 tons. Thirty-four properties, which made small shipments in 1917 are listed as having been dropped from the shipping list in 1918.

The Mining News

ALASKA

ALASKA GOLD (Juneau)—Dry tons milled in November was 94,395; calculated heads, 0.963; extraction, 79.55%; and tails, 0.198.

KENNECOTT (Kennecott) — November production was 12,146,000 lb. of copper.

ARIZONA

Cochise County

PHELPS DODGE (Bisbee)—November smeltery output was 15,785,011 lb. of copper, of which 1,841,920 lb. came from custom ores and 13,943,091 lb. from mines of company. Of latter figure Mexican properties yielded 3,551,418 pounds.

SHATTUCK ARIZONA (Bisbee)—November production was: Copper, 583,655 lb.; lead, 514,127 lb.; silver, 11,296 oz., and gold, 86.03 oz. Production for 11 months in 1918 was: Copper, 8,575,627 lb.; lead, 2,019,097 lb.; silver, 139,724 oz., and gold, 1134.14 ounces.

CALUMET & ARIZONA (Warren)—Smeltery production during November was 5,718,000 lb. Available for Calumet & Arizona, 3,898,000 pounds.

Gila County

OLD DOMINION (Globe)—November production was [illegible] lb. of copper.

INSPIRATION (Miami)—November copper production was 7,500,000 pounds.

MIAMI (Miami)—November production was [illegible] lb. of copper compared with [illegible] lb. in October.

Pima County

NEW CORNELIA (Ajo)—November production was 3,264,000 lb. of copper.

Yavapai County

JEROME VERDE (Jerome)—Shipping 22 tons of high-grade ore per day.

SHEA (Jerome)—Making small shipments of silver-copper ore to Verde smeltery.

UNITED VERDE EXTENSION (Jerome)—Completing large apartment house for miners; is part of general housing scheme.

PECK (Prescott)—Frank H. Giroux appointed manager for new operating corporation headed by L. G. Kirkland, of Chicago, and C. E. Batton. Installing new ball mill, with Wilfley tables and 14 cyanide tanks to handle old dump of 20,000 tons, sampling high in silver.

FRANCO-AMERICAN (Stoddard)—Operating New Year's group, adjoining Stoddard property. Lately purchased on bond by Washington capitalists, represented locally by Fred Bowler. Compressor to be installed.

ARKANSAS

Independence County

OZARK (Batesville)—Installing dry process plant to recover fines. Production of nugget ore good. Shipped last car week ago.

TRENT (Batesville)—Developing manganese orebody by open cuts. Operated by owner, T. J. Walburt, with W. T. Barr.

WACO MANGANESE (Batesville)—Operating Patterson mine on Bayou. Has purchased steam shovel, Keystone No. 6.

WREN HILL (Batesville)—Operated by Polk Kendall and associates. Has two shafts in high-grade manganese, one 73 ft., which has cut three runs, other 25 ft., which is in first run.

EUREKA (Cushman)—Installation completed of three sets of three-cell and one set of two-cell jigs, to be used with log washer on manganese ore. Capacity of reservoir increased to 250,000 gallons.

KLONDYKE (Cushman)—E. W. Buskett and associates will build washery. Manganese deposit developed by shaft.

CALIFORNIA

Amador County

FREMONT (Drytown)—Closed down at end of November owing to prohibitive costs of gold mining. Pumps and other machinery pulled out of shafts. Prospective buyers said to be looking over property. Mine timbers and some other materials sold to Plymouth mine. Has been operating for many years, usually at profit.

CENTRAL EUREKA (Sutter Creek)—New ore reported. Twenty stamps of 40-stamp mill dropping on good-grade ore.

Inyo County

WILSHIRE-BISHOP CREEK (Bishop)—New flotation plant installed and tests made on dump ores showed 87 per cent. saving. Higher recovery expected in treatment of fresh ore. Rated capacity 100 tons a day. Crushing capacity of mill 60 tons. Employ 25 men. New Leyner drill installed. Mark Gillman is superintendent.

Madera County

CALIFORNIA COPPER (Madera)—Ore umps at mine and smeltery site leased to V. T. Perry, of Fresno, to be concentrated. ggregate about 200 tons.

Nevada County

HYDRAULIC MINING in region of utch Flat and You Bet active in preparaon for winter work. Liberty Hill mine am, in Bear River, being raised 50 ft.; ight miles of flume and ditch rebuilt, ready or piping. California Placers raising dam n Missouri Canyon, below You Bet. Drifting at Quaker Hill this winter in preparaion for hydraulic work next season.

KIRKHAM (Mountain House)—Installng reduction mill to treat gravel.

MAYFLOWER (Nevada City)—To deelop in conjunction with Sharp Consoliated. Equipment includes hoist and 20-tamp mill. Small orebodies have been xplored.

Plumas County

COAL DEPOSIT in north end of Plumas County reported at Quincy. Development nder consideration.

TRASK & COFFER (Greenville)—Started rushing ore in new mill. High-grade coper ore reported. L. Coffer is manager.

BUSHMAN (Quincy)—Rich gravel reported. Prospecting to discover connection with old channel, formerly large producer.

Shasta County

CHROME ORE HAULING by motor truck from Cow Creek to Castella for rail shipment abandoned for winter on account of snow on divide; 300 tons on divide may be brought down.

AFTERTHOUGHT COPPER (Ingot)—Construction of new electrolytic plant, delayed by labor shortage caused by influenza, now resumed. Underground development discloses large ore reserves.

MAMMOTH COPPER (Kennett)—Smeltery supplied with ores from Shasta King, Balaklala and Bully Hill. Development in main Mammoth property continues.

Siskiyou County

HYDRAULIC MINING to be active in Callahan, Forks of Salmon, Oak Bar, Seiad, Scott Bar and other districts during season. Early snow indicates abundance of water. Placer mining on Klamath River and on Salmon promise fine season. Collapse of chrome industry to some extent accountable for revival of hydraulic and placer mining.

COLORADO

Boulder County

LOGAN (Boulder)—After repairing over 1000 ft. of workings, lessees M. Smith and A. S. Coan have opened shoot of payable ore 400 ft. long on Teller vein, and made trial shipment. Vein is three feet wide, of which eight inches is shipping ore. Lessees Berryman and Ardourel taking ore from main Logan vein. Charles Wahlstrom sinking winze in Logan oreshoot below fourth level. Pockets of 60-oz. silver ore opened near junction of Logan vein with Yellow Pine Extension vein.

CARIBOU (Caribou)—Lessees McKenzie & Johnson operating on 740 level of No Name vein. Have blocked out considerable ore between 740 and 600 ft. levels. Expect to produce two carloads per week during next few months.

COLORADO TUNNEL (Crisman)—Being driven on contract for Colorado Mining and Milling Co. to prospect Kink & Carlson property. Will run 100 ft. and toward oreshoot which yielded 10% tungsten ore near surface. Property under development includes part of Fortune Dyke, Jewel, and King No. 1 mines. Two small veins cut by tunnel assay small amounts in gold and silver.

KING (Summerville)—Being developed by Hoosier Dyke Mining Co., of which J. L. Rinehart is superintendent. Payable gold-silver ore opened on 300 level.

Clear Creek County

SILVER CREEK (Alice)—Crown Reserve Mining Co. will not exercise option on placer ground it has been testing.

COLORADO CENTRAL (Georgetown)—New modern heating plant installed at mill, which will run throughout winter.

ONONDAGA (Georgetown)—Leased by Harry Lees, who has developed shoot of payable ore.

Gilpin County

FRONTENAC (Central City)—Ress & Co., lessees, removing pillars on 400 level.

San Miguel County

ALTA MINES (Ophir Loop)—Shut down until next April, on account of labor shortage.

Teller County

FOREST QUEEN (Cripple Creek)—Operations resumed after shutdown on account of illness among workmen. Development progressing on bottom level, where payable ore has been opened. Edwin Gaylord is vice president and general manager.

IDAHO

Boise County

GOLD HILL (Quartzburg)—Operated and controlled by Boston & Idaho Gold Dredging Co. Employing 65 men.

Shoshone County

SHERMAN (Burke)—Sherman Development Co. transferred all property to Sherman Lead Co., new corporation, and turned over 51% of capital stock to E. R. Day in return for advance of $100,000 to complete payment of bond of property and necessary capital to equip and develop same. Officers of new company are: E. R. Day, president and general manager; Charles McKinniss, vice-president, and H. R. Allen, secretary-treasurer.

NATIONAL COPPER (Mullan)—Winze from 1500 level down 75 ft. Will crosscut and explore vein at 100 ft. Much ore broken in upper levels. Mill running one shift for several months. Will put on another this month and probably third by **Jan. 1.** Low-grade copper.

MICHIGAN

Copper District

QUINCY (Houghton)—No. 2 shaft yielding large amount of mass and barrel copper, particularly from lower levels. Now practically 9000 ft. deep. Machinery for new hoisting plant to operate to 14,000 ft. being installed rapidly.

NEVADA

Churchill County

NEVADA WONDER (Wonder)—Mine opened to 2000 level. Mill operating steadily. Good progress made in reopening Monitor-Belmont mine, now operated by this company. Belmont and Highbridge shafts both equipped with hoisting plants, water lowered to 70 ft. below 200 level, and considerable footage of old workings reopened and retimbered. Development on deepest levels has opened new oreshoot.

Clark County

GREEN MONSTER (Goodsprings) — Shipping good-grade lead-zinc ore. Recent development has opened two oreshoots below 200 level. Mine operated by Walter Darrington, lessee.

Elko County

EXPERIMENTAL OIL SHALE PLANT of 20 tons daily capacity to be built near Elko by Southern Pacific R.R., assisted by petroleum department of Bureau of Mines, it is reported. Catlan Shale Co. has had 20-ton plant in operation for a year, and is now increasing capacity.

Esmeralda County

SILVER DISCOVERY made recently 20 miles south of Goldfield on Silver Moon and Silver Fox claims, owned by J. E. Peterson and J. Luckman, of Goldfield. Lessees have sunk 30-ft. shaft and will continue.

ATLANTA (Goldfield)—Large tonnage low-grade ore amenable to flotation treatment developed on lower levels. Important work on 1850 level.

CRACKER JACK (Goldfield)—Work resumed on larger scale. Drifting on east vein on 320 level. Winze started toward junction of this vein with West Cracker Jack vein. Five-year lease secured on 40 acres, covering part of consolidated Florence vein. H. G. McMahon is manager.

GRANDMA (Goldfield)—Drifting on 800 level along shale contact zone.

GREAT BEND (Goldfield)—Two stopes opened on 160 level now producing shipping-grade ore. Raise from 370 level opening ore of shipping grade. Considerable milling-grade ore developed. Treatment tests being made to determine remodeling necessary on old mill. J. K. Turner is consulting engineer.

MERGER (Goldfield)—Milling-grade ore opened above 175 level in shale contact.

RED HILL FLORENCE (Goldfield)—Shipping regularly. Crosscut on 600 level has entered Rogers vein.

SILVER PICK CONSOLIDATED (Goldfield)—Peculiar occurrence of high-grade molybdenum ore encountered on 1260 level recently. No oreshoot of commercial size found so far. Main shaft being sunk another 50 ft. to prospect quartz oreshoot further.

SPEARHEAD GOLD (Goldfield)—Good-grade ore opened 600 ft. south of main shaft on 910 level. Shoot similar to that opened in shale on Jumbo Extension four years ago. Geologically, discovery of ore in shale at depth very interesting to Goldfield operators.

Humboldt County

KRAMER HILL (Golconda)—Shipping from 40-ft shaft and surface pits. Small amount of development work done, several leases made, and extension work to be started at once. Property three miles south of Iron Point station.

SILVER STATE (Packard) — Milling operations curtailed for week to permit changes in plant. Mill has been treating 120 tons daily. Development progressing.

ROCHESTER (Rochester) — Sinking winze in ore on 11 level. Driving footwall drift in ore on 10 level. Stoping on 7 level and Hunter lease gloryhole.

INDIAN CREEK (Unionville)—High-grade gold-silver ore being shipped.

QUARTZ HILL (Winnemucca)—Copper property five miles west of Winnemucca being developed.

Lander County

MANGANESE DISCOVERY made near Reese River Valley, 16 miles from Austin. Deposit said to be opened by cuts and tunnels.

FARETTA CINNABAR (Battle Mountain)—New reduction plant of 12 retorts in Jersey section of district to be operated in few weeks. Property owned by M. D. Faretta, Frank Childress, and John Ross, of Battle Mountain.

Lincoln County

GROOM (Groom)—To resume operations.

Mineral County

WALL STREET (Luning)—Shipping ore, grade of which is limited by long pack and wagon haul to railroad. Better transportation facilities would permit larger shipments of lower-grade ore.

Nye County

LABOR SHORTAGE in Tonopah district keenly felt. Federal Industrial Commission notified that 100 men can be employed at once. War conditions and then influenza greatly depleted forces of mines, resulting in reduced tonnage.

MAYFLOWER (Pioneer)—Milling plant will be remodeled and enlarged. W. J. Tobin, manager.

PIONEER (Pioneer)—Sinking shaft to 900 feet.

TONOPAH DISTRICT ore production for week ended Nov. 30 was 7189 tons, having a gross milling value of $122,213. Producers were: Tonopah Belmont, 1766 tons; Tonopah Mining, 1100; Tonopah Extension, 2226; West End, 1067; Jim Butler, 150; Montana, 105; Tonopah Divide, approximately 200; MacNamara, 401; Rescue, 64; Halifax, 70, and miscellaneous, 40 tons.

CASH BOY (Tonopah)—Sinking of shaft stopped at 1656-ft. point. Station cut at 1546 ft. Direct hoisting to surface now possible.

GOLD WEDGE (Tonopah)—Sinking shaft on this property in southern part of New Divide district.

GREAT WESTERN CONSOLIDATED (Tonopah)—Enlarging shaft. Additional pump installed.

JIM BUTLER (Tonopah)—October production was 1054 tons, netting $5942. Treated at Tonopah-Belmont mill. Drifting on 800 level from Wandering Boy shaft. Prospecting for faulted segment of Fraction vein in crosscut from 815 winze. Raising from 600 level, also from 200 level of Fraction shaft.

TONOPAH BELMONT (Tonopah)—Has found faulted segment of South vein.

TONOPAH DIVIDEND (Tonopah) — Electric power installed. Cross-cutting east and west on 300 level to cut Brougher and a parallel vein. Road to mine completed, and telephone lines to Tonopah installed. E. P. Cullinan, manager.

TONOPAH EXTENSION (Tonopah)—Working deepest level in district. Sinking Victor shaft from 1700 to 1800 level. Pumps installed on 1680 level handling water successfully; one will be lowered to 1760 level. Much lateral development work planned on 1800 level when reached; 133 ft. new development work done in third week in November.

WEST END CONSOLIDATED (Tonopah)—Managing heads will have offices at company headquarters in Syndicate Bldg., Oakland, California.

WEST TONOPAH (Tonopah)—Installing pump to lift 1000 gal. per min. from 1100-ft. depth.

Storey County

MEXICAN (Virginia City)—Ore crushed at mill during week ended Nov 30 was: Consolidated Virginia, 475 tons, averaging $[illegible], Mexican, 72 tons, averaging $22.76, and Ophir, 67 tons, averaging $9.87. Mill ran 88% of time.

NORTH END (Virginia City)—Production for third week in November was: Union, 142 tons; Consolidated Virginia, 382 tons; Mexican, 133 tons, all treated at Mexican mill. Advancing east drift in Mexican mine on 2300 level and producing good-grade ore from winze in south drift. Developing on 1900, 2000 and 2200 levels of Consolidated Virginia.

White Pine County

MINING REVIVAL in Cherry Creek district under way. Eagan mine leased to J. W. Walker and being reopened. Lessees operating Pine Nut and Black Metal properties are shipping. J. W. Walker has recently transferred interest in lease on Mary Ann mine to New York men, who will install machinery and continue work on larger scale.

CONSOLIDATED COPPER MINES (Kimberly)—October production of 1,479,024 lb. copper came chiefly from Kimberly operations, as only 7100 tons was shipped from Ora claim at Liberty pit. Kimberly mill made 78.6% extraction for month. Recent developments in Alpha mine encouraging. Stopes above 1200 level improving in grade. Up to Nov. 20, over 2000 tons of 7.9% copper ore shipped from 1200 level. Crosscut from Alpha shaft on 1300 level being pushed to explore downward continuation of orebodies.

NEW MEXICO

Grant County

ATWOOD (Lordsburg)—Will install compressor at shaft being sunk on Southern group. Will sink 200 ft. and drift under Atwood ground 350 ft. below collar of old shaft. J. Tangye, superintendent.

EIGHTY-FIVE (Lordsburg)—New mill handled 275 tons daily for last month. James Jackson, mine superintendent.

CALUMET (Pinos Altos)—Development of property begun in July, 1918. Flotation machines and other concentrating equipment purchased from Colorado Iron Works. Property, lead-zinc. J. A. McCallum in charge.

GREAT EAGLE (Redrock)—November shipments were about 800 tons of fluorspar. Fred Kroll, manager.

OREGON

Jackson County

RAY & HAFF (Gold Hill)—This group of gold mines, with Sylvanite group, three miles north of Gold Hill, now operated by Gold Hill Mining Association, recently organized with office at Medford, Ore. Property under lease to J. G. Davies, of Sacramento, Calif., during last year.

SOUTH DAKOTA

Lawrence County

HOMESTAKE (Lead)—Golden Star mill with 200 stamps is closed, owing to labor shortage, making 300 stamps idle; 720 dropping. Hardinge mill on ground for months not set up, also because of the lack of men.

UTAH

Beaver County

CAPITOL (Milford)—Has purchased new hoist good for 1000 feet.

Juab County

TINTIC SHIPMENTS for week ended Nov. 22 were 127 cars by 17 shippers, as compared to 126 cars the week preceding. Dragon Consolidated, Iron Blossom and Tintic Standard were the heaviest shippers. Shipments for week ended Nov. 29 were 106 cars by 18 properties. Light production due to labor shortage. Conditions as to influenza are improving

COPPER LEAF (Eureka)—Work of following ore cut in shaft at 915 ft. resumed after suspension due to flow of gas, which has been removed. John W. Taylor is superintendent.

EUREKA LILLY (Eureka)—Sinking of inclined winze to be resumed under contract. Grant Snyder is manager, succeeding R. S. Edwards, resigned.

GRAND CENTRAL (Eureka)—November output 30 cars compared with 27 cars in October. Production during first six months of year 288 cars or about 12,000 tons.

LEHI TINTIC (Eureka)—Development work being done in north Tintic. Gas flow stopped work in winze following ore streak, now 130 ft. below tunnel. New tunnel being driven to winze.

TINTIC STANDARD (Eureka)—Main working shaft now 1475 ft. deep, sinking from 1263 point being nearly finished. Stations being cut at 1250 and 1350 levels. New orebody proving very large. Principal value in silver. Shaft in ore of shipping and milling grade from 1260 ft. to present depth. Further sinking proposed after stations are finished. Production week ended Nov. 29 was 600 tons.

ZUMA (Eureka)—Shaft driven 750 ft. Proposed to drift at 800 ft. Country rock, limestone and porphyry. Property is in east Tintic.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Ore in Braine fissure, recently opened in workings from Copper Prince tunnel, runs well in lead, silver and copper; also small amount of gold. Drifting on this ore to west along fissure. Sulphide ore being accumulated for shipment. Car of lead-carbonate ore shipped.

MICHIGAN-UTAH (Alta)—New tram unable to handle output. Next spring capacity to be enlarged and line lengthened. At present extends from mine to Tanners Flat, 4½ miles. To be extended to Wasatch. Present capacity 100 tons per day.

GARFIELD SMELTERY, A. S. & R. (Garfield)—New fire-alarm system installed, under supervision of A. J. Coffee, representative of Gamewell Company, San Francisco. Work on this began several months ago.

ALTA TUNNEL AND TRANSPORTATION (Salt Lake City)—Following ore in raise and west drift from tunnel, about 3200 ft. from portal. Fissure four feet wide and being followed to reach contact of shale with overlying limestone. Principal value, lead and silver.

UTAH COPPER (Salt Lake City)—Offices of company and of Bingham & Garfield R.R. moved from McCornick Block to three upper floors of new Deseret National Bank Bldg., on Dec. 1.

Summit County

PARK CITY SHIPMENTS for week ended Nov. 22 were 3,528,900 lb. of ore and concentrates. Figures include 560,040 lb. of spelter from Judge Mining and Smelting. Shipments for week ended Nov. 29 totaled 3,775,960 lb. of ore and concentrates. Output slightly below normal.

ONTARIO SILVER (Park City)—New development work being done on 1300 level and in some upper workings from which lessees are producing. Company's present production from 1600 and 1700 levels. Shipments about 500 tons per week. November output was 2450 tons, October, 2235. Production for first 11 months of 1918 estimated at 30,600 tons.

SILVER KING CONSOLIDATED (Park City)—New 150-ton mill warming up on ore from old California-Comstock workings. Principal value in lead, silver, and zinc. Flotation used. About 30 men employed in mine and mill. New drain tunnel now 8800 ft. and advancing to get under California-Comstock workings and D. & M. section of property; now in Woodside shale.

WASHINGTON

Lincoln County

CRYSTAL (Miles)—E. S. Campbell and associates, of Spokane, have option on property and are unwatering it. Company owns 40 acres. Shaft down 200 feet.

Stevens County

UNITED COPPER (Chewelah)—Mill handling 275 to 300 tons, but will soon increase to capacity of 600 tons. Conrad Wolfle, president, states there is 14 ft. of ore on 1200 level north and high-grade body being opened on 1300 south. Latter followed by 50 ft. drift. Copper King claim being drilled.

LOON LAKE BLUE BIRD (Loon Lake)—Has installed compressor and added boiler and other equipment

SPOKANE COPPER (Loon Lake) — Pushing development work.

ADMIRAL (Valley)—Work resumed under management of J. Richard Brown, Spokane. Will run 80-ft. crosscut from lower level to block out additional orebody 100 by 300 ft. Bond issue of $75,000 authorized for equipment and development. Will install compressor and power plant.

CANADA

British Columbia

PRODUCERS' (Jedway)—Preparing to develop silver-copper property on Moresby Island. Providing 10-in pipe to feed 48-in. Kincaid waterwheel. Compressor plant brought from Vancouver. Expect to drive 250-ft. tunnel to vein. Frank Buckingham will have charge of mining operations.

CARTER & MARTIN (Stewart)—Bonded to Welch, Fetter & Carlton, Seattle. Crosscutting from 200 ft. tunnel to get under surface croppings. D. A. Harris in charge.

SALMON-BEAR RIVER (Stewart)—To ship sawmill and compressor over snow this winter and saw lumber next season for building concentrator. Silver-gold property 15 miles up Salmon River. R. K. Neill in charge.

BELLEVUE (Winnipeg)—Plan to erect 20-stamp mill this winter; 10 stamps received. Treatment by amalgamation and Deister Overstrom plates. Ore free-milling gold quartz. Will enlarge present camp. Thirty men employed. Two shafts sunk 40 and 70 ft. respectively. Property, four claims and fractions 25 miles east of Lake Winnipeg and three miles north of Hole River.

Ontario

CAMPBELL (Boston Creek)—Gold telluride discovery reported on claims.

MILLER INDEPENDENCE (Boston Creek)—Will increase capital from 500,000 to 700,000 shares. New development renders present mill capacity of 40 tons daily inadequate.

ADANAC (Cobalt)—New vein six inches wide struck in crosscutting on 310 level.

GIFFORD (Cobalt)—Two veins, heavily mineralized, and several stringers encountered on 390 level; supposed to be continuation of Beaver vein system.

KERR LAKE (Cobalt)—Will not erect its own concentrator, present contract with Dominion Reduction Co. being satisfactory.

MINING CORPORATION (Cobalt)—Has dropped option on silver-lead property near Revelstoke, B. C., recently acquired.

PETERSON LAKE (Cobalt)—Trial judgment of Justice Middleton that Peterson Lake was entitled to ownership of tailings deposited on its land by Dominion Reduction Co. was upheld in divisional court, and appeal of Dominion company dismissed.

CASTLE (Gowganda)—Crosscutting under way at 300 level to tap series of veins encountered in shaft.

CANADIAN KIRKLAND (Kirkland Lake)—Acquired by Drummond interests, of Montreal.

ELLIOTT KIRKLAND (Kirkland Lake)—Diamond drilling from 500-ft. level shows increase of porphyry formation at 600-ft. depth. Shaft will be sunk to that level.

ONTARIO-KIRKLAND (Kirkland Lake)—New electric plant ready for operation. Shaft will continue from 100 to 300 level. Property formerly under option to La Rose.

HOWIE-COCHENOUR (Lightning River)—Work suspended on account of impassable roads.

DAVIDSON (Porcupine)—Electric equipment now in operation.

DOME (Porcupine)—J. S. Bache, president of stock-brokerage house of that name, elected president to succeed late J. R. De Lamar.

McINTYRE (Porcupine) — Raise from 1200 level to 1000 level will soon be completed. Main shaft will then be sunk to next main haulage level, at 1375 ft., with two intermediate levels, and electric haulage system installed. Company's plans include sinking to still deeper levels.

SOVEREIGN (Porcupine) — President C. W. Moodie has underwritten 100,000 shares at 25c. per share, out of proceeds of which development will be resumed.

DOME LAKE (South Porcupine)—Started winze from 500 to 600 level. Three shifts employed. Charles A. Randall is manager.

MEXICO

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper production during October was 1,873,760 lb. Ore averaged 3.77% copper.

Sonora

CERRO COLORADO (Altar)—Bonded and leased for $150,000 to Frank W. Turner, of Yuma, Arizona.

GREENE CANANEA (Cananea)—November production was: Copper, 5,100,000 lb.; silver, 169,560 oz., and gold, 1330 ounces.

NACOZARI CONSOLIDATED (Nacozari)— Has purchased Tharsis York property from New York-Boston corporation and will continue adit tunnel, now in 2500 ft., to develop six-foot vein of copper, silver, and gold ore. Ground adjoins Moctezuma property

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver		Dec.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
5	4.7565	101⅛	48¾	9	4.7570	101⅛	48 7/16
6	4.7565	101⅛	48 7/16	10	4.7570	101⅛	48 7/16
7	4.7575	101⅛	48 7/16	11	4.7570	101⅛	48 7/16

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Dec.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
5	*	†	7.05	6.75	8.00 @8.10
6	*	†	7.05	6.75	8.00 @8.10
7	*	†	7.05	6.75	8.00 @8.10
9	*	†	7.05	6.75	7.95 @8.05
10	*	†	7.05	6.75	7.95 @8.05
11	*	†	7.05	6.75	7.95 @8.05

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

* No market. Producers ask 26c. No buyers.

† No market. Major supplies held for distribution at an arbitrary price of 72½c.

LONDON

Dec.	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
	Spot	3 M.		Spot	3 M.	Spot	3 M	Spot
5	122	122	137	275	270	40½	39½	56
6	122	122	137	275	270	40½	39½	56
7								
9	122	122	137	275	270	40½	39½	56
10	122	122	137	275	270	40½	39½	56
11	122	122	137	(a)	(a)	40½	39½	56

(a) Not received at time of going to press.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—Dec. 11, 1918

The situation in the metal markets does not clear up in the sense that interested parties see their way any more plainly, but rather is it that the perplexities of the problems and their gravity become evident. It is also becoming perceived more clearly that the more that Washingtonian policies are dismissed from consideration, and the sooner the idea of nursing the markets is forgotten and things are allowed to take their own natural course, the better will it be in the end, although some of the immediate events may be uncomfortable. There is, however, one matter of relationship with Washington that requires consideration and judicious arrangement, and this is the matter of liquidating the surplus stocks of metals that are held by the Government. The producers can better attend to the disposition of them than can any Governmental bureau, but pending their liquidation, the Government ought to assist in the financing, for the producers are going to have enough financial burdens of their own.

The need for reopening commercial relations with Europe in a normal way is another thing that is becoming pressing. Even if we do not sell any of our copper and zinc there, the Mexican lead that is refined in this country must be sold there. The delay in cable communications is a troublesome feature at present, a week being required for obtaining a reply to an inquiry.

Copper.—In making our report last week we indicated a change in the situation in copper and reserved the right to correct our representation of the market from the end of November onward. The facts of the situation are these: The Government never fixed the price for copper in the sense of establishing it. What it did by the pronunciamento of Sept. 21, 1917, was to fix a maximum price beyond which sellers might not go, and, sellers being unwilling to take any less, the price was substantially fixed, first at 23½c. and then at 26c., and those prices were unquestionably the market prices, all of the copper being sold at them. The price of 26c., first made on July 2, 1918, was to prevail to Aug. 15, being subsequently extended by agreement to Nov. 1, and then to Jan. 1. On Nov. 15, after the armistice, when it appeared that Government orders would soon terminate, the producers entered into a new agreement with the War Industries Board, whereby they promised to maintain production and wages until Jan. 1, and in return they received assurances respecting Governmental control of the market, which amounted to agreement that the Government would pay 26c. for any further copper it might order and would sanction the producers' asking that price from other buyers and acting unitedly. Since that time such copper as has been sold has been booked at 26c., but the quantity has been trifling (only a few thousand tons), and since the end of November there has been none sold, and there have been no buyers, and there has been no market. In the absence of either transactions or bids, we can do nothing but report "no market" and give no other representation of the situation than "26c. asked by all producers with Governmental sanction, and Governmental control against asking any more." We carry this revised representation back to Dec. 1 in accordance with the reservation that we published in our report of last week. This is still a tentative correction, for in the event that significant sales of copper should be made at 26c. (nothing higher is permissible while the control of the War Industries Board continues), after a period of reporting "no market" we should consider that for statistical purposes that figure should be recorded as the daily price in the interval. But if a market develops at a lower price, there will be a statistical gap, which cannot reasonably be filled in.

The *Ironmonger* says. "The general belief is that so far as this country [Great Britain] is concerned the full demand for copper is not likely to be felt for quite 12 months."

Copper Sheets—The base price of copper sheets is 35½@36c. per lb. Copper wire is quoted at 28½c. per lb. f.o.b. mill, carload lots.

Tin—There continues to be no market in tin. The War Industries Board has made a price of 72½c., New York, and the American Iron and Steel Institute is distributing tin at that figure to those who want it, but that is rather a distributing price than a market price. In the meanwhile, there are free transactions in lots of tin that are offered for resale and in tin that is produced by American smelters from Bolivian ore. During the last week business in electrolytic tin was done at 71¾@72c., while there were transactions in tin of 99% grade at 70@71c. Such transactions reflect a market, although hardly a free and natural one, which there cannot be with the present elimination of importers and traders and merchants generally.

The tin production of American smelters is attaining considerable proportions, amounting to about 50 tons per day at present, with fair prospects of further increase by the end of the year. The conditions of purchasing Bolivian ore on the basis of London quotations which are far below the level here are now favorable to the American smelters.

Lead—The business in lead at the new prices was very small, if anything it was smaller than in the previous week. It seems clear that consumers neither have to buy nor will buy at the present prices. In fact, some of the manufacturers have been surprised at the extent of the cancellation of orders, which has backed up pig lead on their hands. There is gossip about lead being offered for resale at prices under the Lead Committee's figure. We have heard 6.75c. mentioned. The Lead Committee will hold a meeting on Dec. 20, and it is not improbable that a free market in lead will be declared at that time.

Zinc—Prime Western spelter for December delivery has been rather scarce, and a premium has been asked for it and has been paid in some small business. For December delivery 8.15c. was bid today. This does not, however, reflect the real situation in the zinc market. The major market has now become for first-quarter deliveries, for which all producers are anxious to make sales. Some of them got 8c. in the early part of the week, and considered themselves lucky. Since Monday first-quarter deliveries have been unsalable at 8c. and, in fact, the metal has been offered at 7⅞ cents.

There was a cancellation of a Government order last week, which the seller was willing to accept on condition of reimbursement of loss. The Government official who made the cancellation claimed that the market was at a figure where there would be no loss, which the seller denied. In order to establish the difference between the Government and the seller, the contract was sold at public auction on the Metal Exchange Dec. 9 and realized 7.85c., St. Louis basis. This was for Grade C spelter. The contract provided for the delivery of 1000 tons previous to May 1, 1919, the metal to be delivered at the buyer's option, but not more than 250 tons per month. Under this contract, the buyer could call for 250 tons of December spelter. While there were special conditions connected with this contract, the transaction throws considerable light upon the real situation of the market. There was another large cancellation today.

High-grade spelter is offered freely both by producers and by consumers who desire to resell. If there has been any business it has been on secret terms. The War Industries Board has asked the producers to meet in Washington on Dec. 13 to consider the matter of refixing the maximum price on high-grade spelter. Why there should be any need to consider that question is beyond our comprehension.

The *Ironmonger* says that "the general expectation in Great Britain is for a recession in spelter prices as soon as the restrictions are removed, it being considered that there is over-production in this metal and that the industrial demand will not be sufficient to take care of the quantities that have been absorbed by war requirements."

The price schedule agreement for Joplin ore between miners and smelters has been abandoned. As we pointed out in the beginning, it was uneconomic and destined to failure. The primary cause of the discontinuance of the arrangement was the desire of some ore producers to sell when, how, and as they could.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb.

Antimony—The market is dull and substantially unchanged. We quote spot at 8½@8¾c. Out of such a price the producer gets very little, and it is therefore not surprising to receive the news that producers in China are suspending operations. Nobody quotes figures.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—The market continued dull, but was a little weaker than last week. We quote $120. San Francisco telegraphs $115, weak.

Silver and Platinum

Silver—Market has no new features. price remains stabilized at $1.01½ for 999 fine as the official price. Owing to the lack of steamer accommodations, no silver was shipped to London last week from New York. Trouble of the same kind exists at San Francisco. Shipping facilities for the time are limited.

Mexican dollars at New York: Dec. 5, 77½; Dec. 6, 77½; Dec. 7, 77½, Dec. 9, 77½; Dec. 10, 77½; Dec. 11, 77½.

Platinum—Strong at $105@106.

Palladium—Strong. No sales were reported to us, but it is certain that more than $135, the formerly fixed price, would have to be paid.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 7.—Blende, per ton, high, $75.30; basis 60% zinc, premium, $75; Class B, $60@50; Prime Western, $45@42.50; Calamine, basis 40% zinc, $40@35. Average selling prices: Blende, $44.32; calamine, $37.80, all zinc ores, $41.12.

Lead ore, high, $104.45; basis 80% lead, $100@80, average selling price, all grades of lead ore, $91 per ton.

Shipments the week: Blende, 7381; calamine, 237; lead, 1521 tons. Value, all ores the week, $474,520.

Not to exceed 300 tons of zinc blende was shipped this week, bought on the premium base, with prospects of less next week, with the arrangement for this basis schedule ending Dec. 21. The falling through of the schedule for Prime Western grades put 30,000 tons of ore on the open market. One smelting firm purchased upward of 8000 tons of this on a $45 basis, $1 off on each unit under 60% zinc to 58%, and $1.50 per unit under 58% zinc. The bulk of this purchase was 57% and higher grades. Several other companies purchased heavily on $45 to $42.50 basis. The high lead settlement price was on ore purchased two weeks ago, this week's basis dropping to $80 per ton of 80% lead. A carload or two of lead-free calamine has held the market up to $40 basis, though the demand for other grades has fallen materially with the advent of the open market on blende the quotable price being barely $35. Production is lessened by the heavy toll taken by the epidemic of influenza in sickness and death. The lowered price of lead, it is predicted, will cause some Oklahoma mines to close, as the high level of lead gave them a small profit with the low zinc price, which will disappear now.

Platteville, Wis., Dec. 7—Blende, basis 60% zinc, highest settlement price reported, $76.45; base price for premium grade, $75; base price for high-lead blende, $47.50 per ton. Lead ore, basis 80% lead, [illegible] per ton.

Shipments reported for the week were 1703 tons blende, 120 tons galena, and 131 tons sulphur ore. For the year to date, the totals are 117,704 tons blende, 7647 tons galena and 36,360 tons sulphur ore. During the week 2685 tons blende was shipped to separating plants.

Other Ores

In chrome, manganese, molybdenum and tungsten ores the situation remains just as we reported last week, and we cannot add any information of importance.

Other Minerals

Pyrites—Spanish pyrites is quoted subject to the raising of the embargo, at 17c. on the basis of the ocean freight [illegible] [illegible] war risk and insurance. Restrictions still continue. It is predicted that they will be removed before the end of the year. Unchanged.

Ferroalloys

Ferroalloys—There is no regular market on ferromanganese or spiegeleisen. Furnaces quote ferromanganese nominally at the old price, $250, delivered, for 70%, and re-sale lots have been offered at $240 without finding takers. Furnaces have reduced their asking price on spiegeleisen from $75 to $70, furnace, for 16 per cent.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861	88.082	27.597	36.410	43.620
April	64.415	73.875	95.346	30.662	36.963	47.215
May	74.269	74.745	99.505	35.477	37.940	48.980
June	65.024	76.971	99.500	31.060	39.065	48.875
July	62.940	79.010	99.625	30.000	40.110	48.813
Aug.	66.083	85.407	100.292	31.498	43.418	49.077
Sept.	68.515	100.740	101.125	32.584	50.920	49.500
Oct.	67.855	87.332	101.125	32.361	44.324	49.500
Nov.	71.604	85.891	101.125	34.192	43.584	48.969
Dec.	75.765	85.960	.....	36.410	43.052	.....
Year	65.661	81.417	.....	31.315	40.851	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct.	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	26.000	110.000	122.000	125.000	137.000
Dec.	23.500		110.000		125.000	.....
Year	27.180		124.892		138.401	

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388	(a)	207.443	318.875
April	55.910	(a)	220.171	329.905
May	63.173	(a)	245.114	364.217
June	62.053	(a)	242.083	331.925
July	62.570	(a)	242.181	360.347
August	62.681	(a)	243.978	380.900
September	61.542	(a)	244.038	343.905
October	61.851	(a)	247.467	335.543
November	74.740	(a)	274.943	323.550
December	87.120		298.556	.....
Av. year	61.802	.....	237.563	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199	7.201	9.120	7.091	30.500	29.50
April	9.288	6.772	9.158	6.701	30.500	29.50
May	10.207	6.818	10.202	6.704	30.500	29.50
June	11.171	7.611	11.123	7.511	30.500	29.50
July	10.710	8.033	10.644	7.750	30.500	29.50
August	10.594	8.050	10.518	7.750	30.500	29.50
September	8.680	8.050	8.611	7.750	30.500	29.50
October	6.710	8.050	6.650	7.750	30.500	29.50
November	6.249	8.050	6.187	7.750	30.500	30.60
December	6.375		6.312		30.500	
Year	8.787		8.721		30.500	

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	8.491	7.672	8.141	54.000	54.100
December	7.685		7.510		54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron Pgh	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	36.60	33.95	34.40	33.95	35.40
December	37.25		33.95		33.95	
Year	[illegible]		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 10
Alaska Gold M	4⅜
Alaska Juneau	2
Am.Sm.&Ref.,com.	85¾
Am.Sm. & Ref., pf.	107⅞
Am.Sm.Sec., pf., A.	93¼
Am. Zinc	12⅞
Am. Zinc, pf.	45½
Anaconda	67⅝
Batopilas Min	1¾
Bethlehem Steel	68¼
Butte & Superior	21
Butte Cop. & Zinc	7¼
Cerro de Pasco	34½
Chile Cop.	20
Chino	38¾
Colo. Fuel & Iron	41
Crucible Steel	60¾
Crucible Steel, pf.	89½
Dome Mines	12½
Federal M. & S.	12
Federal M. & S., pf.	40
Greater Nor., ore ctf.	32⅛
Greene Cananea	48⅞
Gulf States Steel	68
Homestake	94
Inspiration Con	48⅞
International Nickel	33½
Kennecott	36
Lackawanna Steel	72
Mexican Petrol	161¼
Miami Copper	25⅛
Nat'l Lead, com.	68
National Lead, pf.	104
Nev. Consol	19⅛
Ontario Min	8¼
Ray Con	22¾
Republic I.&S.,com.	78
Republic I.&S., pf.	99½
Sloss-Sheffield	49
Tennessee C. & C.	15
U. S. Steel, com	99¼
U. S. Steel, pf	113
Utah Copper	80½
Va. Iron C. & C.	58

BOSTON CURB*	Dec. 10
Alaska Mines Corp.	‡.12
Boston Ely	.90
Boston & Mont.	.54
Butte & Lon'n Dev.	.14
Calaveras	1⅜
Chief Con	3¼
Contact	.05
Corbin	.25
Cortez	.17
Crown Reserve	.15
Crystal Cop	.30
Eagle & Blue Bell	2¼
First Nat. Cop	2¼
Houghton Copper	.40
Intermountain	‡.05
Iron Blossom	.47
Iron Cap	15¾
Majestic	.25
Mexican Metals	.30
Mines of America	.70
Mojave Tungsten	07
Nat. Zinc & Lead	.10
Nevada-Douglas	.38
New Baltic	1¼
New Cornelia	16½
Oneco	.25
Pacific Mines	‡.35
Rex Cons	.05
Yukon Gold	1

SAN FRAN.*	Dec. 10
Alta	03
Andes	04
Best & Belcher	02
Caledonia	.01
Challenge Con	.03
Confidence	.10
Con. Virginia	.09
Gould & Curry	01
Hale & Norcross	03
Jacket-Cr. Pt.	.05
Mexican	.04
Occidental	.40
Ophir	03
Overman	.01
Savage	‡.02
Sierra Nevada	.08
Union Con	.11
Utah Con	.01
Belmont	2.85
Jim Butler	.37
MacNamara	.21
Midway	.19
Mont.-Tonopah	.12
North Star	.07
Rescue Eula	09
West End Con	1.25
Atlanta	.05
Booth	12
Comb. Frac	‡.02
Florence	.16
Jumbo Extension	.14
Kewanas	.06
Nevada Hills	.03
Nevada Packard	.29
Round Mountain	20
Silver Pick	.05
White Caps	.13

COLO. SPRINGS*	Dec. 10
Cresson Con	5.06¼
Doctor Jack Pot	04¾
Elkton Con	06¾
El Paso	15
Gold Sovereign	‡.02
Golden Cycle	1.71
Granite	.18½
Isabella	.06½
Mary McKinney	.08½
Portland	1.08
United Gold M.	15
Vindicator	47

BOSTON EXCH.†	Dec. 10
Adventure	‡.60
Ahmeek	75
Algomah	‡.30
Allouez	46
Ariz. Com.	13½
Arnold	‡.20
Bingham Mines	10
Bonanza	.07
Butte-Balaklava	.45
Calumet & Ariz	68
Calumet & Hecla	445
Centennial	13½
Copper Range	46
Daly West	2½
Davis-Daly	5½
East Butte	9½
Franklin	4½
Granby	‡79
Hancock	‡7
Hedley	‡12
Helvetia	‡.20
Indiana	‡.60
Isle Royale	25
Keweenaw	‡1
Lake	5½
La Salle	‡3
Mason Valley	‡3½
Mass	‡5
Mayflower	3½
Michigan	3½
Mohawk	55
New Arcadian	1½
New Idria	‡13
North Butte	13
North Lake	‡.40
Ojibway	1½
Old Dominion	38½
Osceola	53
Quincy	65
St. Mary's M. L.	45½
Santa Fe	.40
Seneca	15½
Shannon	3½
Shattuck-Ariz	‡16½
So. Lake	‡1½
So. Utah	‡.10
Superior	8
Superior & Bost.	3½
Trinity	3
Tuolumne	.80
U. S. Smelting	47½
U. S. Smelting, pf	46¾
Utah Apex	3½
Utah Con	9½
Utah Metal	1½
Victoria	2½
Winona	.90
Wolverine	21
Wyandot	‡.50

N. Y. CURB†	Dec. 10
Big Ledge	1 1/16
Butte & N. Y.	.50
Butte Detroit	.02
Caledonia	.32
Calumet & Jerome	.50
Can. Cop. Corpn	2½
Carlisle	‡2
Cashboy	.09
Con. Ariz. Sm	1 11/16
Con. Coppermines	6⅜
Goldfield Con.	.26
Goldfield Merger	‡.09½
Greenmonster	‡ 7/16
Hecla Min	5 3/16
Howe Sound	4⅛
Jerome Verde	‡.50
Louisiana	‡ 3/16
Magma	29
Marsh	.04
McKinley-Dar-Sa.	.44
Milford	‡.75
Mother Lode	.35
Nixon Nevada	.35
Ohio Cop	11/16
Rawley	‡2¼
Ray Hercules	3½
Richmond	‡.56
Rochester Mines	.31
St. Joseph Lead	14
Standard S. L.	¾
Stewart	.17
Success	.10
Tonopah	3⅛
Tonopah Ex	1½
Tribullion	‡½
Troy Arizona	‡.10
United Eastern	4½
United Verde Ext.	‡35½
United Zinc	‡½
Utica Mines	‡.08

TORONTO*	Dec. 10
Adanac	.09
Bailey	.04
Beaver Con	.35
Chambers Ferland	.10
Coniagas	2.00
Hargraves	.09
Kerr Lake	‡5.75
La Rose	.30
Lake Shore	90
Min. Corp. of Can.	‡2.50
Nipissing	8.50
Peterson Lake	.09
Temiskaming	.29
Wettlaufer-Lor.	.03
Davidson	‡.65
Dome Exten.	.25
Dome Lake	.15
Hollinger	6.12½
McIntyre	1.62½
Newray	.12½
Porcu. Crown	.22
Teck-Hughes	.25
Vipond	.20
West Dome	10

* Bid prices † Closing prices ‡ Last quotations

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr Ago
No. 10	4 25	5 52	5 52	6 55	5 52	5 44½
No. 12	4 30	5 57	5 57	6 60	5 57	5 49½
No. 14	4 35	5 62	5 62	6 70	5 62	5 54½
Black						
Nos 18 and 20	4 80	6 32	6 32	7 39	6 32	6 24½
Nos. 22 and 24	4 85	6 37	6 37	7 35	6 37	6 29½
No. 26	4 90	6 42	6 42	7 40	6 42	6 43½
No. 28	5 00	6 52	6 52	7 50	6 62	6 53½
Galvanized:						
No 10	5 25	6 97	6 77		6 87	6 69½
No 12	5 35	6 97	6 87	7 85	6 82	6 79½
No. 14	5 35	6 97	6.87	8 00	6 97	6 79½
Nos. 18 and 20	5.65	7 17	7 17	8 15	7 27	7 09½
Nos. 22 and 24	5 80	7 32	7 32	8 30	7 32	7 24½
No 26	5 95	7 47	7 47	8 45	7 47	7 39½
No. 28	6 25	7 77	7 77	8 75	7 77	7 69½

STEEL RAILS—The following quotations are per gross ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$55.00	$38 00	$65 00	$38 00
Standard openhearth rails	57.00	40 00	67 00	40 00
Light rails, 8 to 10 lb	3.13½*	83 00	3 13½*	68 00
Light rails, 12 to 14 lb	3.09*	82 00	3 09*	67 00
Light rails, 25 to 45 lb	3.00*	75 00	3 00*	65 00

* Government price per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, $\frac{9}{16}$-in. and larger	$3.90	$5 00	$4 50	$5,30	$6 70
Track bolts	4 90	6 25	5 50	Premium	8 00
Standard section angle bars	$.25	3 65	4 45	Premium	5 15

STRUCTURAL MATERIAL—The following are the base prices f. o b mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	New York Current	New York 1 Yr Ago	St Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3 00	$4 27	$5 25	$4 27	$4 27	$5 25	$5 05
Channels, 3 to 15 in.	3 00	4 27	5 25	4 27	4 27	5 25	5 05
Angles, 3 to 6 in. ¼ in. thick	3 00	4 27	5 25	4 27	4 27	5 25	5 05
Tees, 3 in. and larger.	3 00	4 27	5 30	4 27	4 27	2 55	5 05
Plates	3.25	4 52	10 00	4 52	4 52	5 50	5 28

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4–5	$4–5	$4 50

RIVETS—The following quotations are per 100 lb.:

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St Louis	Warehouse San Francisco	Warehouse Dallas
STRUCTURAL							
¾-in and larger	$4 65	$5 675	$7 00	$5 57	$5 55	$6 70	$7 00
CONE HEAD BOILER							
¾ in. and larger	4 75	5 775	7 10	5 67	5 65	6 80	7.10
⅝ and $\frac{11}{16}$	4.90	5 925	7.25	5.82	5 80	6 95	7 25
½ and $\frac{9}{16}$	5 25	6 275	7 60	6 17	6 05	7 30	7 60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+17½%
Galvanized cast steel rigging	2½%
Bright plow steel	30%
Bright cast steel	17½%
Bright iron and iron tiller	List

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St Louis	Denver	Birmingham
Straight	$6 25	$7 25	$6 50	$6 25	$8 00	$7 25
Assorted	6 40	7 75	6 50	6 40	8 25	7 50

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh

Iron bars	3 5c	Steel bars	2 90c

COAL BIT STEEL—Warehouse price per pound is as follows

New York	Cincinnati	Birmingham	St Louis	Denver	Chicago
$0 12	$0 16½	$0 18	$0 19	$0 18½	0 16½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	16c	14c	[illegible]	16c
Hollow	24c	25c		28c

PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917 for steel pipe and for iron pipe:

Butt Weld

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
⅛, ¼ and ⅜	44%	17½%	¾ to 1½	33½%	17½%
½	48%	33½%			
¾ to 3	51%	37½%			

Lap Weld

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

Butt Weld. Extra Strong Plain Ends

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

Lap Weld. Extra Strong Plain Heads

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1.

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
¾ to 3 in. butt welded	40%	43%	41 1%
3½ to 6 in. lap welded	36%	39%	37 1%

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
¾ to 3 in. butt welded	28%	28%	26 1%
3½ to 6 in. lap welded	25%	25%	23 1%

Malleable fittings, Class B and C, from New York stock sell at list plus 15%. Cast iron, standard sizes, 5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$0 80	List	$1 25	$1 30	$0 98	$2 00
Hot pressed hexagon	.80	List	1 05	1 30	78	2 00
Cold punched square	2 50*	List	75	List	1 00	1 50
Cold punched hexagon	2.50*	List	.75	List	1 00	1 50

* List plus

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10%	50%
Chicago	50%	45%
Cleveland	50–10%	50%

MACHINE BOLTS—Warehouse discounts in the following cities

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	40–10%	40–10%	37%
Larger and longer up to 1 in. by 30 in.	20–5%	20–5%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York .... $2 00 Cleveland .... List Chicago $2 50

For cast-iron washers the base price per 100 lb. is as follows:

New York $6 00 Cleveland $4 25 Chicago $4 50

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York or Chicago.

	Carload Lots	Less Than Carload Lots
Tarfelt (14 lb. per square of 100 sq. ft.)	$64	$65
Tar pitch (in 400-lb. bbl.)	21	22
Asphalt pitch (in barrels)	40	45 50
Asphalt felt	72 00	77 20

PREPARED ROOFINGS—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1 45	$1 70	$1 85	$2 [illegible]	$2 25	$2 50
No. 2 grade	1 30	1 55	1 60	1 90	2 00	2 25

Asbestos asphalt saturated felt (14 lb. per square) costs $[illegible] per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2 40 per roll in carload lots and $2 65 for smaller quantities.

Shingles, red and green slate finish, cost $5 75 per square in carloads, $6 [illegible] in smaller quantities, in Philadelphia

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul	$.056	$0.11	$0.162
Cincinnati	.086	.165	.218
Seattle	.09	.175	.30
Los Angeles	.0668	.12	.20
New Orleans	.14	.20	.29

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	Y. P.	Fir	Hemlock	Spruce	Y. P.	Fir
Cincinnati	$37.00	......	$36.00	.....	$41.00	$40.00
Kansas City	38.00	40.50	$40.50	$38.50	43.00	42.50
Seattle	24.50	24.50	24.50	24.50	24.50	24.50
St. Paul	......	52.00	48.00	48.00	......	60.00
Denver	43.00	33.50	......	......	......	39.00

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and G. 10 In. x 16 Ft.	
	Y. P.	Fir	Hemlock	Y. P.	Fir
Cincinnati	$43.00		$39.00	$42.00	$38.00
Kansas City	45.50	$54.75	54.75	52.25	60.00
Seattle	24.50	24.50	24.50	24.50	24.50
St. Paul	62.50	45.00	43.00	......	48.50
Denver	43.25	32.50	32.50	35.00	31.00

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.50	$4.37	$4.75	$4.32	$5.35
Cut	4.00	6.50	.	4.47	6.75

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Current	One Month Ago	One Year Ago
New York	$4.00	$4.00	$2.22
Jersey City	3.64	3.64	2.16
Boston	3.67	3.67	2.37
Chicago	3.05	2.45	2.21
Pittsburgh	3.15	2.55	2.31
Cleveland	3.32	2.72	2.44
Denver	3.67	3.67	3.20

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$17.50	$14.50	$2.90	$2.65
Kansas City	22.00		2.35*	2.20*
Chicago	18.00	17.50	1.80*	1.10*
St. Louis	22.00	16.00		1.75
Boston	22.20	18.20	3.65	3.35
Dallas	16.50			...
San Francisco	20.00	......	...	2.15
St. Paul	25.00	19.00	1.97*	1.93*
New Orleans	19.74	16.45	19.47‡	.
Cincinnati	14.20	......	13.20‡	11.95‡
Denver	.....	......	26.25‡	2.50*
Los Angeles	22.00	.	18.00‡	14.50‡
Seattle	25.00		.	2.80†

* 200-lb. barrels. † Per 180-lb. barrel. ‡ Per ton.

Note—Refund of 10c. per cloth bag, amounting to $2 per ton.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$1.[illegible]9	$1.25	$1.90	$1.25	$1.77	$1.22
5-gal. cans	1.84	1.35	2.00	1.40	1.97	1.32

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		1 Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	14.00	14.50	12.25	12.50	14.00	12.50
25- and 50-lb. kegs	14.25	14.75	12.50	12.75	14.25	12.75
12½-lb. keg	14.50	15.00	12.75	13.00	14.50	13.00
5-lb. cans			14.25	14.00	16.00	14.50
1-lb. cans			14.25	14.50	17.00	14.50

MINING AND MILLING SUPPLIES

HOSE

Fire

	50-Ft. Lengths
Underwriters' 2½-in.	85c. per ft.
Common, 2½-in.	40½%

Air

	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.60	$0.35	$0.30

Steam—Discounts from List

First grade..... 25% Second grade...... 30% Third grade....... 40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40%	35%
St. Louis	40-5%	35%
Chicago	45%	40-5%
Birmingham	35%	35%
Denver	40%	30%
Cincinnati	40-10%	40%

RAWHIDE LACING—40-5% off list.

MANILA ROPE—For rope smaller than ¾ in. the price is ½ to 2c. extra, while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ¾-in., 8 ft.; ⅞-in., 6; 1-in., 4⅓; 1⅛-in., 3⅓; 1½-in., 2 ft. 10 in.; 1¾-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.34	Denver	$0.36
New York	.36	Kansas City	.34½
Cincinnati	.35½	San Francisco	.33
Chicago	.35	Seattle	.34
St. Paul	.36	St. Louis	.34½

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.99
Asbestos for high-pressure steam	1.76
Duck and rubber for piston packing	1.10
Flax, regular	.99
Flax, waterproofed	1.21
Compressed asbestos sheet	1.10
Wire insertion asbestos sheet	1.30
Rubber sheet	.66
Rubber sheet, wire insertion	.99
Rubber sheet, duck insertion	.55
Rubber sheet, cloth insertion	.25
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.21
Asbestos wick, ½- and 1-lb. balls	.75

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Chrome brick	net ton	$175.00
Chrome cement	net ton	75.00
Clay brick, 1st quality fireclay	per 1000	50.00—$55.00
Clay brick, 2nd quality	per 1000	35.00— 40.00
Magnesite, raw	ton	30.00— 35.00
Magnesite, calcined	ton	32.00— 35.00
Magnesite, dead burned	net ton	32.00— 35.00
Magnesite brick, 9 x 4½ x 2½ in.	net ton	110.00—125.00
Silica brick	per 1000	50.00— 60.00

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—High grade, $55; St. Louis grade, $40.
Birmingham—Fire clay, $50; silica, $50; magnesite, $110; chrome, $165.
Chicago—Second quality, $25 per ton.
Denver—Silica, $35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	1.48	1.33
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2.70	1.92

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak			1.05
7x9x8 red oak, No. 4	.80	No. 5	.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

	New York	Chicago In Bbl.	Chicago Car	Denver In Bbl. Lots	Denver In Carload Lots
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	$0.65–$0.67½	$0.70	$0.65	$0.76	$0.62
Pure destructively distilled pine oil	.65– .67½	.60	.57	.55	
Pine tar oil, sp. gr. 1.02 = 1.035	.38– .40	.40	.38	.65	...
Crude turpentine	.45– .47	.70	.65	.60	...
*Hardwood creosote, sp. gr. 0.96-0.99	.23	.40	.38	.42	

* F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	$52.00	$58.00
Chicago	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder*
New York		$0.31½	$0.38½	...	$2.50
Boston	$0.25¾	.28¼	.35¼	.42¾	2.50
Cincinnati	.19¾	.23¾	.29¾	...	2.45
Kansas City	.21½	.27¾	.34¾	.44¾	2.55
Seattle	....	.25½	.32½	.	
Chicago	.19¾	.23¾	.34	.44	2.45
St. Paul	.20	.27¾	.34¾	....	2.55
St. Louis	.20	.24	.34½	.44½	2.15
Denver	.18¾	.26	.33	.43	2.50
Dallas	.25	.33½	.40	.50	
Los Angeles	.22	.29	.37	...	3.05

CHEMICALS

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 44c.; Chicago, .31½c.; St. Louis, 35c.

SODIUM SULPHIDE—In New York the price per pound is 8½c. for concentrated, 4½c. for crystals. The St. Louis price is 9½c. for concentrated, 20c. for fused; the Chicago price is 7½c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb.; Chicago, 16c.; Denver, 14c. f.o.b. Pueblo; St. Louis, 16c.

ALUMINUM DUST—Chicago price is $1.65 per lb.

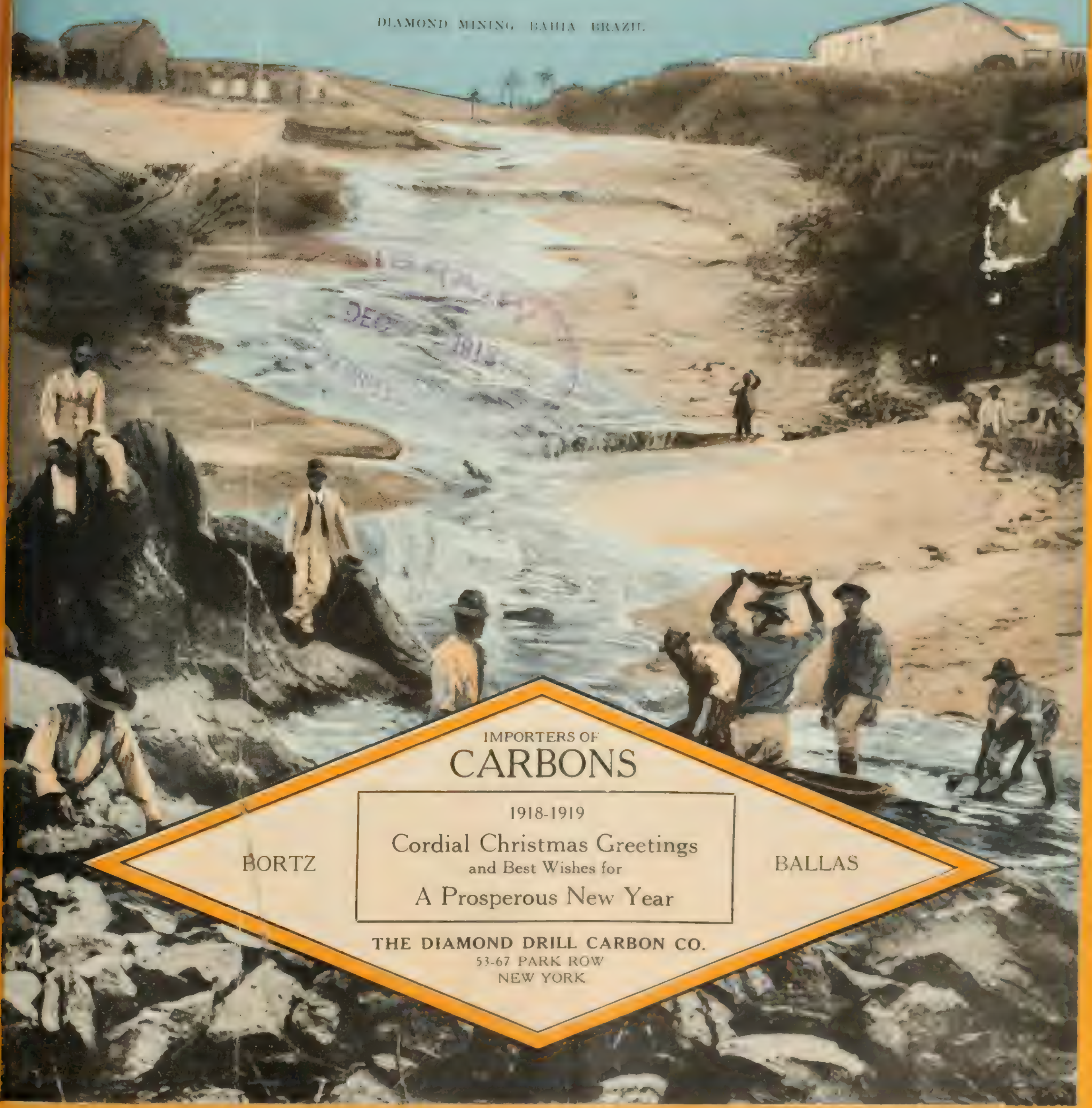
MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drums Per Drum
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo.	124.00	119.00	1.74
West Coast	129.00	124.00	1.81

Engineering and Mining Journal

McGraw-Hill Co., Inc. Price 20c. New York, December 21, 1918

DIAMOND MINING, BAHIA, BRAZIL.



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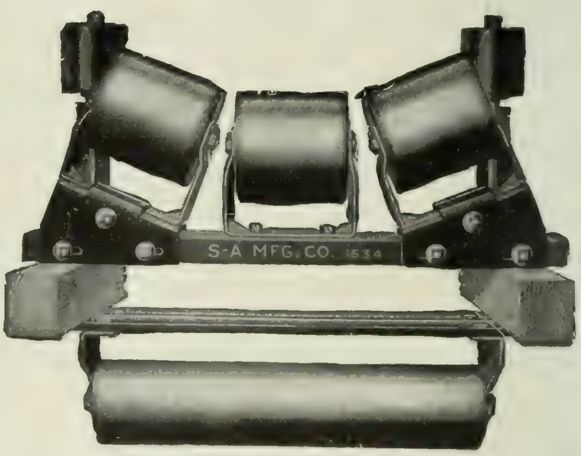
"S-A" BELT CONVEYORS FOR HANDLING ORE

These illustrations show a typical installation of "S-A" Belt Conveyors for Handling Ore for some of the bigger mining companies. These conveyors aggregate 582 ft. in length and are each 26 in. wide. They handle 900 tons of ore per 8 hour day from the crushers to the bins. Their operation is controlled by one man.



The "S-A" Unit Carrier

An "S-A" Belt Conveyor consists of an endless belt running over a series of "S-A" Unit Carriers. These Unit Carriers are ball-bearing and long wearing without attention of any kind. They are standardized so that "S-A" Standard Belt Conveyors can be adapted to a wide variety of conditions.

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Engineering and Mining Journal

December 21, 1918

Volume 106

Number 25

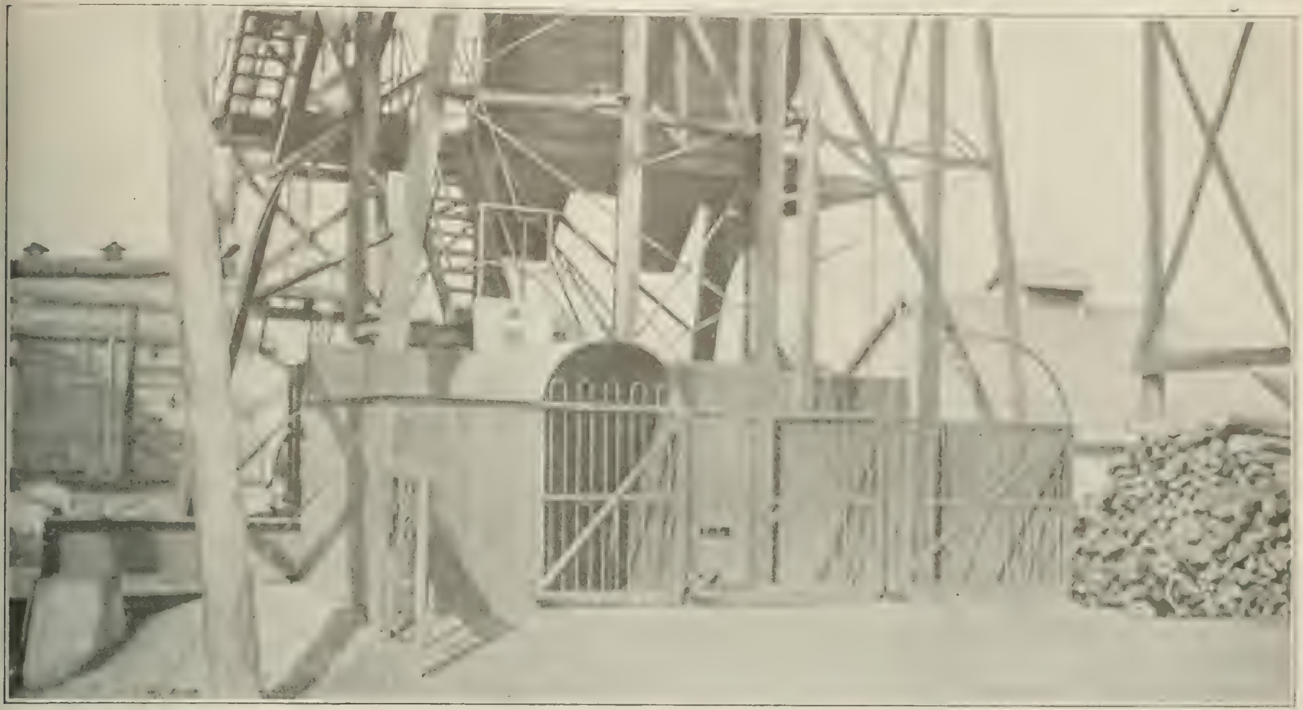


FIG. 1. SHAFT COLLAR SHOWING SELF-CLOSING GUARD GATES

Safeguarding the Mine Shaft

By D. E. CHARLTON

Accidents attributable to operations connected with shafts form a considerable proportion of those occurring in or around mines. Forming a connecting link between the surface and underground workings, not only is it necessary that extreme care be used in the sinking and construction of a shaft, but, upon its completion, it is essential that certain practices be adopted, the aim of which is to prevent accidents. The article deals in a general way with protective measures that may be applied in shafts, both mechanical safeguards and safety regulations.

INASMUCH as the shaft is an essential part of underground mine equipment, it is necessary that considerable attention be given to safeguarding it properly; and the study of mine-shaft accidents, the correction of wrong practices, and the introduction of various types of accident-preventing devices have done much to reduce the number of accidents at or in shafts. There is, perhaps, a tendency on the part of many operators to feel that because some shafts are of temporary duration, and serve as a means of extraction for a small tonnage, little attention need be given to matters of safety, and that the expense involved is out of proportion to the operation, but the small mine can be successfully and economically provided with proper safeguards, and the men taught the necessary regulations, and both of these efforts will result in worth-while returns to the operator. An expensive shaft equipment, provided with elaborate safeguards, is undoubtedly an effective sight to the visitor, but the results in accident prevention may be just as satisfactory at a smaller shaft, and with less expense, if the right sort of coöperation is obtained between the men and the management.

The various types of headframes permit of a diversity of methods of safeguarding, but in general it may be said that proper guard rails and toe boards should be supplied on all stairways and platforms. These may be of lumber or standard iron pipe, although for permanency and durability the latter is to be recommended. If the shaft is of the straight skip-dump type, and includes a bin into which the ore is dumped, the worker at the chutes should be protected from rocks and other falling material, and the platforms from which he operates should be substantially braced and provided with guard rails. The use of a cage in ore hoisting precludes the above-mentioned protection to an extent, but makes other guards necessary, and much of the safety that may accompany the operation of hoisting depends on the cage rider or top-man.

ELECTRIC HAULAGE ON STOCKPILES REQUIRES SPECIAL SAFETY PROVISIONS

The stockpile trestle should be provided with sufficient light for night work. Switches and frogs should be blocked, and ample provision made in the matter of guard railings. In electric haulage systems, the motors should be equipped with proper safety devices and continuous-ringing bells should be supplied. Most standard makes of motors include all that is necessary in that line, but many excellent devices to overcome local conditions have been installed to meet individual and special circumstances. One that is worthy of mention is an iron plate that forms a roof over the motor operator and is used to good advantage where it is necessary that the motor pass by the dumping plate in the headframe where there is danger of loose chunks falling and striking the motorman.

TYPES OF GUARDS AT SHAFT COLLARS

The shaft collar should present a neat appearance and be a special study from a safety standpoint, for here it is necessary to guard not only the mine worker but the passer-by. Fig. 1 shows an excellent manner of guarding a shaft collar. As illustrated, the entrances to the two hoisting compartments and to the ladderway are provided with self-closing iron gates that must be unlatched before being opened. A sheet-steel fence surrounds the shaft and presents a pleasing effect. The ladderway compartment is completely covered with a semicircular iron roof, so that men will be protected from falling objects while entering or leaving the ladderway. Fig. 2 shows another type of ladderway housing, and offers substantial protection from falling material. At the left of the photograph is shown a type of wooden shaft-guard gate that will be found serviceable and which may be installed at small expense.

Safety signs may be posted to excellent advantage about the headframe, where they will serve as a reminder to the men entering the mine. Signs forbidding riding on the skip, those calling attention to the danger of falling objects, and others of a similar nature should also be conspicuously posted.

COMFORT AS WELL AS SAFETY SHOULD BE CONSIDERED IN PLACING OF LADDERS

The best practice in placing shaft ladders is to extend them at least four feet above sollars or landings, and they should be placed at least four inches from the side of the shaft timber, to allow a good handhold or foothold. Where it is not practicable to extend the ladders, iron staples should be used, and these will serve as well. Steel or wooden ladders, or a combination of both steel and wood, may be used, but the essential points are that they should be kept in repair and substantially supported. A 12-in. tread will be found the easiest, and an inclined ladder will be less fatiguing than a vertical one. Sollars should be placed at least 25 ft. apart in vertical shafts and should be kept clear of obstructions at all times.

SEPARATING THE LADDERWAY FROM THE HOIST COMPARTMENT

All ladderways should be properly separated from the hoisting compartments, either by boarding them off completely or placing heavy wire screening over the aperture. The latter practice is to be preferred, as it interferes less with the ventilation. It is recommended that wherever possible electric lights be installed throughout the length of the ladderway compartment, and this is particularly advisable where the shaft is dry, for the carrying of lights through the shaft may then be prohibited and one source of danger from fire eliminated. At one dry shaft with which I am familiar a coil of two-inch pipe connected to a main water line was placed directly below the collar of the shaft, encircling the two hoistways and the ladder compartment. The pipe was perforated, so that when the valve was turned on, at regular periods, the water could run down and thoroughly wet the timbers.

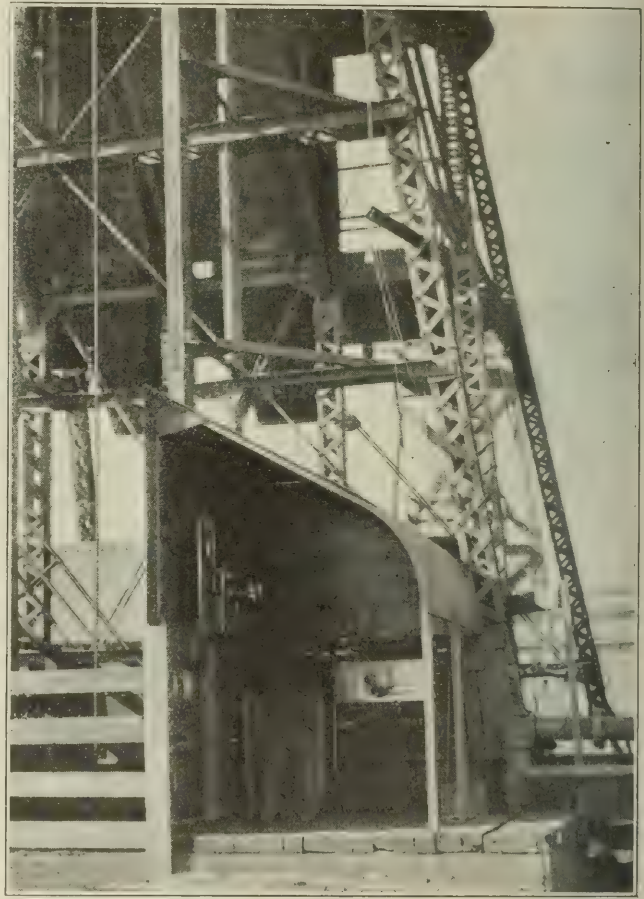


FIG. 2. LADDERWAY HOUSING AT SHAFT COLLAR

Power wires should be carefully boxed or carried down the shaft in conduits and placed in one corner of the ladderway compartment, away from the ladder side. Steam pipes should be covered, although this will usually be done as a matter of steam conservation.

At shaft stations it is essential to safety that sufficient light be provided, and this is also an advantage in facilitating operations. The station is necessarily the underground gathering place for the men, and, unless a pump room is provided, it is advisable that first-aid material, stretchers, and similar equipment always be available here. The use of mine telephones is becoming almost universal in the larger mines, and usually each station is provided with an instrument. It seems hardly necessary to say that the system of bell signals for the hoisting or lowering of the skip or cage should be posted in a conspicuous place on each level.

Shaft gates at stations are an absolute necessity, and in some instances the mine management has not been satisfied with a low gate or bars, but has placed sectional wooden doors which cover the complete opening to the shaft. Where this procedure interferes with ventilation, the practice is to use a door made of heavy wire mesh, reinforced with strap or band iron.

SAFEGUARDING THE SKIP PIT

In the skip pits or at the loading chutes in the shaft, a run-around should be provided so that the skip tender will not have to cross the shaft at any time. Cleaning out the skip pit is dangerous work, but may be made perfectly safe by the installation of a door or doors that will completely cover the hoisting compartments directly above the skip pit. They may be hinged on one side of the shaft, operated by a counterweight and pushed back against the shaft wall when not in use.

Regulations regarding the hoisting or lowering of the skip or cage, loading or unloading material, and respecting the number of men permitted on the cage vary with different localities, but all have been evolved after a careful study of conditions and are intended to prevent accidents. Many of the points discussed in this article have already been mentioned in the *Journal* and other publications, and there is much more that may be said about safe practices in the maintenance and operation of mine shafts. The last ten years have seen notable development in mine-accident prevention in this country, but much remains to be done and still greater improvement and progress can be achieved by coöperation and discussion.

Camp Bird, Ltd.

The annual report of the directors of Camp Bird, Ltd., indicates that no ore was mined during the fiscal year ended June 30, 1918, and that the mill buildings, together with their machinery, were sold for $39,000. The only revenues were, $20,962, which resulted from interest on bank deposits and rentals of ore-bearing ground, and $320,122 received as dividends on shares of the Santa Gertrudis Co., Ltd., owned by the Camp Bird, Ltd.

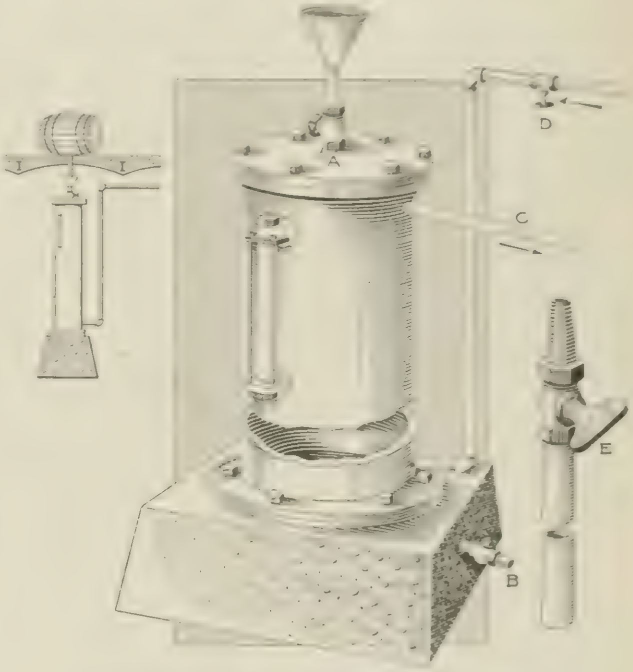
A new tunnel is being driven a distance of two miles to tap the Camp Bird vein at depth. The ventilation of the tunnel is of vital importance and will be obtained from Shaft No. 3 on the Camp Bird vein by a raise connecting with the ninth level, which should be finished in January, 1919. The cost of establishing natural ventilation will be paid by the tunnel company, although the cost of maintaining the Camp Bird upper workings in a condition affording air circulation will fall upon the Camp Bird, Ltd., during its period of activity. The object of the tunnel is to cut the Camp Bird vein at depth, and this point was reached June 1 at a distance of 11,000 ft. from the mouth of the tunnel and 300 ft. further than was originally estimated. The time required to perform the work was within the estimate, but the cost, owing to labor conditions, far exceeded expectations.

New buildings have been erected which afford ample protection against storm and with a minimum of fire risk. Natural ventilation should be available by January, and at that time the territory opened by the new tunnel will become available for exploration.

Combined Lubricating Oil Tank And Feeder

By L. V. Lauther

An efficient oil tank and feeder can be made at almost any mine shop by means of a length of flange pipe of large diameter, as illustrated. The joint of pipe is mounted vertically upon a concrete base and is closed at top and bottom by means of gasketed flange plates. A gage glass is provided near the upper part of the tank, and a valve connection made at the top and provided with a funnel. A drain cock *B* is similarly provided at the bottom. By drilling and tapping in pipe connections above, as at *C* and below as at *D*, oil partly filling the tank thus made will be forced upward and out by water under pressure admitted through the valve *E*. By regulating this pressure, oil will flow out through *C*, where it can be distributed through the various engines and machines as required. The valve shown in detail is inverted into the bung of the oil barrel, and by partly draining the tank and regulating the drip from the spigot the oil tank is filled. On account of the height of such a tank, it is most conveniently placed in a cellar where the barrels can be discharged from the main floor. Such an apparatus is superior in economy of both labor and oil to intermittent oil drawing from a barrel.



LUBRICATING OIL TANK AND FEEDER

Mosquito Elimination and Malaria Prevention*

By C. N. HARRUB

The work of most mining engineers carries them away from the beaten track—to districts where they have often to grapple with problems of varied character, hygienic as well as technical. The mosquito—either the malaria-carrying anopheles or a member of one of the comparatively harmless but none the less pertinacious types—is ubiquitous, and may be responsible for more disorganization and blasphemy, in proportion to its size, than the proverbial "bull in a china shop." A reiteration of the essential factors for the elimination of the pest will serve a useful purpose, and will draw attention to the simplicity of the fundamental precautions to be observed.

THE course of procedure to follow in endeavoring to reduce malaria is to break the line of transmission from patient to healthy person. As it is definitely known that malaria is transmitted only through the agency of mosquitoes, this is the logical point of attack. No mosquitoes, no malaria. Hence the elimination of malaria reduces itself to a question of eradication of the mosquito. This is best accomplished by making it impossible for mosquitoes to breed.

The first three stages of the life of a mosquito—the egg, the larva, and the pupa—are spent in water, and without water it is impossible for mosquitoes to propagate. The problem is thus to eliminate water, or to render it unfit for mosquito breeding. This may be accomplished in one of four different ways, but in practice it may be found necessary to employ all these to achieve satisfactory results. The four methods are drainage, oiling, fish control, and larvicides.

TRAINING STREAMS

As mosquitoes breed in running water as well as in stagnant pools, steps should be taken to arrest development before the adult insect is produced. This preventive work should consist in cleaning the channels of all obstructions, straightening the course, and regrading the beds so as to confine the water to as narrow a stream as possible, to insure maximum rate of flow. Difficulty is sometimes encountered in this work, especially in low flat ground. The stream banks should be clean cut, and all obstructions removed to minimize the chance for floatage to collect, and also to provide an edge which minnows may approach. Depressions in which water may pool and produce mosquitoes should be filled so that the water will drain off.

CONSTRUCTION OF DITCHES

Open ditches, where necessary, should be as straight as possible, and should have clean-cut slipping edges and narrow bottoms. The main ditch should be dug first, and then such laterals as are found necessary. In joining a lateral to the main ditch, it should be given a down-stream direction, to prevent the deposition of silt and sand at the junction. In some cases, where the maintenance of open ditches is too expensive, it is found advantageous to line them, or portions of them, with concrete, not necessarily for their full depth, but just the bottom and a small distance up the sides. Lined ditches are more easily cleaned, but care must be taken to provide sufficient anchorage so that the lining will not be washed out.

DRAINAGE, FILLING, AND MAINTENANCE

Tile pipe may be used in subsurface drainage, the object being to lower the water table, so that storm water will be more rapidly absorbed by the ground. It is also used to intercept seepage from hillsides. Where the collection of water cannot be economically drained, filling must be resorted to, but if the area is too large it may be partly filled, so that the reduced water area may be controlled more easily. As a rule, draining is more satisfactory and cheaper than filling. Under maintenance come any measures necessary to keep the ditches in their most efficient condition, such as removal of collections of débris, regrading, and other upkeep provisions. Vegetation will grow, and must be removed, and in ditches which always contain water, aquatic growths and algæ often have to be combated. In such cases copper sulphate will be found useful. Ditches should be inspected at frequent intervals to see that they are free from obstructions, and records should be kept. These should show the work performed and the materials used, so that costs may be figured. It is well to have a map of the area, with the locations of all ditches shown on it.

OILING PRACTICE IN MOSQUITO-CONTROL WORK

Oiling may be used as a supplementary control measure when funds for proper drainage are not available, or until drainage work can be carried out. The object of oiling is to kill the larvæ before they can develop into mosquitoes, and also to render the water disagreeable to the mosquitoes, so that they will not deposit their eggs in it. The oil should spread well, so as to form a thin film over the surface of the water. Many kinds of oil are effective in this work, ranging in density from that of kerosene to that of crude oil. The former has been used extensively, and has some advantages over some of the other grades. It forms a thin film, spreads rapidly, and is easily obtained. Its chief objection is that it evaporates quickly, but to overcome this feature, it may be added to a heavier oil, the mixture being so proportioned that it works well in the sprayers and readily forms the film on the surface of the water. The percentage of kerosene in the mixture varies considerably, and may be as high as 75 to 80%. The film is more permanent with such a mixture than with kerosene alone.

Oil may be applied successfully to pools, ditches, streams, and edges of ponds and rivers. It should also be used in such containers as fire barrels and similar storage places. In ponds or streams of large size it is unnecessary and useless to endeavor to cover the entire area, because the larvæ are seldom found in the deep

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*From a paper presented before the [illegible] health officers of Florida and reprinted in *Engineering and Contracting*, Oct. 9, 1918.

water, and because a film of large dimensions will be easily broken up by wind action and driven to one side.

Wherever oil is used, care should be taken to see that all débris, such as floatage and weeds, is cleared out. The efficiency of the oil film depends entirely on its continuity, and if grasses or weeds and sticks are left penetrating the water surface, they not only interfere with the spreading of the film, but the film will not come in contact with them at the water surface. A small annular space is left around each grass or stick, and here the larvæ may come to breathe. An excessive amount of oil will sometimes overcome this difficulty, but this method is too expensive for general practice.

METHODS OF APPLYING OIL

Oil may be applied in any of a number of ways, for example, by means of a common garden sprinkling pot, a knapsack sprayer, a drip can, a small bundle of oil-soaked cotton waste, a sprayer from a boat, or thrown from a small dipper. This last method is only a makeshift, is wasteful of oil, and should never be considered as a permanent method of distribution.

The field of usefulness of the sprinkling pot is limited to small areas, where all parts are easily accessible. The knapsack sprayer is best for general use. It increases the range over which the oil may be spread, the operator being able to cover a radius of 20 ft., if desired. The can holds 5 gal., and is carried on the back of the operator, thus leaving both hands free when not operating the sprayer. This is a great advantage when traveling over rough ground. Drip cans are used on small streams. The can is placed about 3 or 4 ft. above the water level so that the force of the fall will break up the drop of oil and immediately spread it out in the required film. The rate of dripping depends on the size of the stream and its velocity. In a small stream, a foot or so in width, 10 to 20 drops per minute will usually suffice. On larger streams as many as 60 drops per minute may be required. This is a matter which should be determined by trial. Whenever possible, it is best to place the drip can so that the oil falls on a rather swift part of the stream. This aids in breaking up the drop, which then spreads out over the quieter water below. Various kinds of drip cans are used, different kinds of oil requiring different methods of handling.

The oil-soaked cotton waste is used on streams where the flow is too small to require the use of a drip can. The waste is dipped in the oil and then squeezed just enough to stop the dripping. It is then fastened by wire in the bed of the stream at its headwaters. The oil gradually works out and forms the required film. It will serve for about a week and must then be re-dipped. Hand pumps and sprayers are used in small flat-bottomed boats to spray the edges of streams, lagoons, and similar places, where drainage cannot be economically employed.

FISH CONTROL

In certain localities, malaria-control work is materially assisted by fish. The top-feeding minnow is the deadly enemy of the mosquito larvæ; and, if given a little assistance, will often entirely prevent the development of mosquitoes in a pool. It is necessary to keep clean and smooth edges on the pool or stream, and to remove all floatage in which the wigglers may hide. Small pools may be stocked with these minnows, and oiling thereby rendered unnecessary. Such pools should be inspected frequently to be sure that the fish control is effective.

LARVICIDES

Under certain conditions larvicides may be used in malaria-control work, but as a rule they are less satisfactory and more expensive than draining or oiling. Larvicides are poisonous, and they should therefore be used with care and discretion. They may kill fish and other aquatic life if applied too freely, and, by thus destroying the top feeding minnows, destroy one of the best natural agents in mosquito control. A larvicide may be used to best advantage in such containers as fire barrels, where it cannot injure stock or kill forms of life other than those for which it is intended. One feature in favor of some larvicides is that one application is sufficient for a whole season, or until the water is changed. Such a one is niter cake.

PROPHYLAXIS AND SCREENING

In addition to the mentioned methods of control, which are designed to eliminate the mosquito, prophylaxis and screening may, in certain cases, be used to advantage. In prophylactic work quinine is used. The dose varies with the object in view, a larger one being more to produce immunity than to simply ward off the disease. It has been used very effectively in Italy among the rural population. For the 10 years preceding 1902 the average annual death rate was above 14,000. At that time quinine prophylaxis was started, with the result that in 10 years the rate had been reduced to a little over 3000, or about 25% of the former figure. As no other means of control were employed during this time, quinine must be given the credit for this reduction. It has also been used with equally good results in all tropical countries.

Screening of houses should be done in all malarial localities, but cannot be considered by itself as an efficient method of control.

Tin and Tungsten Ore in Siam

According to an official estimate, the Siamese output of metallic tin for 1917 was about 142,000 piculs (9466 short tons), as compared with 151,175 piculs (10,078 tons) for the fiscal year 1916, says *Commerce Reports*. The Siamese government collects a royalty on tin and tin ore amounting to about 25% of the market price in Singapore, the fluctuation in value at the latter place being adjusted and the rate reckoned according to a "royalty scale" published in the Siamese government *Gazette* from time to time. A recent issue of this *Gazette* contained a notice of an extension of the "royalty curve" to meet the increased price of tin.

The approximate quantity of tungsten ore recovered during 1917 was 12,000 piculs (800 short tons), against 8769 piculs (584 tons) in the previous year. A recent order in the government *Gazette* announced that the royalty on tungsten ore, which was previously collected at the same rates as in force on tin ore, had been reduced to 10% *ad valorem*.

Remember the Comfort Fund of the 27th Engineers.

Free Acid Determination in Presence Of Metallic Salts

By LOUIS F. CLARK*

The acid leaching of copper ores is rapidly becoming standard practice as an efficient method of extraction, and the determination of free acid in solutions containing metallic salts is thus of considerable interest. The determination is a difficult one, and the ordinary direct titration with alkali is unreliable. Textbooks ignore the subject; and the publication of the following paper, which deals with a specialized method of estimation, and is accompanied by extensive information of a practical nature, should be a welcome addition to the available literature on the control of operations in the wet metallurgy of copper.

THE accurate and rapid determination of free acid, usually sulphuric, in the presence of metallic salts, has long been an interesting problem. The contribution on the subject which the present paper offers is made not because it is thought to be a definite and ultimate solution of the problem, but because, by the procedure described, satisfactory results have been obtained in Chile, and in the belief that others may find it equally helpful.

The determination of free acid alone is readily effected by the aid of indicators, which show a change of color at the neutral point, or thereabout. If a solution contains, besides free acid, metallic salts, then either the color change of an indicator is obscured, or it is impossible to determine the true end point, because the hydrolyzation of weak base salts permits precipitation, and such salts may be reported as free acid. Further, solutions in which free-acid content is desired may be dirty or turbid with suspended matter. It may even be undesirable to attempt filtration, because of acid consumption in attendant oxidation. On the other hand, when such solutions are clear, or may be made so, the usual methods for the determination of free acid take advantage of the very fact of incipient precipitation of weak bases, and the solutions are titrated to a permanent turbidity rather than to the color change of an indicator.

USE OF ALCOHOL IN ACID TITRATION WORK

In most solutions of this sort the color imparted by the metallic salts is not in itself sufficient entirely to obscure the color of an indicator; and, if the tendency toward precipitation could be avoided, such solutions might be readily titrated. With the purpose of preventing the hydrolyzation of such metallic salts, and yet permitting the neutralization of the free acid, experiments were made with a proportionately large volume of alcohol to the volume of aqueous sample taken. At this point the solubility of the various metallic sulphates in alcohol solution became an item of great interest, and it was found from tables that the double sulphates of "alums" formed with ammonium sulphate were quite insoluble in alcohol, and presented the possibility of completely precipitating the interfering elements without changing the free acid content.

A further investigation of the literature on the subject brought out a method by Beilstein and Grosset, given in Sutton's "Volumetric Analysis," in which the free acid in aluminic cakes is separated by filtration of the free acid, dissolved in alcohol, from a precipitate of ammonium-aluminum sulphate. Other texts made it clear that copper, either as cupric alum (ammonium salt), or as the hydrated cupric ammonium salt formed with excess ammonia, could be separated by a critical proportion of alcohol. It was noted also that both ferrous and ferric iron could be similarly separated, either because of the insolubility of the ferric sulphate itself or of the insolubility of ferrous ammonium sulphate. Manganese, too, forms a similar alum.

EXPERIMENTAL INVESTIGATION OF ANALOGOUS METHOD

Experiments were then conducted as described in the procedure given by Sutton. This involves evaporation of the alcoholic filtrate solution in water, and titration, using litmus as indicator. Such a scheme involves the loss of all the alcohol used, and requires much time and apparatus. Obviously, if the titration could be effected at once in the alcoholic solution, much time would be saved, and the alcohol could be redistilled. This brought up the question of a suitable indicator.

The ideal indicator for usual acidimetric work in alcoholic solution is phenolphthalein, but in this case, where a large excess of ammonium sulphate has been used as a precipitant, the phenolphthalein is useless. Some authors say that titration with alcoholic caustic will permit the use of phenolphthalein in the presence of ammonium salts in alcoholic solution, but this has not been found to apply to the solutions in question. An attempt to substitute sodium sulphate for ammonium sulphate as a separation agent, thus permitting the use of phenolphthalein, was unsuccessful, owing to incomplete precipitation of copper.

TYPE OF INDICATOR NECESSARY

In the process described by Sutton, the alcohol is evaporated and the acid taken up in water, in order that litmus indicator may be used, the litmus being insoluble in alcohol. Methyl orange is soluble in alcohol, but apparently the acid is only partly ionized, so that subsequently titration gives an end point when only about half the acid actually present has been neutralized; but this indicator may be used if the alcohol is diluted with about three times its volume of water. This dilution makes recovery of alcohol by redistillation too expensive; but without dilution the titration may be affected by using the indicator on a spot plate on the outside. What is required, then, is an indicator soluble in alcohol, not affected by ammonium salts, and sensitive to the slightly ionized acid present.

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*Potrerillos, Chile.

Various indicators, including lacmoid and methyl red, present possibilities, but cochineal has been found to give excellent results. The last mentioned is preferably used as an internal indicator for the direct titration of the alcoholic solutions.

USE OF COCHINEAL AS AN INDICATOR

Cochineal is described as being useless in the presence of ferric and aluminum salts and acetates, and this seems to be true in aqueous solutions. For some time after this indicator was used it was considered advisable to filter the solutions before titrating, as described by Sutton. This seemed to involve a slight mechanical retention of free acid by the flocculent precipitate, so that a blank had to be run in the same way. Later it was found that, if one part of sodium sulphate (anhydrous) with three parts of ammonium sulphate was used instead of ammonium sulphate alone, this large mass of flocculent precipitate became granular. When the solutions were filtered, the copper was dissolved off the paper with hot distilled water, leaving the insoluble residue (usually from a leach test on an ore) on the paper. The copper was then determined in the filtrate. Subsequent experiment has shown that, if enough indicator is used, it is possible to titrate directly, even in the presence of the insoluble ore material.

This titration was at first conducted with alcoholic caustic, in order to avoid any possible effect upon the indicator by ionization of the iron and aluminum precipitates. The alcoholic caustic of the required strength, about 60 gm. c.p. NaOH per liter, was prepared by dissolving the alkali in its own weight of water (distilled) and then pouring the resulting syrup into alcohol of about 36° Bé. quality. About 12 hours should then elapse for proper solution before it is used for titration. The alcoholic caustic has the advantage that the drops are about half the size of those formed by the aqueous solution. This is important when 0.05 c.c. of NaOH solution is equivalent as a neutralizer to about 3 lb. of acid per ton of ore. For any caustic solution, however, a two-way burette should be used, together with a bulb pump from a bottle reservoir, to facilitate rapid manipulation and to prevent evaporation.

THE PROBLEM TO BE SOLVED

The particular problem presented in Chile is as follows; and, for convenience, it is divided into two parts:

1. Determination of free acid content in sulphuric acid solutions, obtained from leaching operations on copper ores. The free acid content may be as high as 180 gm. H_2SO_4 per liter of solution.

2. A laboratory acid consumption determination on 2 gm. samples of 80-mesh material. The samples to be treated with 10 c.c. of 12% H_2SO_4 for 24 hours, and the residual free acid determined. Milligrams of acid consumed by 2-gm. samples are reported as pounds per ton of ore.

Solutions: Standard sulphuric acid for leach tests is made about 12.3% H_2SO_4, and two gm. of $(NH_4)_2SO_4$ is added for each 10 c.c. of volume. It is therefore advisable to use about 900 c.c. distilled water, 75 c.c. concentrated H_2SO_4, and 200 gm. $(NH_4)_2SO_4$. This will give about 1 liter of solution, which is standardized against Na_2CO_3.

Ten cubic centimeters of the above-mentioned acid solution contains about 1.33 gm. of H_2SO_4, which will require about 1.08 gm. NaOH for neutralization. I find it advisable to be able to titrate the samples with somewhat less than 20 c.c. of caustic solution for each; hence the use of about 60 gm., or 2 oz., c.p. NaOH per liter, is to be recommended.

PROCEDURE IN DEALING WITH LEACH LIQUORS

(a) When c.p. neutral $(NH_4)_2SO_4$ is available, measure 10 c.c. samples, add about 4 gm. of the salt, and allow to stand 15 min. for complete solution. Add 100 c.c. ethyl alcohol (34° to 38° Bé.), agitate and allow to stand about 20 min. If precipitate is not yet granular, add more $(NH_4)_2SO_4$. Add a dash of cochineal indicator (made in 34° Bé. alcohol). Agitate well with glass rod during titration.

(b) When c.p. neutral $(NH_4)_2SO_4$ is not available, the salt may be prepared by evaporation of the neutralized acid. The product is usually very acid. Hence it is advisable to put the same weight (about 4 gm.) of ammonium sulphate into each beaker, and to cover the salt with 10-c.c. samples in respective beakers. Cover one portion with 10 c.c. distilled water as a blank on the salt used. Agitate and allow to stand about 15 min.; add 100 c.c. of 36° Bé. alcohol, and again agitate. Allow to stand about 15 min. again, and titrate. Correct for alkali consumption on the blank. If metallic salts are required in the same samples of liquor, either filter the acid alcoholic mixture before titration, and wash all free acid out with more of the same alcohol, or re-acidify slightly, after titration of the acid, and then filter to recover alcohol. In either case, dissolve metallic alums from the paper with hot distilled water.

TO DETERMINE ACID CONSUMPTION ON 2-GM. SAMPLES

Treat 2-gm. samples with standard acid for 24 hours. Use covers on beakers to prevent too great evaporation. Then:

(a) Add 50 to 75 c.c. of 36° Bé. alcohol, allow to stand 20 min., filter, and wash with about 50 to 75 c.c. of the same alcohol. Add indicator to filtrate, and titrate residual acid. Dissolve metallic alums off papers with hot distilled water. When this procedure is followed, some Na_2SO_4 (about 1:3) should be mixed with the $(NH_4)_2SO_4$ used in the acid, in order to make the precipitate more granular.

(b) This alternative seems permissible on some ores. Treat ore samples with standard acid as before, add 100 c.c. 36° Bé. alcohol, allow to stand 20 min., add about 5 c.c. of strong indicator solution, and titrate with much agitation until a persistant change of color is noted. Re-acidify, for filtration, in order to recover alcohol, and dissolve alums off paper in hot distilled water.

IMPORTANT CONSIDERATIONS TO BE NOTED

1. If alcoholic solutions are filtered from alum, precipitated before titration, then portions of standard acid should be run in the same way, in order to estimate the slight loss of acid by mechanical retention in the grains of precipitate.

2. After titration, alcoholic solutions may be passed through a common large filter, so as to form a rapid separation of the alcohol from the sodium sulphate precipitated during titration. This filtered alcohol is redistilled in a tin-lined copper still, such as is commonly used for distillation of essentials oils. It is placed in a large pan of water, and elevated somewhat off the bottom to give a good water-bath effect. A tin-lined coil, with one charge of condensing water, gives very good condensation here in Chile. The alcohol for redistillation should be slightly alkaline from the titration; but, if not, a small portion of lime should be added. If 38° Bé. alcohol is used to begin this work, one distillation after each set of determinations should keep up the quality of the alcohol. About 20% loss occurs.

3. Cochineal powder should be ground in a mortar and then put into bottles so as to saturate the 34° alcohol used. The indicator is more soluble in a poorer grade of alcohol, but this quality is specified in order not to introduce any more water than is necessary into the system. After a portion of powder has served to saturate two or three portions of alcohol, it becomes very poor in active principle, viz. carminic acid, even though it seems to impart a decided color to the alcohol.

4. Titration should proceed slowly near the end, with continuous agitation to avoid local concentration.

5. For all this work the denatured ethyl alcohol licensed for sale by the Chilean government has been found entirely suitable. If, however, alcoholic caustic solution is preferred, rather than the aqueous, natural ethyl alcohol must be used for this particular solution, because the caustic apparently decomposes the denaturant to an extent that a dirty yellow liquid results.

The foregoing procedures have been outlined to obtain figures desirable here in Chile. The exact details, however, should be regulated to suit any special requirements. Thus here, for the treatment of 2-gm. samples of ore, the alum-forming sulphates are introduced into the standard acid itself, in order to save time in subsequent addition. In this determination those conducting the tests in Chile were interested only in the acid consumed. Such a procedure in the case of a leaching determination might lead to a higher result for the copper extracted than would be considered comparable to operating conditions.

In general, the details of the strength and constituents of a leaching solution are selected to suit individual circumstances and ideas. In some cases it may be possible to combine the two determinations of acid and copper leached on a 2-gm. sample, where the ideas for the determinations are not in conflict, or when it may be possible from the chemical standpoint, or expedient. It would, in such a combination, seem advisable to add any alum-forming sulphates after the time of leaching had expired, rather than to introduce them directly into the leaching acid. In the tests here in Chile, because of the presence of manganese in the ore and its solution, together with the copper (which it is necessary to determine by cyanide titration), a separate and distinct manipulation becomes necessary in order to prepare the solution for the cyanide. It thus becomes a matter of expediency to conduct the determinations by two separate treatments; and the procedure as given for 2 gm. samples of ore only properly covers the item of acid consumed.

Temperature and Concreting*

Heat hastens the hardening of concrete; cold delays it. The effect of cold becomes noticeable in this respect when temperatures are below 50° F., and becomes more marked with the lower temperatures. The general opinion is that freezing will not injure concrete that has first had an opportunity to harden for at least 48 hours, under favorable conditions. If, before early hardening has taken place, concrete is allowed to freeze and thaw at short intervals, it will be damaged. As a rule, concrete will not show any serious effects from having once been frozen if, after it thaws out, it is not again frozen until early hardening is complete. But it is far better to protect the concrete from freezing for from 48 hours to four or five days, depending upon the degree of the cold, rather than to expose it to the possibility of freezing. If such protection is given, no injury need be feared when the concrete is finally exposed to freezing temperatures.

Some of the requirements leading to success with concrete work done in cold weather are self-evident when one remembers the conditions under which concrete hardens and gains strength in warm weather. Warmth and moisture are necessary to the proper hardening of concrete. Any means that will cause both these conditions to be present, in cold weather, particularly during the period of early hardening, will lead to the success of concrete work done at such times, if every other good practice is also followed.

Gold Absorption by Copper Plates†

In connection with cleaning up old mills after shutdown, the following data on this subject were recently obtained, and are published by Rand Mines, Ltd.:

From "A" Mill.—A plate weighing 565 lb. (approximately 5 ft. 6 in. by 12 ft.) was first steamed, then scoured. It was then scaled by application of chemicals and heat. The gold-copper scale obtained contained 12 oz. fine gold, or 42.27 oz. per ton of plate. After scaling, the plate was melted into an ingot, which assayed 3.75 oz. fine gold per ton.

Total fine gold in plate after steaming and scouring: In scale, 12 oz., or 42.47 oz. per ton; in ingot, 1.05 oz., or 3.75 oz. per ton, a total of 13.05 ounces. The return noted is from a plate after 20 years of service.

From "B" Mill.—The plates were first steamed and scoured; then scaled, as in the previous instance, with the following result:

RESULTS OF SCALING COPPER PLATES

Plates (5 ft. 6 in. by 12 ft.)	Weight of Scale Oz.	Weight of Scale After Acid Treatment and Melting, Oz.	Fineness of Bar	Fine Oz.
4 battery (primary)	548	130	740.0	96.20
12 battery (primary)	1,616	316	886.5	280.1
5 tube mill (secondary)	447	83	872.0	72.38
21	2,611	529	.....	448.59

Average yield per plate, 21.36 oz. The scale was refined by acid treatment, using sulphuric acid and niter. The plates from "B" mill had been in use at least 20 years.

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*Abstracted from a pamphlet published by the Portland Cement Association.

†Abstracted from the *Queensland Government Mining Journal* Sept. 16, 1918, p. 423.

Pneumatic Mixing and Delivery of Concrete[*]

BY H. B. KIRKLAND

Pneumatic mixing and delivery of concrete find many applications in mining practice, and the following paper demonstrates the simplicity of the method. Perhaps the most notable use of such a system has been in connection with the construction of subways in New York City and suburbs. A portion of the mining work involved has been carried out by the practice of ordinary tunneling and timbering methods, but a large part, where the ground is soft enough, is excavated by shield and concreted in sections. The ability to maintain the position of the mixer, at a convenient distance from the face, by adjustment with lengths of piping, is a feature of the pneumatic concreting system; and its use in underground New York and elsewhere has greatly facilitated subway construction. Wear on conveying piping is necessarily severe, but the expense in this connection is usually counterbalanced by economies effected in other ways.

THE pneumatic method of mixing, conveying and placing concrete is a comparatively recent development in engineering construction. It should not be confused with the cement-gun process, which results in a plastering and is entirely different in operation and purpose. Both methods are patented. The pneumatic method is adapted for heavy, difficult concrete work, using ordinary ingredients with aggregates up to 4 or 4½ in. diameter. Briefly described, it consists simply in blowing batches of concrete through a pipe from a central point of supply to the concrete forms. The materials for a batch of concrete (1½ cu.yd.) are proportioned in a measuring device and dropped into the pneumatic mixer without previous mixture.

EQUIPMENT REQUIRED FOR PNEUMATIC OPERATION

The plant for pneumatic mixing and placing consists of a mixer, a pipe conveying system, and compressed-air apparatus. The mixer consists of a steel shell having the shape of an inverted cone, surmounted by a cast-steel cylinder in which a door is operated by a small air piston. This door is opened by releasing the air in the cylinder and allowing it to drop open by its weight. At the bottom of the inverted cone chamber is a 90° elbow which forms the connection to the discharge pipe. The door, with the piston, is the only movable part of the mixer, and the inside contains no mechanical mixing apparatus, and is entirely smooth and free from obstructions. An air jet at the heel of the bottom elbow of the mixer is the prime means of conveying and mixing the concrete, and is supplemented by other air jets at the top of the mixer. The main air jet is directed into the center of the discharge pipe, where it catches the material as it falls from the cone-shaped hopper above. The upper air jets create a pressure from above the batch, forcing it downward into the discharge pipe where it is caught by the main jet. To admit air to the mixer, two valves are used, one on the air-supply line leading to the lower jet and the other on the line leading to the upper jets placed above the level of the batch.

THE OPERATION OF THE PLANT

In operating, after the batch containing cement, aggregate, and water is placed in the mixer, the door is closed and the main jet is opened. This is followed by opening the valve to the upper air jets. Many operators vary this method, but the effect of this sequence of control is to start the batch forward at the bottom of the machine, detaching successive parts of the batch at the tip of the cone. The materials in the mixer flow downward in the same manner that sand flows from the upper chamber of an hourglass, but the speed of the flow is accelerated by the air pressure.

The conveying pipe consists of any standard smooth steel pipe with joints made with bolted flanges or any type most easily and rapidly handled in making connections. The most rapid wear on the pipe occurs at the points where there is likely to be a slight irregularity or a shoulder. Threaded pipe is also thinner where the threads are cut, and of course wears through there first. For making deflections of the pipe line, cast elbows are used. An ordinary cast-iron elbow will last sometimes less than a day, but a case-hardened steel elbow will usually last a few weeks. The best elbow is cast manganese, which will almost outlast the pipe itself. These elbows are made in 45° with a thickness of ⅝ in. on the inner curve and ⅞ in. thickness on the outer curve. This gives a weight of about 220 lb. for an 8-in. elbow. The radius of the elbow is 3 ft. minimum, as a shorter radius is too sharp a turn and causes plugs in the line. Shorter radius elbows may be used, however, at the discharge end of the pipe. A split elbow of 90° has also been used for 6-in. pipe. This elbow is split lengthwise so that the outer half of the curve, which usually wears rapidly, may be replaced.

A means of deflecting or guiding the discharge of concrete in the forms consists of a series of slightly tapered pipes, fitting together like stovepipe. Two or three sections of this light pipe 3 or 4 ft. long are all that are needed in a tunnel form for diverting the discharge from one side wall to the other and for guiding the concrete discharge around points of rock projecting from the roof. Where the tunnel is wide, however, as in a double-track railroad tunnel, a "Y"-branch is used in the line, so there are two lines of pipe entering the tunnel form. A side valve or gate is placed in the "Y" for diverting the batches through one line or the other.

A compressor of suitable type is employed, the one ordinarily selected being a straight-line, one- or two-stage machine, compressing from 80 to 125 lb. The drive may be steam, oil, or electricity, as may be cheapest, most convenient, or most economical. It is desirable to have the plant near the mixer, and it is necessary to provide air storage close to the mixer sufficient at least to store enough air to discharge a batch of concrete at the maximum distance required. This storage should have at least 100 ft. capacity, with 30 cu.ft. capacity added for each 100 ft. of pipe line. There should be additional storage at the compressor if the mixer is a considerable distance away (for example, more than 300 ft. distant).

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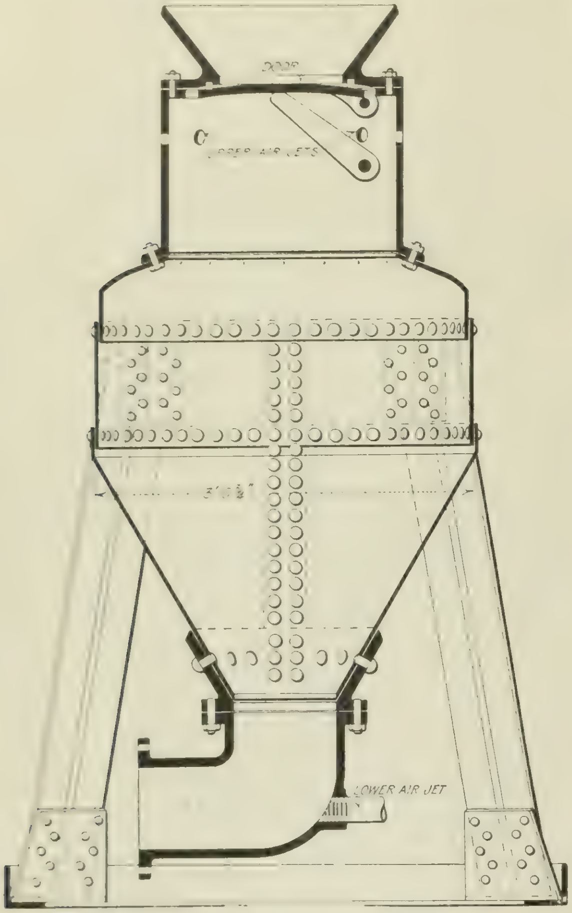
[*] Abstracted from the *Compressed Air Magazine*, and Trans., Western Society of Engineers, July, 1918, p. 8817.

The amount of air required to convey concrete depends upon the specific gravity of the materials, the smoothness of the pipe, the number of bends in the pipe line and their radii, the distance conveyed vertically and horizontally, and upon the pressure or velocity of the air used. For the standard-size mixer, this is about 2 cu.ft. of actual free air compressed to 100 lb. per sq.in. per lin.ft. of pipe per batch. In other words, to convey one batch 500 ft. it will take 1000 cu.ft. of actual free air compressed to 100 pounds.



CONCRETE MIXER AND MONTEJUS

The Mixing Process

One of the first questions asked by the engineer is, "How is the concrete mixed?" This is explained by a study of the conditions which affect the batch from the time it is placed in the mixer until it is delivered in place in the forms.

In loading the mixer, the ingredients, cement and water, are usually placed in a measuring hopper, so that when the hopper is emptied into the mixer the first commingling of the ingredients takes place. The first commingling is not particularly important, as it is slight. When the air is turned on, that portion of the batch which is at the bottom of the mixer, in front of the conveying air jet, is first to move and is instantaneously followed by portions dropping from above. As the mixer has the shape of an hourglass, the central portion of the batch in the mixer flows down first, and the portion in the sides follows in the stream from the upper part, exactly as sand flows in an hourglass. During this operation the mingling of the different ingredient parts causes the smaller ingredients to flow into the voids between the larger ingredients. As the portions of the batch drop into the lower air stream, which travels at an exceedingly high velocity, these portions are carried along in suspension, much as dust is carried along in a storm, except that the particles are much closer together. Although the speed of the air jet is high, that of the concrete materials is much lower. The speed of the concrete varies according to the amount of voids in the materials which permit the air to pass through. The air in passing through tends to carry with it the smaller ingredients; that is, the sand tends to fill the voids between the rocks, and the cement tends to fill the voids remaining, and, as the voids become filled up with the smaller ingredients passing through, the speed of the mass increases, the pressure of the air behind the mass increases with the decrease of the voids in the mass, and the speed of the mass concrete increases.

Now, in this explanation of the mixing process I have assumed that the air velocity passing through the pipe is sufficient to keep the materials in suspension. It is important to have a sufficient air pressure for this purpose, because, when the air velocity is reduced, the materials simply roll and tumble along the bottom of the pipe. The concrete will also mix in this manner, but it is not conducive to good operation and makes a dirty pipe line, which is likely to become plugged. In shooting concrete, therefore, it will be found that with an 8-in. pipe and with materials of the specific gravity of limestone, the pressure should not fall below 50 lb. per sq.in., as the materials will then begin to drag along the pipe. Any air expended below 25 lb. is wasted when blowing concrete through an 8-in. pipe.

Three general types of pneumatic installations have been developed through the requirements of different classes of work. These are the central plant or plan of placing the mixer at a central point, from which the conveyor pipe is laid to the forms; a portable plant or outfit upon which the mixer is carried, and is either loaded from bins carried on the same conveyance or supplied by a belt or other loading device; and a scheme of loading the mixer at various points, as at the bottom of manholes in shallow tunnels, and supplying it with materials through a chute from the various corresponding points along the surface. The last mentioned is a form of central plant made semi-portable.

Consolidated Interstate-Callahan Mining Co.'s report for the third quarter of 1918 shows extensive development work. The repairs and operating costs amounted to $220,958, a net profit of $49,750 being obtained from ore shipments. The development work in the mine and alterations in the concentrating mill have proved satisfactory and a mineral recovery of 92% is expected. The adjustment of differences between the company and the American Metal Co., Ltd., over a long-term contract for treating the ores, resulted in a cancellation of the contract and the surrender of 145,097 shares of the company, held by the American Metal Co., thus reducing the outstanding stock of the Consolidated Interstate-Callahan Mining Co. to approximately 300,000 shares.

Standardization of Mining Methods
VI—Standard Equipment*

By CHARLES A. MITKE†

This paper contains suggestions toward greater simplification of operations underground by means of standardized equipment and the elimination of unnecessary variety. Tools, tool houses, and machines are considered, and requirements outlined that will aid in the establishment of more efficient operation. The standard tool car.

THE handling of tools and supplies underground has not received the attention that the subject deserves, although it is one of the important links in the chain of standardized operations in prospecting and development. Good work is impossible unless good tools are provided and a sufficient supply is kept on hand to meet all emergencies. A miner was once heard to remark: "Give me the tools, and I will do the work." This statement followed the boss's reprimand at the end of a shift for not doing a satisfactory day's work; but the miner had been forced to spend several hours seeking an ax and pick before setting up to begin his round. The fact that a great part of the miner's time has to be spent in collecting tools and supplies is not always understood by bosses.

When hand drilling was the practice, the careful handling of the steel and supplies was simple compared to the complications that are inseparable from machine drilling. The hand miner, on receiving his hammer and several pieces of steel, is prepared to do a day's work, whereas the machine miner must assemble a far greater variety of tools and supplies before he is ready for drilling. To start without a complete outfit means stoppage of the work and a series of delays until the necessary parts are found.

Distribution of Tools and Supplies Underground

A distinct system for the distribution of tools underground is employed in almost every mine. In one case a number of locked tool boxes may be found, to which only the shift bosses and repair men have keys. The difficulty with this system is that the repair men may lose their keys or the shifters forget theirs, causing serious delays. Cupboards are used in other mines. These are always open, and anybody may help himself. As a general rule, there are seldom any tools there, as the men forget to return what they take out; and it is hardly possible, with such a lax system, to keep an accurate check on the contents of the cupboards. Another plan is to have the tool house and powder magazine in the same drift, which, of course, is extremely dangerous. In still another instance, tool houses, with all tools and supplies, arranged in their proper place, may be situated so near to the powder magazine, though in a separate drift, that the powderman can attend to both. He checks out all the tools at the beginning, and receives them at the end of the shift. This is a good system, inasmuch as an accurate record can be kept of all tools, but it is practicable only in small mines where the distances between the working faces and the tool house are short. In large mines, in which the workings are scattered and the drifts and raises a considerable distance from the central tool house, it is not practicable to return the tools at the end of the shift. An improvement over this method would be to leave the tools in the different working places in the mine, and have the tool "nippers" check them over, replacing them when necessary with others from the central tool house. When going off shift the boys should leave a report of all tools and supplies taken from the central tool house, and of the situation of the working places in the mine where they were distributed. A record should also be kept of all machines taken from the working places and sent to the repair shop.

Care of Rock-Drilling Machines

Marked progress has been made in drilling-machine design in the last few years, and new models are constantly put on the market. It has, therefore, been impossible to standardize on one particular machine. In some camps it was considered good business to scrap the old machines and purchase new ones at once, though other organizations continued to use their old machines and added new ones when they were brought out. This led to an accumulation of many different types. A number of good machines are now available, and it is possible to select a few which are best adapted to the kind of ground that is being worked, and to standardize on them. At several properties where many different machines were in use, a Paynter tester was installed, and the drills were tested for efficiency. It was found that many machines which apparently seemed to be working well struck a blow only one-third of their rated strength. Machines in this condition involve a constant loss, and the tester provided a rapid and satisfactory method of determining how many drills among those which had been in stock for a considerable time were fit for further use. Those found to be worn out were immediately scrapped.

Repairs to Rock Drills

A machine which is out of order is frequently put aside on the ground. The next miner who comes along may not know of its condition, and, quite possibly, may pick it up and put it on the bar. After he has made his complete set-up he discovers that the machine is entirely out of order. Examples of such a mistake are frequent, and time studies have shown that in one mine, within a single shift, as many as three machines have been put up on the bar, each in turn found to be in defective condition.

When the drill does not work well, the miner underground often opens the valve chest and tries to take the machine apart. Often this is done where there is a con-

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*The sixth of the series of articles which began in the Nov. 9 issue of the *Journal*. Copyright, 1918, McGraw-Hill Co., Inc.

†Mining engineer, Bisbee, Arizona.

siderable amount of loose dirt and by a miner whose hands are not clean and who has no cotton waste. Many particles of dirt and rock are dropped into the mechanism, and by the time the miner thinks he is through with the repair work the machine is in a far worse condition than it was before he opened it. In all cases where there is anything seriously wrong with a machine it should be sent to the proper repair shop, which may be either underground or on the surface. Often, owing solely to low air pressure, the drill appears to be out of order, and the machine man is tempted to take it apart and try to find out what is the matter.

Frequently, the miner forgets to blow out the hose with compressed air before connecting the machine, and any rock and dirt accumulated there is sent directly into the machine and causes much trouble and delay. Every miner should have a standard oil can to take the place of the variety now in use, which includes tomato cans, tobacco cans, and various kinds of bottles. These receptacles usually contain dirt, which finds its way into the machine.

Sound of Machine No Indication of Work Done

Many miners believe that, when it is operating in a drift, they can judge a machine by the sound. The remark is frequently made: "Listen to the hammer of that machine. There is a good machine. You can tell by the sound that it is surely cutting the rock." In most cases judgment made on such evidence is based on error. The sound of a machine is no indication of its actual cutting power. Machines often sound as if doing excellent work when, in reality, operating at only 50% efficiency. This can be proved by the Paynter testing machine.

Sufficient rock drills should be kept in stock underground. Accidents will happen occasionally, and machines get out of order, and there should be a number on hand to provide against such an emergency. In this event any man who starts a round, even if he has serious machine trouble, will be able to finish it in the shift.

Small Machines Often Suitable

Wherever possible, the small machines should be used, except in drifting in extremely hard ground, where the larger machine still holds its own. Recent competitive tests have been made with several drifting machines weighing about 150 lb., and the results compared with those obtained from small machines, weighing about 45 lb., and the drilling speed was found to be the same in both cases. This is possible because the smaller machine puts in a smaller hole, and consequently less ground is taken out. The tests were made in fairly hard ground. In medium ground, however, more satisfactory results were obtained with the small machine than with the larger one; and this indicates a wider field for it than has been thought possible.

In some mines the small machine has already replaced the large machine in all development work, as well as in hard ground in stopes, and is giving equal if not better satisfaction. Moreover, it has the added advantage of requiring only one man, either to operate or set up, which naturally reduces the expense. Under present conditions of high cost of production and scarcity of competent mine labor the small machine should be more generally adopted, and the large machine and larger steel held merely in reserve for use in exceptional and unusual cases.

With the small machine, and correspondingly smaller-size steel, the holes drilled will naturally be much smaller than those drilled with the heavy Leyner type of machine. Consequently, in hard ground, higher-strength powders should be used. This was formerly impracticable, on account of poor ventilation, but recently so much attention has been devoted to an improvement in the methods of maintaining healthful atmospheric conditions, that it is now possible to use the higher-strength powders in the smaller holes without detriment to the working atmosphere.

Handling Steel Underground

Before it is possible to standardize on steel, it will be necessary to standardize on machines. Usually, in most mines, four to six different kinds of steel are in use. Experiments are being conducted in one mine having an output capacity of 2000 tons a day, and an effort is being made to standardize on one kind of steel only, which is to be used for drifting machines, pluggers, and stopers. However, it has not been demonstrated that this will be practicable; but it is reasonable to believe that the entire drilling in the average mine can be done with two kinds of steel—the large, round, hollow steel (1⅛-in. diam.) for large machines working in exceptional ground, and the hollow quarter octagon (1⅞-in. diam.) for the Jackhamer type and stoping machines. This is being done successfully in several mines, and when put into general use will facilitate the standardization of steel and do away with the expense of carrying in stock a number of different kinds. The inefficiency resulting and the confusion caused underground should thus be materially reduced.

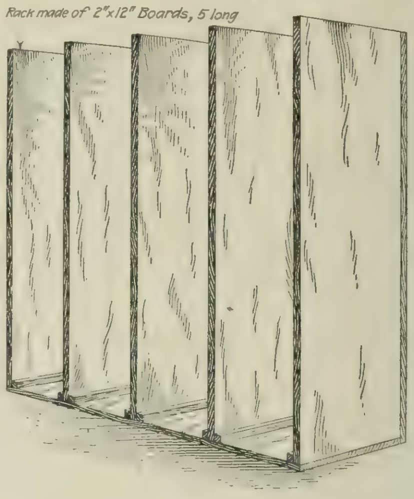

FIG. 1. UNDERGROUND STEEL RACK

Necessity for Underground Steel Racks

Another important consideration is the character of the steel and drill bit. A great deal has been written on this subject, and much has been done to improve the design. The drill bit should be made with great care, with the temper which the ground requires, and with the exact gage, cutting edge, and reaming surfaces. Four pieces of steel (the 1st, 2d, 3d and 4th) should be fastened with an iron ring into one bundle, to facilitate handling. This bundle contains all the steel required for the drilling of one hole to its proper depth, and can be used over again until the steel becomes dulled.

Another problem is to keep the steel moving. For example, after it passes through the drill-sharpening shop, it is transported to the shaft, lowered in steel cars to the various stations, and taken thence to the steel racks. Frequently, it is merely stood up on the ground, and becomes plugged before it is put in the machine. This may be avoided by the use of steel racks, where it is sorted into different lengths and kinds. These racks (see Fig. 1) should be on all levels underground, at convenient distances from working places. The steel is taken to the racks from the shaft stations on trucks, and distributed to the different tool cars by the tool "nippers," who, in turn, take the dull steel back on small trucks to the shaft stations. Here it is put into the steel cars in which the sharp steel has been brought down, and sent to the surface. A surplus of sharp steel should always be kept in the central steel racks, so that a man who has not enough steel to finish his round can obtain more.

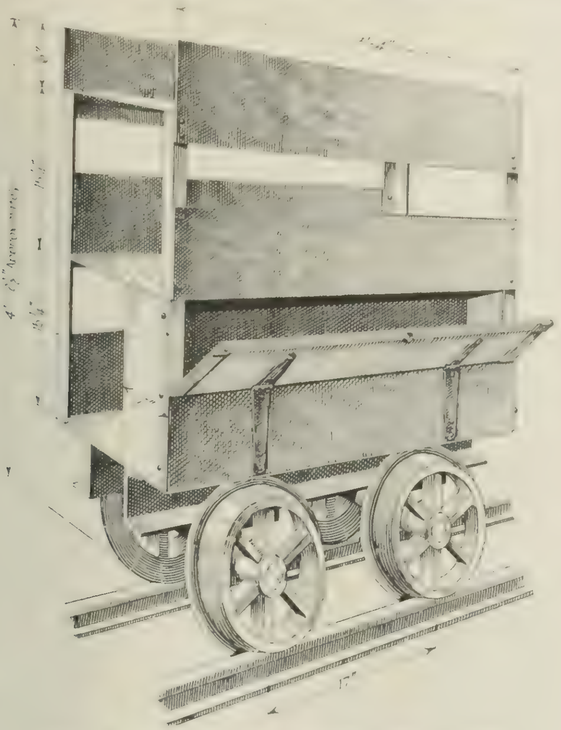

FIG. 2. LEYNER DRILL AND TOOL CAR

The central steel rack should be near the tool house and also close to the powder magazine, so that the powderman who gives out the powder, caps, and fuse can also attend to giving out the tools, supplies, and steel. He should also check all that comes out, in order that a record may be kept of the machines and other equipment.

Standard Equipment for Drifting Work

To have a complete outfit, so that the machine man will not find it necessary to seek additional tools or supplies during the shift, he should be furnished with standard equipment, consisting of: 1 machine; 52 pieces of properly tempered steel; one 50-ft. air hose, and connection; one 50-ft. water hose, water valve and connection; 1 column, arm, clamp, chuck wrench, a monkey wrench, and an 18-in. Stilson wrench; 1 blow pipe and valve; 1 oil can, filled with proper machine oil; 1 ax; 1 double jack; 1 shovel; 1 jack bar; 1 light 6-ft. bar; 1 pick; 1 scraper; 2 blocks; 6 wedges; 1 foot-block; gaskets, side rods, nuts and springs; 1 powder sack; 1 cap and fuse sack; 1 tamping stick. This equipment should be sufficient to drill a standard round, and the list includes everything needed by the miner during the shift, with the exception of the powder, and is equally applicable whether large or small machines are used.

The equipment should be assembled at the tool house on the level of the mine on which the work is to be done, loaded on the tool car designed for that purpose, and sent to the working place before the miner arrives. Then, as soon as he comes on shift, he can begin setting up and drilling.

Standard Type of Tool Car

The tool car should have four compartments—the two larger compartments for the machine, steel, bar, hose, blocks, and like material, the two smaller ones for wrenches, oil can, gaskets, side rods, and smaller appliances generally. This car should be designed to hold the entire equipment in a small space, and its adoption will obviate the necessity of using several trucks or ore cars. At the end of the shift, the equipment should be loaded on the tool car, everything being put in its original place, and moved to a siding, where it should be attended to by the tool "nipper" on the next shift. He should look over the car, refill the oil can, replace dull with sharp steel, and see that everything is in first-class order. If water lines are not provided in the drift, water cars should be used. Figs. 2 and 3 are drawings of practical tool and water cars in use in several mines in the Southwest.

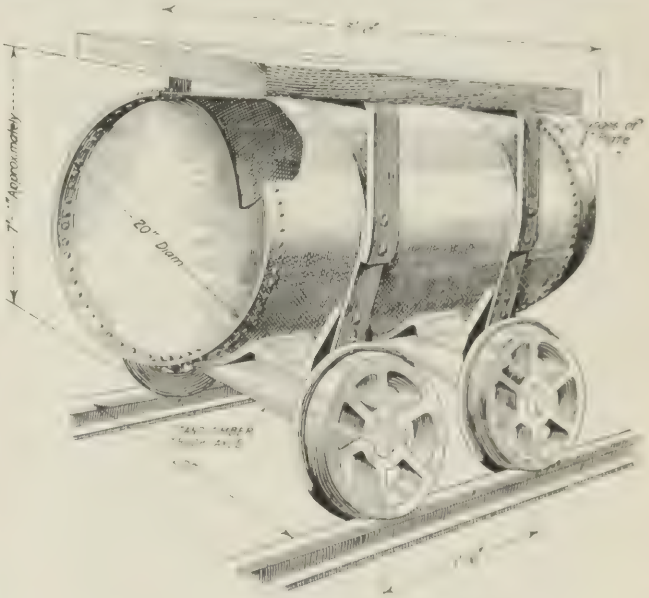

FIG. 3. LEYNER DRILL WATER CAR

Standard Equipment in Raising and Stoping

A standard equipment unit for raising or stoping should consist of 1 stoper machine; 52 pieces of selected stoper steel; one 50-ft. air hose and connections; 1 oil can, filled with proper machine oil; 1 pick; 1 foot-block; 1 monkey wrench; gaskets; 1 scraper; 1 powder sack; 1 fuse sack; 1 tamping stick. If the stoper is a water machine, then 50 ft. of water hose, water valve, and connection should be included. The equipment should be loaded on the tool car or small truck, and handled as in drifting.

SHOVELING

When the mucker enters the drift he should have the following equipment, which he has obtained from the tool house on the level: 1 short-handled scoop or 1 square-pointed shovel; 1 round-pointed shovel; 1 pick; 1 double jack; 1 six-ft. bar; 1 light car, obtained at the working place. Turnsheets should be laid in all drifts before blasting, so that the mucker will be more efficient in his work. Exhaustive studies have been made of mucking on the surface, and many of the principles evolved could be advantageously applied to underground work. Little attention has usually been paid to the kind of shovel which is given to the mucker, or whether its size, shape, design, or length of handle are suitable for the load it has to carry. Too much emphasis cannot be laid on this important feature, upon which depends the efficiency of the worker and the cost of the operation.

SHOVELS, SHOVELING MACHINES, AND SCRAPERS

In most drifts a short-handled, large scoop is preferable, provided turnsheets have been first laid so that the mucker can shovel from a smooth bottom. In rare cases, where sulphides are to be handled, a smaller, square-point shovel should be used, as the specific gravity of this material is high. If no turnsheets have been laid, and the mucker must shovel from a rough bottom, then a small, round-point shovel should be used. This is expensive practice, as it requires far greater exertion to shovel from a rough bottom than from a smooth surface, experiments showing that it costs approximately 40% more than if turnsheets are laid and a short-handled, square-pointed, 21-lb. shovel is used.

Shoveling machines are used in large stopes and motor drifts. Though a large amount of material per shovel can be handled and loaded in cars, serious delays are frequent, owing to breakdowns which require the services of expert mechanics in making repairs. Scrapers, when operated by small tugger hoists, are used to advantage in horizontal top-slice stopes to shovel and transport into raises the ore which has been broken in the headings driven to open up the stopes. After these headings are opened, a large number of stulls must necessarily be put up, which would interfere with the action of the scraper and prevent its use in the stopes. As much as 80 tons has frequently been handled with one of these scrapers by two men in an 8-hour shift, but such a machine can be used to advantage only in soft ground. In stopes where there is hard ground which breaks into large boulders it is not practicable unless an excessive amount of explosive is used to break the boulders, and this adds materially to the cost. The cars used should be light. Considerable effort is required to move a heavy car, and if one man must handle it alone it is impossible for him to transport much ore.

Frequent sidings and switches should be laid in long drifts to lessen the distance for hand tramming. Mule or electric haulage should be used from these sidings to transport ore or waste to its destination.

Where short trams are planned for the mucker to tram either ore or waste into raises or stopes, the bosses should always see that there is sufficient room to contain all the material which will be trammed there during the shift, so as not to cause a delay on the part of the mucker in waiting for chutes to be drawn.

The Metric System in Russia

According to the *Ironmonger*, the Soviet Republic has ordered the abolition of the present system of Russian weights and measures and the introduction of the decimal system, the decree to come into force on Jan. 1, 1919. The standards to be used for the decimal measures are the standard meter and kilogram which were presented to Russia at the International Weights and Measures Conference in Paris in 1899, and which are kept at the Central Office for Weights and Measures at Moscow. If for technical reasons it should be found impossible in any particular department or locality to enforce the decimal system on Jan. 1 next, the use of the old measures may be temporarily continued, but Jan. 1, 1922, is the latest date for the introduction of the decimal system. The Commission for Trade and Industry is ordered to supply new weights and measures, and the Education Commission to see that practical instruction in the decimal system is given in all the schools. From Jan. 1, 1922, the manufacture of old Russian weights and measures is prohibited, from Jan. 1, 1923, none may be sold, and from Jan. 1, 1924, their use will be illegal.

War Prices Prevent Normal Business*

In peace this country cannot do business on a basis of war prices. When our Government and all the governments of Europe were paying whatever they had to pay for steel, for coal, for copper, for leather, for foodstuffs—when they were draining the markets of all commodities—ordinary industry and ordinary business, buying in the same markets, were compelled to pay the same prices or even higher. They could do this and get out alive. They could do it because nobody else was going to underbuy them and therefore undersell and ruin them.

With the war over, with all inflated prices due to come down to a dead certainty, industry and business are not going to buy at the top. They don't need to be warned, they know, that if they do stock up with material and goods at two, three, and four times normal values, the concerns that come along after them and buy much lower down will drive them out of their selling market unless they are willing to clean up at whatever loss they must take to meet competition and get rid of their stocks.

Get back to ordinary business. It is the only way. The Government can begin by releasing its surplus wool at such prices that manufacturers can take, and merchants can give, orders now. Let supply and demand regulate the price just as if there had never been any war. Let the Government charge up the difference to the war. There will be plenty of business for everybody on that basis. On the war inflation basis there cannot be. Let the Government lead the way.

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*From the New York *Sun* of Dec. 6, 1918.

The Berdan Pan for Amalgamation

BY A. W. ALLEN

THE simplest type of machine for amalgamating gold in ores, and at the same time effecting the final comminution necessary in most cases to free the metal from the encasing gangue and expose it to the action of the mercury, is the Berdan pan, a diagram of which is shown herewith. It is used extensively in countries where prospectors and small owners need some machine to cleanse their pannings and recover the gold in a salable form. Under such conditions it is realized that most of the losses take place during the final stages of hand panning, dry blowing, or mechanical concentration, in an endeavor to get an absolutely clean product. There is no question that its use could be still further extended if its design were more gnerally known and the simple principle on which it operates better appreciated.

The standard size of Berdan pan is about 5 ft. in diameter. The pan consists of a circular trough which carries a large ball, in the manner shown. The trough is mounted in a steel driving shaft, set at an angle and so arranged that the pan can be driven by suitable gearing at a speed of from 10 to 15 r.p.m. The material to be ground is fed into the pan either continuously, by means of an automatic feeder, or periodically, by hand; and a stream of water enters with the feed and overflows at the lowest point of the lip, carrying with it the treated material. The fineness to which the latter is ground can be regulated, within certain limits, by adjusting the amount of water passing through the pan.

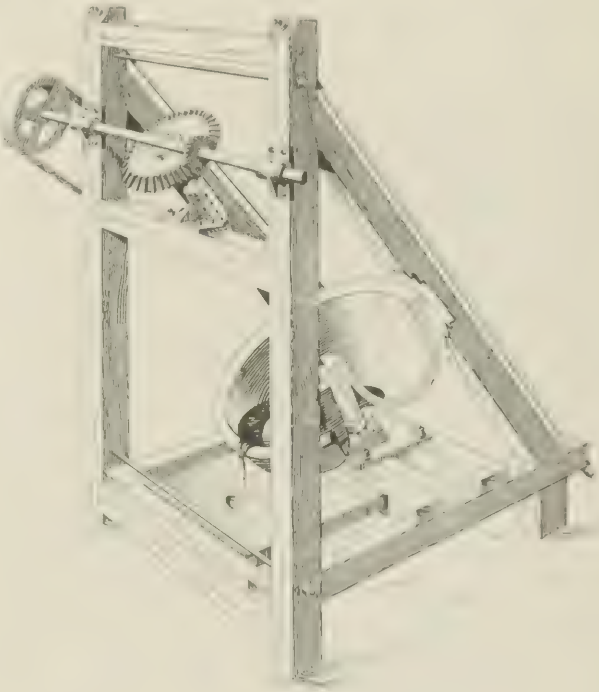
The ball rolls in a pool of mercury, so that any metallic particles that are freed by its crushing action are immediately brought into contact with the quicksilver, and amalgamated. The speed of the pan is so low and the action so quiet that practically no mercury is floured during the operation.

The capacity of the pan for actual grinding is, of course, small, as the ball weighs only about 120 lb., and the power consumed is negligible. It is highly advisable to break the material in a dolly pot or sample crusher before feeding to the pan, so that all will pass ½-in. mesh. If an even finer feed can be arranged, the duty will be proportionately greater. The secret of success as regards capacity is to maintain an even and minimum bed of ore or other material in the pan. Like the stamp mill, the Berdan pan will do practically nothing when overfed.

In place of the steel ball an iron drag is sometimes used, but is not to be recommended. The power consumption is increased out of proportion to the increase in tonnage ground; and it is difficult to maintain the proper thickness of feed bed between the drag and the pan bottom. Liners are sometimes employed to reduce wear under such circumstances. These are, however, unnecessary when a ball is used, when the pan body can be made as a stout casting, of extra thickness where there is abrasive action; and even after continuous operation it will be found to be little worn. It will certainly last for several years. The smooth surface of the trough will permit an effective clean-up to be made, whereas when liners are used the amalgam is likely to lodge between the pan body and the liners, and can be recovered only with difficulty.

The Berdan pan is an invaluable adjunct in a mill, especially where amalgamation is being, or has been, practiced. It has been responsible for the recovery of many tons of mercury since the price of the metal advanced under the stimulus of a war shortage. Many operators have found that the débris around an old amalgamating plant often contains sufficient mercury to make its treatment in a simple machine of this type a highly profitable undertaking.

Millmen will find this amalgamator far more convenient than the amalgam barrel for cleaning up accumulations of mill refuse containing mercury or amalgam. They will appreciate the fact that by withholding the feed for an hour or so before they are free to attend to the clean-up, and by allowing a stream of clear water to pass through the pan during this time, the mercury will be thoroughly cleansed, the iron can be easily removed, and the amalgam can be pressed in a minimum of time. Compared with the messy procedure necessary with an amalgam barrel, and in view of the fact that practically no mercury is floured during the operation of a Berdan pan, there is little doubt as to which is the more convenient machine. It will also be found particularly handy and suitable for cleansing and grinding chippings, scrapings, and scalings from copper plates, and producing an even grade of amalgam for retorting.



BERDAN AMALGAMATING PAN

In addition to its use in connection with battery clean-ups, the Berdan pan will be found invaluable for reducing shot metal and fine gold and silver from slag resulting from the smelting of cyanide zinc-box precipitates and retorted metal.

The Berdan pan is seldom used as a unit of milling equipment, on account of its limited grinding capacity; but on small "one-man" properties, equipped with a battery or mill of some description and a concentrating table, the addition of a pan of this type would involve little expense, absorb practically no additional power, eliminate a great proportion of the labor necessary with apron plates, and insure a greater recovery of gold. Where a middling product, obtained from the concentrating table, needs regrinding, the Berdan pan will be found suitable for this purpose, although it is not to be recommended where very fine grinding is not required, or where an even grade of sized product is expected. By modifying the inclination of the pan so that the depth of liquid is varied, it is sometimes possible to regulate the size of the product delivered, but only within comparatively narrow limits.

What Alsace-Lorraine Meant To Germany

Dr. Felix Pinner, who from time to time contributes articles on economic questions to the *Berliner Tageblatt*, recently enlarged on the importance of Alsace-Lorraine to Germany as a source of raw materials. The following summary is taken from the *Ironmonger* of Nov. 9:

The loss of the manufacturing industries of the two provinces, states Dr. Pinner, would mean far less to Germany than being cut off from sources of certain raw materials with which she herself is not too well provided. The three most important of these are iron ore, potash, and petroleum. Without the 10 Alsatian potash mines, Germany would still hold potash deposits and works from which not only her home requirements but an unlimited export demand could be covered. Nevertheless, the world monopoly in potash which Germany now holds, except for some minor deposits in Spain and the United States, will be broken if Alsace is lost, and this would deprive Germany of one of her few weapons of economic defence.

But the iron-ore question is still more serious. The huge development of the German iron industry would have been impossible without the acquisition of the Lorraine ore deposits in 1871. The Lorraine steel output (2,286,354 tons in 1913), considered in relation to the total German output of 18,958,819 tons, is small, but the fact must be taken into account that not only the Lorraine works but all the West German iron works drew to a large extent upon the Lorraine minette ore. The Luxemburg iron industry is economically bound to that of Lorraine, and if Lorraine is lost Luxemburg cannot continue in the German Customs Union.

Now, the Lorraine and Luxemburg iron-ore output combined in 1913 amounted to 28.5 million tons of the total German output of 35.9 million tons, or, expressed in iron content, to 77% of the total. The loss of Lorraine would, therefore, make Germany dependent upon foreign ore supplies for the greater part of her iron output. She would still be able to obtain ore from Sweden, Spain, Russia, and perhaps even from France, yet the basis of her industry would be so narrowed as seriously to hamper development of her iron industry.

Liquid Crystals

Evidence has been accumulating during the last few decades that there is justification for speaking of "liquid crystals," according to *Engineering*. The term certainly does not appear to accord with the time-honored distinction of the three states of aggregation—solid, liquid, and gaseous. Nor do bodies like pitch and wax and others which gradually soften without having a definite melting point exactly fit this classification. But crystals, substances which in solidifying assume definite though varying shapes, with straight edges and plane faces, and which are characterized by peculiar optical and other physical properties not found in either amorphous or in liquid substances, seem to be the perfect examples of solids, and it is difficult to imagine such substances to partake simultaneously of the characteristic properties of solids and of liquids. Yet it is known that there are a large number of crystal-like bodies of more or less constant shapes, which unite when they meet, forming twins, which may split again, which may be distorted into spirals, and which not only possess some of the specific properties of crystals to an enhanced degree, but actually display certain optical properties for which scientists have so far been looking in vain in solid crystals. These liquid crystals may drift in a trough across which wires have been stretched, and float right through the wires to close up again and to reassume their original shape and properties, much like the proverbial ghost floats through the walls, and is left unharmed by bullets and sword thrusts. The liquid crystals are real, though they are best studied under the microscope and polariscope.

White Arsenic in Rhodesia*

The manufacture of white arsenic on a commercial scale was brought to a successful stage in Rhodesia early in 1918, says the *Board of Trade Journal*, in quoting the report of the Munitions and Resources Committee. One unit of a plant is at present in operation, the output from which is about 14 tons per month. The plant is now being increased, and it is hoped to produce about 100 tons per month before the end of 1918. The product is of excellent quality, assaying about 99% As_2O_3, and it is interesting to note that this grade is obtained from the ore in one operation. For the time being all the arsenic produced is exported for the Union of South Africa for the manufacturing of arsenite of soda, but it is the intention of the syndicate now carrying on the work to turn out sheep-dips itself at a later date. Experiments in the recovery of arsenic as a byproduct have been conducted.

A considerable amount of attention was devoted during 1917 to prospecting for arsenical ores, and bodies of mispickel ore are now known to exist within reasonable distance of the railway line, which could supply South African requirements for arsenical compounds for many years. White arsenic recovered as a byproduct in gold mining would doubtless find a ready sale if the manufacture of dips and of arsenite of soda is begun, but the regular source, the committee states, would necessarily be from high-grade mispickel ores such as are known to be available in the country.

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*Commerce Reports, Nov. 16, 1918.

Destruction of the French Coal Mines*

The French Departments du Nord and Pas-de-Calais have suffered severely through the depredations of the invader. The Germans, in their customary manner, destroyed the greater part of the machinery used at the coal mines. Thanks to their ruthlessness, France is deprived of one-third of her normal output of coal for a period of three or four years to come, and Germany will now be called upon to make good this shortage. Whether the German debt shall be paid by occupying the district of La Sarre or by a coal tax upon the Rhine and Westphalian districts is unimportant, but fuel must be one of the most important considerations in the peace treaty.

What strikes the visitor most forcibly is that the city of Lens, now called Lens le Neant ("Lens the Nothing"), is a vision of horror that cannot be erased from the memory. Everything is pulverized, only a few walls stand, and nothing remains of a once happy population of 355,000 souls. Toward Courrieres are a few stumps of walls and empty houses; further to the east the wrecks of Salloumines, Henin-Lietard, Courcelles, and Auby. Still further to the east is Douai, but here the aspect changes somewhat. The town is nearly intact, and few houses are destroyed, but they are unoccupied except for a few soldier police. The sweeping has been clean. After the inhabitants had left, officers and privates looted thoroughly. The camions have carried off linen and furnishings, leaving shells and war supplies by the roadside. Toward the pits of Aniche and Anzin the Germans destroyed the bridges and blew up the crossroads, but they are still accessible over the side roads where the enemy did not use his heavy trucks. All over the country are the remains of the Decauville portable railway, and by the side of it heaps of barbed wire gratings and helmets.

The destruction of equipment was thorough at Lens, Courrieres, Dourges, l'Escarpelle, and Douai. At Aniche and Anzin it was hoped, for a moment, that less destruction would be apparent, but it is just the same. Steam cylinders and air compressors were dynamited. A few cartridges carefully exploded in screen and washing plants have made them useless. Switchboards were carried away, and no trace of copper is to be found. Here and there are a few cars still loaded with coal, but most of them lie around partly destroyed by nearby explosions.

In the district of Lens the mines were flooded thoroughly, by turning surface water into them. In other districts only the lower levels of the mines are now flooded, owing to the cessation of pumping. By the middle of October scarcely a single inhabitant of the coal districts remained. A few miners hid themselves and stayed behind the retreating Germans, and others, escaping from the retreating enemy, are now slowly coming back, and civil life is beginning again. The engineers and superintendents who had remained at the mines during the war were taken to Belgium in the retreat and are still prisoners. A few engineers formerly connected with the mines are in France, and these are now returning to take such care of the property as is possible and to begin restoration.

At a few mines the destruction was not so complete as intended, and many inhabitants still remain; the Germans, with bayonets at their backs, could not always complete their tasks.

The big problem of today is to decide on the manner of reviving the business. It is a technical and economic problem requiring the maximum production in the shortest possible time. In its solution efforts will probably be limited to certain chosen points where destruction is less complete, but nothing is yet definitely decided upon—the question is still being studied.

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*Extract from *L'Echo des Mines et de la Metallurgie*, Nov. 3 and 10, 1918.

Manganese at Kaslo, B. C.

An interesting geological survey of the manganese deposits of Kaslo, B. C., has been issued by the Mines Department, Ottawa, which reads in part as follows:

> Three claims, the Harp, Collingwood, and Black Diamond, are situated five miles from the town of Kaslo at 2690 ft. elevation, on the northeast side of the valley of Kaslo Creek. . . . The workings examined were at an elevation of 2630 ft., where a quartz vein 3 to 4 ft. wide has been explored by open cut and tunnel for 33 ft. The vein occurs in the Kaslo volcanics group of rocks. It conforms with the strike of the formation and dips 80° west.
>
> The immediate hanging wall is a banded, compact, argillaceous and somewhat graphic schist. The foot wall is a 2-ft. band of chlorite schist, an altered eruptive. Both walls have gouge material and are well defined. The rhodonite in the vein is massive, dull gray to deep pink in color. It occurs along the foot wall in fairly continuous bunches, which were probably at one time joined together in a continuous band of rhodonite varying in width up to 18 in. The gangue consists of vitreous smoky quartz, carrying pyrrhotite, pyrite, and chalcopyrite. The sulphides impregnate the wall rock and cause the foot wall in particular to weather to a rusty brown. The vein has been formed by hydrothermal solutions ascending along a contact fissure and those associated with the sedimentary members, where the fissure is along a contact or bedding plane, from the prevailing type in the Kaslo volcanics.
>
> The secondary deposits of manganese occurring on the valley terraces and slopes flanking the Kaslo volcanic area of the Blue Ridge are the most noteworthy yet discovered in British Columbia. The ore consists of different forms of wad or bog manganese. A sample of this material proved to be a good grade of wad, containing 48.14% of Mn and 1.65% Fe. Six claims were staked for wad in July, 1917, at a point two miles beyond Murphy's property and seven miles from Kaslo. On three of these claims, owned and prospected by A. J. Curle, of Kaslo, wad was found in segregations or layers associated with calcareous tufa and limonite.
>
> A study of the distribution and character of the wad deposits on the northeast side of Kaslo Creek valley points to the fact that mineral springs and swampy ground with sluggish drainage played an important part at one time on this valley slope. Deposition must have been in progress for a considerable period, as layers of wad attaining a thickness of three feet have been encountered in shallow holes and ditch-like excavations. Beds of wad averaging 6 to 10 in. in thickness, separated by tufa or limonite bands, are typical of the occurrence.

Extraction of Mercury With Sulphide*

By C. H. Holland

One part of an ore containing cinnabar, ferric oxide, and a hydrocarbon is crushed, and agitated with 4.5 parts of an aqueous solution containing 4% sodium sulphide and 1% sodium hydroxide. The solution is filtered, and mercury is precipitated from the double sulphide of mercury and sodium by aluminum shavings. The mercury is obtained partly in metallic form, and partly as a powder mixed with foreign matter, which is heated in a retort with manganese dioxide and lime. The total yield of mercury is 84.5 per cent.

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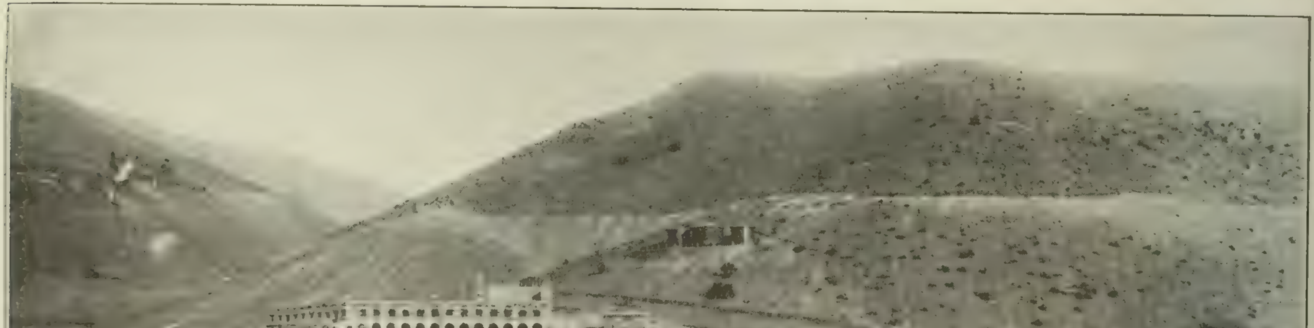
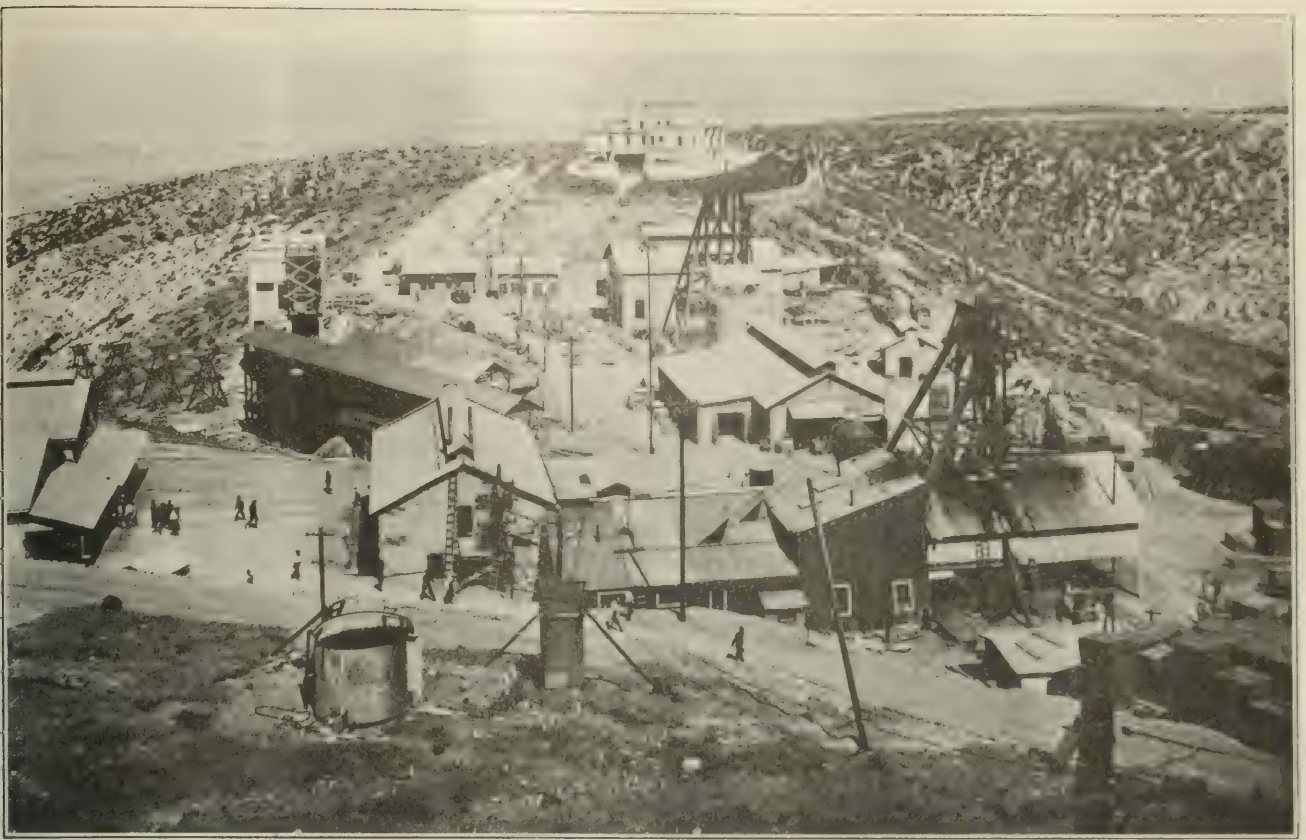
*Abstracted from *New Zealand Jour. Sci. Tech.*, and *Jour. Soc. Chem. Industry.*

Photographs From the Field

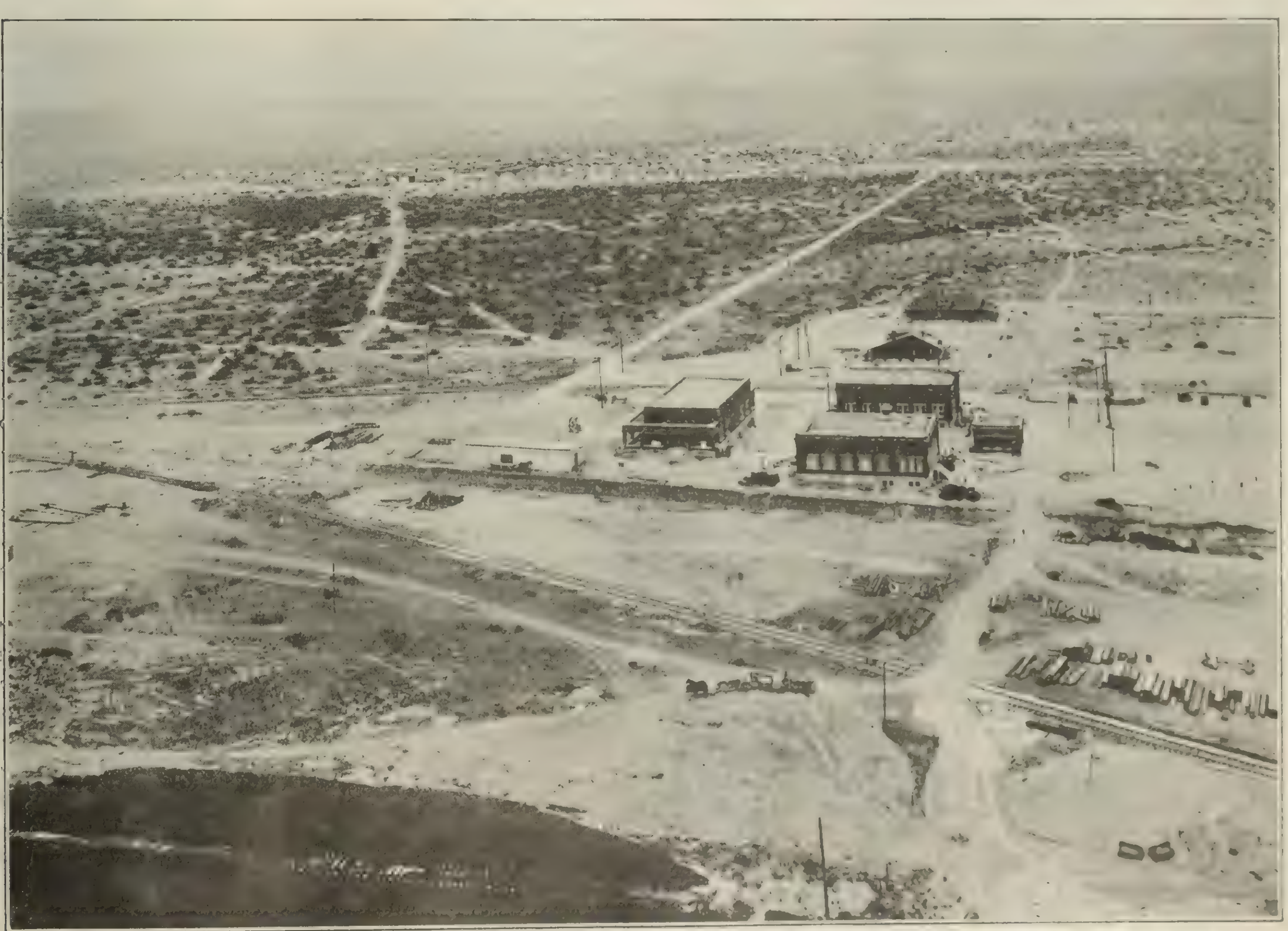
TEMPORARY TOWN SITE OF VERDE, NEAR JEROME, ARIZONA



HOIST, TRANSFORMER HOUSE, CHANGE HOUSE AND MINERS' HOTEL, UNITED VERDE EXTENSION MINE



SURFACE PLANT AT UNITED VERDE EXTENSION MINE, WITH JAMES DOUGLAS' RESIDENCE IN BACKGROUND



GENERAL OFFICE AND LABORATORY AT SMELTERY OF UNITED VERDE EXTENSION MINING COMPANY

How Workmen Fare Under Bolshevism

THE following comprises some illuminating paragraphs from an article by Hans Vorst, the Russian expert of the *Berliner Tageblatt*, Oct. 8, 1918, a translation of which was published in the New York *Times:*

The signs of destruction are still more prominent in Petrograd than in Moscow. I was already convinced of this on my short route from the railway station, and the following days finally revealed to me a dying city. The crumbling pavements, the neglected houses, spoke an impressive language. There is no house without a sign announcing the hurried sale of house furnishings. At every corner so-called "liquidation bureaus" have been established, in which household articles of all kinds, furs, clothing, linens, furniture, objects of art, and antiques are sold. All of these things, often fondly gathered for decades, are now thrown upon the market, and must be auctioned off at ridiculously low prices, if, indeed, they can find a purchaser at all. For who cares to buy, when the requisitioning of bourgeois homes, the confiscation of their furnishings, is in full swing?

The bourgeoisie are fleeing from the city, as the constantly growing distress and increased cost of living, besides the persecution which is threatening them at present and in the future, make life unbearable. Panic-stricken, these people try to gather their possessions at the eleventh hour, and, as far as possible, to turn them into cash. For possessions have become a burden and a hindrance. Now the better middle classes also are fleeing.

But the working class, too, is fleeing, because the city can no longer offer it employment and support. Toward the end of 1917 the population of Petrograd was still 2,700,000; in June, 1918, it was only 1,400,000. In about a half a year, therefore, the population decreased to half its former size, and since then it has doubtlessly fallen off even more.

The eye witnessed signs of this breaking up and destruction of the once so brilliant city, no matter where it looked, even on the short trip from the railway station through the streets. The workingman at my side, meanwhile, told me the old story of being out of work, in distress and hungry. With bitter irony he added:

"For all this, everything is now ours. The houses belong to us, the factories and banks belong to us. But we are not able to live more easily because of it, and everything falls to pieces."

These words, which the plain workingman learned from his own experience, show, in fact, the scarcely enviable lot of the Russian proletariat. The working class has achieved full control in the state, and yet there are groups in its midst who have been deluded, because of this fact, into forgetting that their economic position has not been improved because of it, but rather has begun gradually to decline. The average wage of the industrial and transportation worker, of the clerk, and the municipal employees in Russia in the year 1914 was about 32 rubles a month. According to the reports of the People's Commissioner of Labor, Larin, recently published in the *Isvestia*, the present earnings of the same class of workers amount to about 325 rubles per month—that is to say, about 10 times as much as formerly. This tenfold increase in wages was perhaps the cause of the stiff prices which were current this summer, and which amounted to about 10 times the prices paid in free trade before the war, exclusive of the fact that the commodities, which may be obtained at fancy prices, are not present in sufficient quantities, and that the workingman, too, must often pay a hugely exorbitant price to the profiteer.

Meanwhile, though, the administration has this autumn again raised the prices so much that on the average they amount to about 20 times those paid in peace times. Thereupon was based the demand, presented by Larin, to double the wages again. Larin said:

"One cannot double the prices and let the earnings remain the same or only increase them by half. The working class does not relish such jokes."

Yet the administration, in coalition with the Central Executive Committee, could not decide in favor of a 100% raise, but ordered a 50% raise instead. The increase in wages therefore remains quite a pace behind the increase in prices, and the position of the working class becomes more difficult still because of the lack of provisions and commodities. But even this increase in wages only constitutes a passing palliative measure, as it is a positive economic fact that wages and prices stand in an essentially alternative position, and as soon as wages are raised prices must jump higher, too.

The only possibility of improving the condition of the working classes is by increasing production. But this, too, failed, and, by the course that is being followed, cannot succeed. The productiveness of work sank lower and lower by degrees. It is thus impossible even to maintain the old relationship between wages and prices.

The Soviet government is desirous of introducing expedients into this situation, which, like the partial payment of wages in kind, can only lead to an irreparable confusion, if, indeed, it should come to be realized at all. In the meanwhile, to keep alive the impression among the working class that they are enjoying material benefits from the "dictatorship of the proletariat," steps are being taken to isolate the middle class from its dwellings, to requisition its house furnishings, and to place the proletarians in its stead. A committee at the Council of the People's Commissioners formed a resolution in which was stated:

"Parasitic elements, capitalists, manufacturers, bankers, speculators, property owners, entrepreneurs, and, in fact, persons who do no specially paid work, are liable to exile."

Arrangements have also been formulated for the requisitioning of homes. In Moscow these measures "for the establishment of wholesome shelter for the workingmen" are already in progress. Petrograd is preparing to follow this example.

Though a certain system is being followed, and exceptions are being made in the capitals, it seems that in the provinces the task is being done in a more summary fashion. One number of the official *Isvestia*, that of Sept. 15, contains the following news items:

"In Nikolajevsk the Executive Committee has resolved to confiscate the altogether excessive possession the capitalists and to turn it over to the common na-onal fund.

“The Soviet in Ostashkov has, in conjunction with the ed Terror, prescribed a contribution of 469,000 rubles the bourgeoisie of the community.

“At Voronesh the bourgeoisie is being excommuni-ated from the central part of the city to the suburbs t the will of the Soviet; their dwellings in the city are eing occupied by the workingmen.”

In this way the social revolution in Russia has begun t present to realize just what socialism always brought s a charge against its enemies. Instead of organizing roduction, possessions are being taken from their own-rs and divided among the masses of the poor.

How long will this last, and where will it lead? The working class will soon realize that they will have to tarve and freeze in the dwellings of the rich as well, o long as economic destruction continues.

Metallic-Electrode Arc Welding

By O. S. Escholz*

A reliable method for determining the character of welded joints is of prime importance, and the lack of one has been responsible to a large extent for the hesitancy among engineers with regard to the adoption of arc welding.

Manufactured apparatus is practically all accepted on the basis that it should comply with a process specification, rigidly enforced, in conjunction with the successful reaction to certain tests. Riveting seriously impairs the strength of the jointed plates; yet, with a proper layout and intelligent inspection, the completed structure possesses certain definite features which do not require further examination. The inspector of a finished concrete structure is practically helpless, as the weakest sort of construction may be concealed by a sound surface. With a careful supervision of the process, however, the physical properties of the completed structure can be reliably gaged, and the use of concrete may be justified even in ship construction.

Electric-arc welding is susceptible to better control. The four factors which determine the physical characteristics of the metallic-electrode arc welds are fusion, slag content, porosity, and crystal structure. Some of the more important methods for determining these characteristics are:

1. Examination of the weld by visual means to ascertain: (a) finish of the surface as an index to workmanship; (b) length of deposits, which indicates the frequency of breaking arc, and, therefore, the ability to control the arc; (c) uniformity of the deposits, as an indication of the faithfulness with which the filler metal is placed in position; (d) fusion of deposited metal to bottom of weld scarf, as shown by appearance of under side of welded joint; (e) predominance of surface porosity and slag.

2. Chipping the edges of the deposited layers with a cold chisel or calking tool to determine the relative adhesion of deposit.

3. Penetration tests to indicate the linked unfused zones, slag pockets, and porosity by: (a) X-ray penetration; (b) rate of gas penetration; (c) rate of liquid penetration.

4. Electrical tests (as a result of incomplete fusion, slag inclusions and porosity), showing variations in: (a) electrical conductivity, and (b) magnetic induction.

The utilization of these methods to the best advantage involves their application to each layer of deposited metal as well as to the finished weld. This, excepting in unusual instances, would not be required by commercial practice in which a prescribed welding process is effected.

Visual examination is of more importance than is generally admitted; and in conjunction with failure in the case of the chipping and caulking tests, is of particular usefulness. The last mentioned test serves to indicate gross neglect, by the operator, of cardinal welding principles, owing to the fact that only a poor joint will respond to the tests.

The most reliable indication of the soundness of the weld is offered by the penetration tests. Obviously, the presence of unfused oxide surfaces, slag deposits, and blowholes will offer a varying degree of penetration. Excellent results in the testing of small samples are made possible by the use of the X-ray. However, on account of the nature of the apparatus, the amount of time required, and the difficulty of manipulating and interpreting results, it can hardly be considered at present as a successful means of examination in operations involving large-scale production.

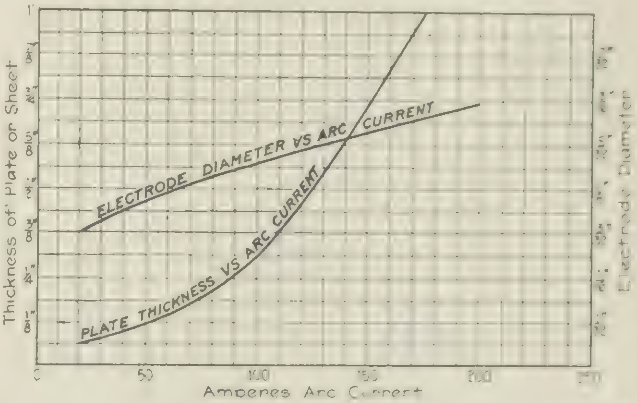


FIG. 1. CURRENT NEEDED AND ELECTRODE DIAMETER FOR WELDING PLATES

The rate that hydrogen or air leaks through a joint from pressure above atmospheric to atmospheric, or from atmospheric to partial vacuum, can readily be determined by cumbersome equipment. The slight advantage over liquid penetration in the matter of time saving is not of sufficient importance to warrant consideration.

Kerosene, of the various liquids that may be applied, has marked advantages, because of its availability, low volatility and high surface tension. When sprayed on a weld surface it is rapidly drawn into any capillaries which may have been produced by incomplete fusion between deposited metal and weld scarf, or between succeeding deposits, slag inclusions or gas pockets, penetrating through the weld and showing the existence of an unsatisfactory structure by a stain on the emerging side. A bright red stain can be produced by dissolving suitable oil-soluble dyes in the kerosene. By means of this test, the presence of faults that could not be detected with hydraulic pressure or other methods has

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been indicated. By the kerosene penetration method a sequence of imperfect structures linked through the weld could be immediately discovered. It must be borne in mind, however, that this method is not applicable to the detection of isolated slag or gas pockets, nor of small, disconnected unfused areas. It has been shown by various tests, however, that a weld may contain a considerable amount of distributed small imperfections without modifying its characteristics to a great extent.

If a bad fault is betrayed by the kerosene test, it is advisable to burn out the metal with a carbon arc, before rewelding under proper supervision. Electrical test methods by which the homogeneity of welds is determined are still in the evolutionary stages, and obvious difficulties are yet to be overcome. Some of these are the elimination of the effect of contact differences, the influence of neighboring paths and fields, and the lack of practicable and portable instruments of sufficient sensibility for the detection of slight variations in conductivity or magnetic field intensity. No simple tests are available, except those which involve subjecting the metal to excessive stresses, for determining the crystal structure. Control of this phase must be determined by the experience obtained from following a prescribed process.

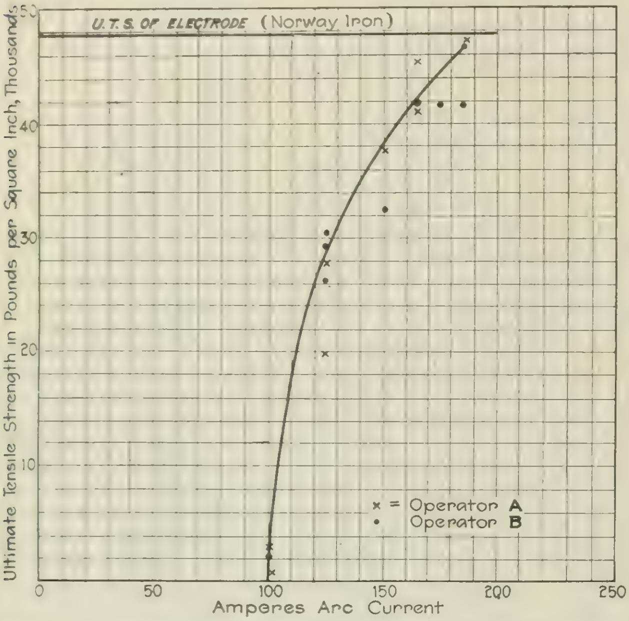


FIG. 2. VARIATION IN WELD STRENGTH WITH CHANGE IN ARC CURRENT

The inspector of metallic-electrode arc welds may consider that, by the proper use of visual, chipping, and penetrating tests, a more definite appraisal of the finished joint may be secured than is possible in either riveting or concrete construction. The operation may be still further safeguarded by requiring rigid adherence to a specified process.

It is unfortunate that most welders consider themselves pioneers in an unknown art. As the result, they are inclined to do their work under a mysterious camouflage, which is bewildering to the untutored. Once in a while, due possibly to a coincidence, one of these "experts" is successful in obtaining a good weld, but more often a successful job is attributable to the friction between slightly fused, plastered deposits.

In common with many other operations, the process of metallic-electrode arc welding is susceptible to analysis. Regardless of the composition of the metal welded with the arc, the cardinal steps are: (1) preparation of weld; (2) electrode selection; (3) arc-current adjustment; (4) arc-length maintenance; and (5) heat treatment.

Sufficient scarfing is involved in the preparation of the weld and in the separation of the weld slants, so that the entire surface is accessible to the operator with a minimum amount of filling. When necessary, to avoid distortion and internal stresses due to unequal expansion and contraction strains, the metal is preheated or placed so as to permit the necessary movement to occur.

The electrode selection is determined by the mass, thickness and the constitution of the material to be welded. An electrode free from impurities and containing about 17% carbon and 5% manganese has been found generally satisfactory for welding low and high carbon as well as alloy steels. This electrode can also be used for cast-iron and malleable-iron welding, although more dependable and more consistent results, permitting the machining of welded sections, can be obtained by brazing, using a copper-aluminum-iron alloy electrode with the aid of a simple flux. Successful results are obtained by brazing copper and brass with this electrode. The diameter of the electrode should be chosen with reference to the arc current used.

Many have attempted welding with too low an arc current, and the result has been a poorly fused deposit. This is due largely to the overheating characteristics of most electrode holders, thus leading the operator to assume that the current used is in excess of the amount needed. The approximate amounts of current to be used for a given thickness of mild steel plate, as well as the electrode diameter for a given arc current, are indicated in the curve in Fig. 1. The variation in the strength of 1-in. square welded joints as the welding current is increased is shown in Fig. 2.

Notwithstanding the fact that electrode development is still in its infancy, the electrodes available are giving satisfactory results, although considerable advance may yet be made in the ductility of welds, consistency in results, as well as in the ease of utilizing the process.

The maintenance of a short arc length is imperative. It is usually maintained by a skillful operator, as the work is thereby expedited, less electrode material is wasted, and a better weld obtained, due to improved fusion, decreased slag content, and porosity. By recording the arc current and arc voltage by meter deflection or other means, the inspector has a continual record of the most important factors which affect weld strength, ductility, fusion, porosity, and other features.

The method of placing the deposited layers plays an important part on the internal strains and distortion obtained on contraction. It is possible that part of these strains could be relieved by pre-heating and annealing, as well as by the allowance made in preparation for the movement of the metal.

The heat treatment of a completed weld is not a necessity, particularly if it has been pre-heated for preparation and then subjected to partial annealing. A uniform annealing of the structure is desirable, even in the welding of the small sections of alloy- and high-carbon steels, if it is to be machined or subjected to heavy vibratory stresses.

The inspector, in addition to applying the detailed tests to the completed joint and effectively supervising the process, can readily assure himself of the competency of any operator by submitting sample welds to ductility and tensile tests, or by simply observing the surface exposed on cutting through the fused zone, grinding its face and etching with a solution of 1 part concentrated nitric acid in 10 parts water.

It is confidently assumed, in view of the many resources at the disposal of the welding inspector, that this method of jointing will rapidly attain successful recognition as a dependable operation in structural engineering.

Rhodesia's Mineral Output in 1917

Southern Rhodesia was fourth in rank as a gold producer in 1917, although the production was curtailed considerably, according to *Commerce Reports*. The decrease is the first since the beginning of the industry, with the exception of a small setback in 1910, and is attributed (1) to the cessation of operations at certain mines, owing to payable ore having been exhausted; (2) to increased cost of working, on account of enhanced value of stores; (3) to growing difficulty in purchasing necessary equipment for mines already developed; and (4) to stoppage of credit to small workers in several instances.

The total yield of gold decreased from 930,356 fine oz., of a value of $18,956,531, in 1916, to 834,231 fine oz., worth $17,010,320, in 1917. During the year 2,595,505 tons of ore was milled, as compared with 2,987,444 tons in 1916; and sands treated amounted to 1,358,065 tons, as against 1,245,547 in 1916.

The average value per ton of ore milled reached 26.90s. ($6.55), as against 26.08s. ($6.35) in 1916. Stamps in use decreased from 1172 in 1916 to 989 in 1917. In addition to gravity stamps, there were in operation 29 grinding pans, 23 tube mills, 6 gate rolls, 6 Chilean mills, 5 Huntingtons, 1 Lane mill, 1 waterfall mill, 1 roasting plant, and 1 smelting plant.

Production of silver showed an increase from 200,676 oz., valued at $106,659, in 1916, to 211,989 oz., worth $129,541, in 1917. The output of copper in 1917 amounted to 3911 tons, valued at $2,016,911, as compared with 3521 tons, worth $1,659,676, in 1916. The average price per ton amounted to £106 ($516). The greater part of the 1917 output came from the Falcon mine, but there were at least 16 other small producers.

On account of the shortage of shipping, sales of chrome ore were more restricted than during 1916. However, prices were considerably higher, and the 1917 output of 72,962 tons, valued at $1,593,034, was worth little less than the 88,871 tons of 1916, which sold for $1,621,372. Owing to the rise in the value of chrome, prospecting was more active in 1917 than in 1916.

During 1917 considerable development of the asbestos industry took place. The production for the year was 9562 tons, valued at $924,100, as against 6157 tons, valued at $482,071, in the preceding year.

The coal industry was also active during the year. In addition to meeting local requirements, the Wankie colliery supplied large quantities of coal and coke to the Belgian copper fields and to the railways throughout the country. During 1917, 548,954 tons of coal was raised, 326,026 tons sold, 124,410 tons used for coke, and 2188 tons employed in connection with brick kilns. The declared value amounted to $873,965, as compared with $639,789 in 1916.

The 1917 output and value of other minerals and metals were: 7072 tons of lead, $461,286; 143 tons of tungsten, $68,700; 53 tons of antimony, $4828; 76 tons of arsenic, $779; 20,749 tons of ironstone, $15,037, and 4 tons of tin, $2672.

Although there was a small decrease in the number of gold claims registered, there was an increase of 747 base-mineral claims. Among the latter were registrations for mica, talc, sulphur, aluminum, and wolframite.

Mining supplies were obtained with such difficulty from abroad that it was necessary to practice strict economy. This was particularly true with respect to explosives, and, owing to the shortage of glycerin, the use of which was decreased by 30%, lower-grade explosives were necessarily adopted. However, despite the obstacles which were encountered, no mine had to discontinue work on account of the shortage of stores.

Chrome Near Contact, Montana

Chrome deposits near Contact, Mont., have attracted the attention of prospectors for many years, and tests for gold, silver, and copper have from time to time been conducted, but it was not until March, 1918, that any attempt to exploit the deposits was made. The first locations were recorded by O. V. Miller, Tom Rowlands, and Charles Blakeley, who staked out eight claims. The chromite deposits occur in three distinct veins, having a strike N. W. by S. E., and they are cut by horneblende and serpentine dikes. Other claims were subsequently located on the extension of the veins, which have shown great persistancy.

The first, or Bonanza, group, consisting of five claims, and the Chancey group of four claims, on the south extension vein, were located and sold to Purdy and Parker, of Great Falls, Mont., in April, 1918. They proceeded with the development of the Bonanza group until the property was taken over by J. C. Gish, representing Colorado interests. This company built a 100-ton concentrating plant, consisting of stamps, classifiers, and Wilfley tables, in addition to bunk houses and office buildings, the work being in charge of O. V. Miller. The property is situated 34 miles from the railway. Transportation is by motor truck, and considerable work has been done by the company in improving the road. Power for the plant is furnished by oil-driven engines, but a hydro-electric installation is under construction, water-power being secured from the Boulder River.

High-grade ore mined from the vein averages about 42% and varies in width from 1½ ft. to 3 ft., and concentrating ore of about 18% occurs in widths up to 30 ft. Paralleling the deposit on the south contact of hornblende and slate is a large pyrrhotitic iron vein, carrying nickel, cobalt, and copper, which is now being prospected by Miller, Rowlands, and Blakeley.

Remember the Comfort Fund of the 27th Engineers.

Correspondence and Discussion

Dust Abatement in Mines

My paper on "Abatement of Dust From Drilling Operations by the Use of Water Drills," presented at the Seventh Annual Congress of the National Safety Council, and which you excerpted in the Nov. 2 issue of the *Journal*, was not intended to offer a solution of this trying problem, but I hoped that, by collecting and tabulating the practical experience of a number of mines, a discussion would result which would lead to improvement in the handling of this problem.

As my object was to promote discussion, I am naturally gratified with the thoughtful editorial comment which you accorded this paper, and with the letter of Charles A. Chase which appears in the *Journal* of Nov. 30. As with all problems which involve not only material factors but also the factor of human personality, which generally transcends in complexity and difficulty all the other variables entering the problem, the solution of this problem of dust abatement depends to a large extent on the attitude of the men.

It is unfortunately true that a solution which was satisfactory several years ago may no longer be so, or that a solution considered satisfactory this year may not be so a few years from now. The one great outstanding fact in connection with all safety work is the difficulty of securing coöperation from the workers who are to be protected, and I believe that all practical safety workers will agree that if a guard or precaution intended to promote the safety of workers interferes in any way with their comfort or habits it will either be ineffective, or else an entirely disproportionate amount of educative effort must be expended to make it effective.

Men who will work with respirators or wet drills under normal conditions of labor competition, with apparent contentment, will condemn both respirators and wet drills when wages are high and labor is scarce, although themselves unable to offer any better means for protection against the threatened danger. Though it is usually easy to convince the individual of the reality and seriousness of the danger, the unreasonable attitude of the men as a whole often persists.

It is not difficult for me to agree with your belief that much could and should be done to improve respirators, and so far as the mechanical improvement of respirators goes, it appears reasonable that they should, if properly developed, offer at least a partial solution of this problem. The real difficulty comes in attempting to get men to wear respirators regularly, and to keep them clean, or even to turn them in to the person charged with keeping them clean.

In general, inasmuch as air velocities sufficient to provide for adequate ventilation in the mine will also cause the continuous suspension of considerable dust, it would be necessary for practically everyone underground to wear respirators. I know that it is possible to get men to wear them in places where the dust is so thick that the accumulation obstructs the nasal passages, but to most men the danger which is unseen does not exist, and it would be difficult to get trammers, timber men, and station tenders, who do not see dust, to wear respirators, although it is true that the very fine dust is often the most injurious.

Referring to Mr. Chase's letter, I quite agree that the method of allaying dust by the injection of water through hollow steel, as at present conducted, has many objections. Reference to the table accompanying my paper will show the frequent occurrence of the symbol (a), meaning, "men prefer dust to getting wet." As Mr. Chase so truly says, "it is an unpleasant and a disappointing fact that the current models of mounted water drills atomize both water and lubricant to such extent that a fog of water vapor is now common about these drills when in operation." This is true also of the wet stopers, and in the questionnaires returned to me there were numerous comments on the promiscuous way in which these wet drills emit water, and on the frequently excessive use of water.

To a considerable extent the quantity of water used is within the miner's control, and I know that this control is frequently not exercised with intelligence. Drill manufacturers, however, have not yet applied to this portion of their task anything like the ingenuity and intelligence which they have, for example, devoted to the development of valve motions. Some drills inject water only, through the steel; others inject water and compressed air, or at least exhaust air, which is still under considerable pressure. I do not approve of the latter system, and I believe that eventually drill manufacturers will abandon the use of the water tube, which is, in most instances, an unmitigated nuisance, especially when it does not terminate in an anvil block, but has to run into the shank of the steel. There is now one wet stoper which uses no water tube, and experience with this has been extremely satisfactory.

It is strange that the drill manufacturers manifest so little interest in, or enthusiasm for, the subject of self-rotated stopers. To many mining men the self-rotated stoper is an interesting subject, because of the possibilities which it offers, but to the drill manufacturer it appears to be a problem filled with black difficulties. The table accompanying my paper will show that mounted water drills are used in raising in preference to wet stopers, and the sole explanation seems to be that, with the former, the operator does not get as wet as with a hand-rotated stoper. To many of us it seems probable that a self-rotated water-feed stoper would wet the operator less than a mounted wet drill, and we hope that eventually the drill manufacturers will produce machines of this type, and give us an opportunity to find out.

I believe that eventually a successful one-man self-rotated water-feed stoper will be produced, and that with it we shall reach an approximate solution of the abatement of dust from drilling operations, in the field not now satisfactorily covered, while, at the same time, securing faster and cheaper work in raising than is possible with the mounted wet drill. I also believe that in overhand stoping, and even in drifting, this type of machine will, in many cases, displace the mounted wet drill. W. O. BORCHERDT.

Austinville, Va., Dec. 6, 1918.

Panning as a Guide to Sampling

The following quotation from a letter recently received from a prospector recalls some interesting experiences in the way of preliminary testing by means of the pan:

"Not having a laboratory or very much chemical training, I took an iron mortar and pounded the specimens to a powder; then dropped a small amount of mercury into the mortar, agitated for 15 min., separated by washing, placed the mercury in a teacup, added nitric acid, got a residue which on the apothecary's scales weighed 1½ grains from 1½ lb. of sand, or $83 per ton. Do you think I arrived at the correct amount per ton in this way?

"You have discovered by this time that I am not much of a miner. I had $7500 worth of experience in ————, and am out of funds to follow up this prospect, but naturally I am very much enthused over the discovery. . ."

Seven thousand five hundred dollars for an experience, for an education, and what an education it was! This is not a comedy, it is a painful tragedy, and this prospector is not a rare example. Many another man has bought experience at even a higher rate when he might have used a tenth part of the sum to buy a broad education; or, lacking the time for that, have bought the experience or education of another for a fraction of what he paid for his own.

To return to the question asked. The prospector was advised to have assays made by a responsible assayer and not to attempt to use his $7500 worth of experience in competition with $2.50 worth of chemistry. Yet is there not something in his suggestion that other prospectors may use? Is he so far away from something that can be used by one who is not the possessor of $2.50? Just what can be learned through panning?

It is my custom in sampling to cut out a small portion of the final pulp from an occasional sample and pan it down to see what, if anything, can be learned from an examination of the concentrates. It is seldom that anything definite can be learned, and yet there are times when it is worth while. Gold, if present, is often visible, and sometimes the amount which is visible will be in proportion to the assay of the ore. Sometimes the silver minerals may be seen and recognized, or an unsuspected mineral may be found. The test is always worth trying and is sometimes of real value in determining the manner of conducting the more careful, detailed sampling.

I recall in this connection some work on the old Virginia mine near Coulterville, Calif. There was a wide variation in the grade of the ore which was not apparent to the eye. Fifteen or twenty assays were made daily to guide the work underground; but there was some complaint because of the time required before the returns were available. As some of the gold was fine, a series of experiments was conducted to ascertain if any definite information could be learned from panning the sample as soon as crushed. The outcome of these experiments was interesting. It was found that, when the sample was reduced to 30 mesh, and a measured quantity, equivalent to about five assay tons, was panned, an examination of the concentrate would enable one to guess at the contents within a dollar when the ore assayed less than $15 per ton. This was true except in one portion of the mine where the percentage of pyrite was rather high. The gold actually observed was not all that the ore contained, but bore such a constant relation to it that the test was extremely satisfactory as an indicator, and those in charge seldom went wrong by following it.

In the sampling of a silver-gold property in Idaho, where it would have required about 1000 samples to cover the developed ground satisfactorily, I was able to cut out areas representing about 400 samples through preliminary panning tests. This ore contained only a little free gold or silver, but both metals were present in proportion to the base-metal sulphides. In this instance, when we had taken and sent on to the assayer the 600 samples on which I felt sure an estimate of the value of the mine would be obtainable, I went back over the low-grade areas, and confirmed the preliminary tests by careful sampling and assaying, only to find that the assumption had been practically correct.

Several years ago I was called upon to examine the property of the Wallis Syndicate, a prospect on the West Coast of Africa in Ashanti. The demand for an early report was urgent, and no assay equipment could be collected and taken to the property, which was about six days' travel from the nearest assay office. No information was available as to developments or character of the ore, beyond the fact that it was an extensive banket outcrop.

Reaching the property, I found two outcrops, one practically continuous for a distance of six miles, with one 30 ft. hole in it, and the other about two miles long with perhaps half a mile of exposures, in which several small shafts had been sunk.

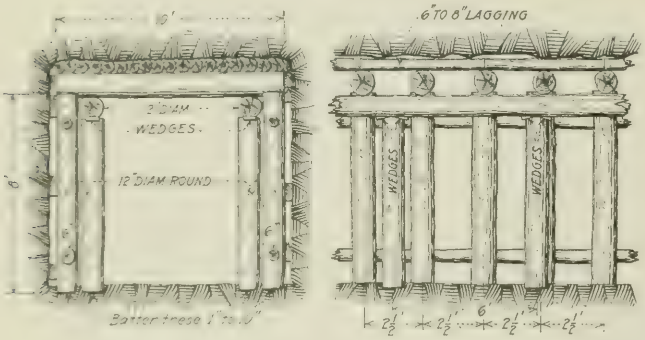
Cable messages continued to reach me asking that information be sent as rapidly as it could be secured, and I immediately began work on the six-mile outcrop, panning a portion of the samples as fast as they were taken, and reporting, by cable, my guess as to contents, pending definite returns from the assay office, which began to return two weeks after my first samples were sent out. In this instance my guess, based entirely upon previous experience in other localities, proved to be just about 100% too high. The assays on the outcrop ore were about half of what I had concluded that they would be from the pan tests. In this case the gold was practically all free and all so coarse as to be easily collected in a small concentrate; hence one saw in his pan about all of the gold that the pulp contained. Fortunately, in this case, the business was not concluded until the assays were available, but the instance goes to show that an old hand can easily be deceived by the pan, and that too much weight must not be placed upon what can be seen there. On the other hand, when used with appreciation of its limitations, when checked with a sufficient number of assays, it may be of considerable value in sampling or prospecting and serve a desirable end in a preliminary examination.

Details of Practical Mining

Method of Relining Timber Sets

A method of timbering which was employed effectively in ground that showed considerable weight after having been opened for about eight months is illustrated in the accompanying sketch. The original sets in the drift, which was used as a main haulageway, were of 12-in. round timber, with 10-ft. caps and 8-ft. posts, slightly battered, and placed at 5-ft. intervals. The back was lagged over with 6 to 8-in. lagging, and the sets were spragged. Little lateral pressure was encountered, most of the weight coming from the top, and though this was not sufficient to break the caps, many showed transverse cracks.

The first relining consisted of placing sets of the same dimensions between the original ones, and it was then only necessary to remove the old sprags, which were replaced by shorter ones. Though this was effective for a time, it was considered advisable to take further precautions, which was done by means of "longitudinal" sets, placed parallel to the drift, the work being conducted in such a manner that it was not necessary to disturb any of the timbering already in place. Twelve-inch diameter caps, 12 ft. long, were used and were placed directly under the original caps at right angles and as near as possible to the old posts. The caps were supported by posts of the necessary lengths, which were placed upright at 6-ft. centers and wedged at the top. In this way, a better distribution of the top weight was obtained and no further trouble was experienced.



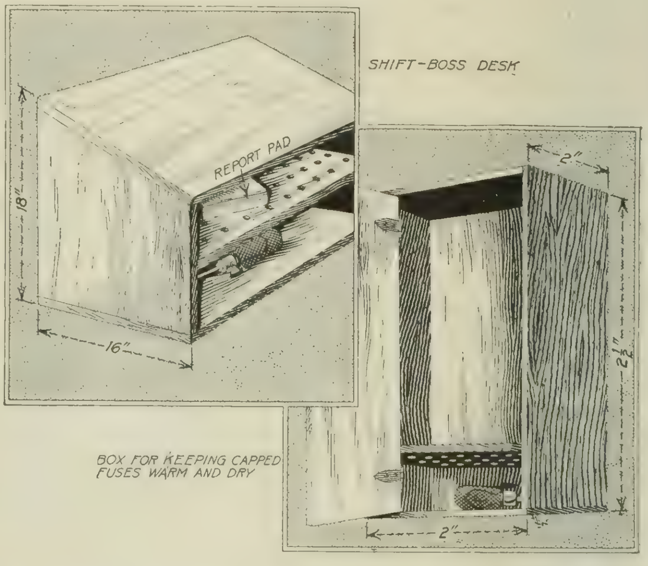
LONGITUDINAL SETS USED IN RELINING

Shift Bosses' Desk for Underground Use

By C. T. Rice

Mine shift bosses are usually required to make out daily reports of the work done by the men under them, and convenient places should be provided underground where it is possible for them to do so. This requires the keeping of report sheets in the mine, and there is often so much humidity in the mine air that the paper becomes moist and difficult to write upon. In the sketch is shown a desk that can be placed on a bench along the drift where it is convenient for the shift boss to make out his reports at the end of the shift. A 16-cp. lamp is sufficient to give the necessary heat to keep the paper dry, and may be kept burning all the time during the shift if the air is at all moist. In order to prevent fire, as well as to protect it from breaking, the lamp is incased in an ordinary wire guard.

In a similar manner can be made a box for keeping fuse perfectly dry in a moist mine, as well as flexible in a cold mine. The bottom of the upper compartment in both instances is made of $\frac{1}{2}$-in. or 1-in. boards with $\frac{3}{4}$-in. holes bored through at intervals so as to permit the warmth from the lamp compartment below to come up through it. A door is needed upon the fuse box, but the desk is probably more convenient if made without a door. In the cap box, if cheesecloth is tacked to the under side of the board, it would prevent any caps from falling through the auger holes.



DESK AND FUSE BOX FOR UNDERGROUND USE

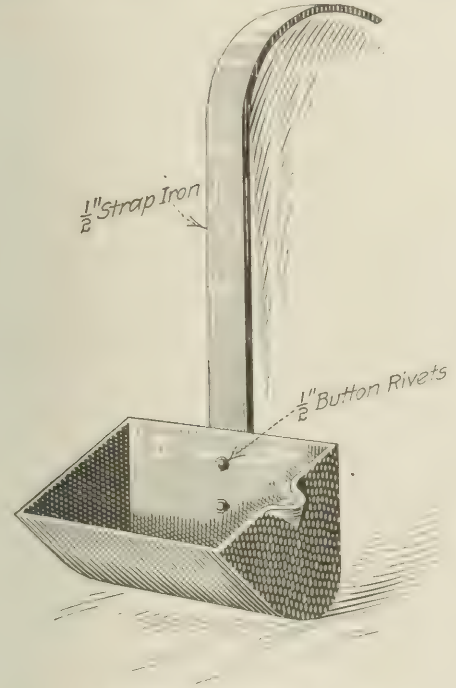
Care in Handling Primers

Many mine accidents, caused by explosions that occur while the miners are loading their holes, might have been avoided had more care been used, writes William H. Tremerwan in the *Anode*. Every miner should bear in mind, when loading holes, that the percussion blasting cap is a dangerous thing to handle unless all precautions are observed, and care should be used in making a primer, particularly in loading it into a hole. Many miners, some of them old-timers, use the tamping stick too vigorously in tamping the powder into the hole, and use the same method with the primer. As a result the jar of the tamping stick against the cap sometimes causes an explosion, and they are seriously injured, or killed.

In loading the holes the primer and powder should be carefully pressed into the hole, but the primer should not be tamped with hard strokes. It is not necessary to use great force in loading the holes so long as the powder is pressed sufficiently tight to prevent it from falling out. Often explosions occur because the miner is in a hurry to get his holes loaded, and he does not want to take time enough to do his work carefully. His partner may be the innocent victim. It is well for the miner to remember "It is better to be safe than sorry."

Simple Pouring Ladle for Mine Use

An easily constructed, serviceable grease or molten-metal ladle for use around the shop or mine may be easily made by any machinist or blacksmith from an old elevator bucket of the proper size by fastening thereon a handle of strap iron shaped to suit the requirements or the fancy of the user. As shown in the accompanying cut, two ½-in. button rivets hold the handle securely in position in the center of the cup. If desired, a lip may be shaped on one end of the cup for ease in pouring.



A HANDY POURING LADLE

Rejuvenating a Worn-Out Pump

By H. H. Hunner*

An Allis-Chalmers single-stage pump making 1750 r.p.m. and pumping 1290 gal. per min. on a 165-ft. head was found to lose its water once or twice in 24 hours whenever the power-line voltage fluctuated to a point low enough to cause it to drop in speed; and when running the pump would pound with a continual end thrust. On examination it was found that the ring seats were worn away on both sides of the impeller and that the recess in the castings which accommodated the rings was gouged out on both sides, top and bottom. The sides of the casing next to the impeller were worn in places to a depth of over half an inch.

To repair the impeller, the ring seats were turned down to make a driving fit for two rings that had been previously made up. A ¾-in. section was cut from these rings, the ends were drawn up and welded, and, after having been driven to a tight fit on the new seats cut on the impeller, they were turned down to give a running fit for the standard rings, which made an impeller as good as new.

The repair of the castings required two barrels of charcoal, 40 ft. of 42-in. asbestos paper, 75 firebrick, 150 cu.ft. of oxygen and 12 carbic cakes. An air line was extended to the place where the castings were to be heated, and five feet of 1-in. pipe was used for a nozzle to produce forced draft. The castings were stood on end on the ground, propped up with firebrick and walled in on all sides with the firebrick placed about 18 in. away from the castings, the brick being laid with about ½-in. spaces end to end.

The brick wall was built up to the height of the castings, and the charcoal then dumped in between the brick and castings on a kindling-wood fire. The top of the castings and the charcoal was then covered with two thicknesses of asbestos paper, cut into 42-in. square sheets; the air, turned down to about 10-lb. pressure, was used to give the charcoal a good start and the improvised furnace was left for three hours without artificial draft, after the charcoal had a start. On removing enough brick to reach the ring recesses it was found that the castings were easily brought up to a welding heat on applying the torch for a few seconds.

Both castings were repaired on one side, and the brick wall was torn down, using forceps to handle the bricks. The castings were flopped, the charcoal was heaped around their base, and the bricks were built up to hold the charcoal in place. By covering the entire work with asbestos paper, the operator was able to work at close range without undue exposure to the heat. When the time arrived to fill in the last piece of casting, it had cooled too much to work without reheating. The supply of charcoal was exhausted, but pine wood was available, and the bricks were covered with sheet iron and the air nozzle was used again, and this combination secured a better heat in an hour's time than had been possible by means of the charcoal, which is not essential where air is available.

The operation was finished in about eight hours and little hammer and chisel work was required to get a smooth job on the castings. At a moderate expense a new water end was provided, and a wait of six months for delivery on a unit that was absolutely essential was obviated. The castings were covered with the asbestos paper after the job was finished and allowed to cool slowly for several hours.

Substitute for Tin.—The Advisory Committee on Science of the Commonwealth of Australia announces that a combination of carbolic acid and formalin produces a resin soluble in methylated spirit and suitable for varnishing cardboard containers for packing foodstuffs. Its use imparts no taint to the food, and it is claimed that containers so treated will serve for most of the food-packing purposes for which tin is now used, while the cost to produce is lower than that of tinplate at war-time prices.

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*Superintendent, Onahman Iron Co., Ironton, Minnesota.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Tungsten Embargo Refused

A request for a 90-day embargo on imports of tungsten has been denied by the War Trade Board. A committee representing the producers, importers, and consumers came to Washington in an effort to secure such an embargo, so as to give time for adjustments and stabilization. The War Trade Board has a well-defined policy to the effect that its curtailment of imports and exports must be based on shipping needs. To grant protection, the board holds, to one American industry, and possibly affect adversely other American industries, is without its province.

Relief Lacking in War-Minerals Act

If any remedy is applied to the war-minerals situation under the new conditions brought about by the ending of the war, it must be a new one. This is rapidly becoming the conviction of all who are interested in the subject. The War-Minerals Act, it is pointed out, was intended solely for Government relief during the war. The relief of producers of war minerals is a post-war—a reconstruction—problem. Therefore it is held by many that Congress should decide what relief should be granted. Though it is believed that there would be no objection from any quarter to the use of a part of the administrative fund carried by the War-Minerals Act to conduct an investigation of the situation, so as to enable Congress to obtain actual facts in the case, it is apparent that Secretary Lane is not convinced that such a procedure would be justified.

To Stimulate Engineering Research

The war having demonstrated in striking manner the need for stimulating engineering in all its branches, steps are now being taken to urge the adoption of legislation to create engineering experiment stations. Previous efforts in this direction have failed largely owing to disagreements as to where the schools should be situated. The Smith-Howard Bill, now before Congress, is a compromise measure, which, with some amendment in important particulars, can be made a suitable vehicle for the legislation desired. It is believed that the differences between land-grant colleges and state schools, which were the principal stumbling blocks heretofore, can be avoided. The matter has been given careful consideration by the National Research Council. That body is firmly convinced of the need of stimulating scientific research in each state of the Union, but believes that the kind of research to be undertaken at a station, and the situation of that station, are essentially state matters, which can be determined by a state board.

The Smith-Howard Bill provides that the experiment stations be directed by the U. S. Bureau of Standards. This provision meets with decided disapproval, as most of those who have studied the matter feel that Washington should help, rather than direct, the work. Some assistance from Washington would be necessary to prevent duplication of work and to give general aid. Opinion seems to favor, however, the placing of the Washington work in the hands of the Smithsonian Institution or the National Research Council, rather than turning it over to one of the departments.

Facts Wanted as to Profiteering in Ores

All information in possession of the Federal Trade Commission relative to profiteering in the smelting, reduction, and handling of metalliferous ores and metals is asked by Senator King, of Utah, in a resolution which has been referred to the Senate Committee on Interstate Commerce. The resolution reads as follows:

> Resolved, That the Federal Trade Commission, be, and it is hereby, directed to furnish the Senate with the following information:
>
> Any and all facts, figures, data, or information now in possession of the Federal Trade Commission relative to profiteering in the smelting, reduction, and handling of metalliferous ores and metals by smelting and refining companies and by metal-selling companies, and to investigate said companies for such supplementary information as may be required for a complete report in the premises, and to transmit such complete report to the Senate.

Lessen Import Restrictions

Import restrictions have been lifted by the War Trade Board in the instances mentioned in the following statement:

> At the time the program of the War Trade Board for conservation of tonnage by restriction upon imports was determined upon, the tonnage situation was so acute as to render it impossible to make exceptions to the restrictions, even to cover purchases already made by American importers. Importers so affected, who were forced to make this sacrifice as their contribution to the winning of the war, were told that as soon as the tonnage situation was at all relieved the War Trade Board would permit shipment of these goods.
>
> In fulfillment of this promise, the War Trade Board announces that applications for import licenses will be considered for all restricted articles included within lists of restricted imports Nos. 1 or 2, to cover purchases or contracts made by American importers before the date of the announcement of the restrictions. Such applications must be accompanied by proof of the purchase or contract.

Sulphur Litigation Expected

Intimation of developments which will have an important bearing on the sulphur situation are reaching Washington. The armistice having removed any patriotic scruples against hampering the production of sulphur, no surprise would be occasioned if the Union Sulphur Co. should attempt to take advantage of the recent favorable decision of the district court in Delaware in regard to the validity of its patents. Despite this decision, there is strong legal opinion that the court erred. As the Freeport Sulphur Co. and the Gulf Sulphur Co. have strong financial support, a legal contest of fair proportions is expected.

Interest is manifested in Washington as to whether the Union Sulphur Co. will attempt to prevent the use of the Frasch patents by its competitors, or whether a licensing plan will be proffered. The company sued on the basis of its second patent, which was granted in 1905. The competitors hold that they are using processes covered by the original patent, which was granted in 1901 and which has now expired. Officials are outspoken in their praise of the accomplishments of the Union company during the war. By the most intelligent operation, the output of its wells was tripled.

Production of sulphur by the Gulf Sulphur Co. will begin in January, it is understood in Washington. This operation is in the vicinity of Matagorda. Drilling has revealed that this is the largest and most important known deposit of sulphur in the United States. It was not the plan of its owners to exploit it at this time, but at the direct request of the Government, during the war, they prepared to operate on a large scale. The company is now prepared to produce sulphur cheaply. The large investment which has been made probably will call for active operation of the property.

Bureau of Mines Work Summarized

Summarizing the work being done by the Bureau of Mines in the interest of the metal-mining industry, Van. H. Manning, in his report to Congress on Dec. 19, mentions the following activities:

Mining and milling problems at mineral deposits throughout the country were investigated to ascertain the available supply of metals and minerals especially needed in the conduct of the war.

A body of engineers and chemists was organized for war-minerals investigation, to determine how supplies of necessary commodities, such as nitrates, manganese, chrome, magnesite, nickel, tin, and platinum, could be obtained most readily.

In coöperation with the War Department, the production of artificial nitrates and the development of processes and plants for their manufacture were studied.

Representatives of the Bureau helped to devise a process for the production of nitric acid by the oxidation of ammonia, which is more efficient than any in previous use.

Means by which the supply of sulphuric acid needed in the manufacture of explosives could be increased were investigated.

A complete survey of the domestic and Canadian nickel deposits was made.

The extraction of molybdenum, tungsten, and vanadium from their ores was investigated with reference to the use of these metals in special steels for munitions and machine tools.

A leaching process and a chloride volatilization process for the treatment of oxidized lead ore have been developed. Tests have shown that the volatilization process can be used for lead sulphide ores.

A cheap and simple process has been developed for recovering zinc from a solution of zinc sulphate, making possible the treatment of low-grade and complex zinc ores by leaching.

Further work on the flotation process for treating ores has indicated the most suitable flotation agents or mixtures for certain ores and has shown why minerals float.

Through field demonstrations, operators and well drillers were shown how large wastes of oil underground may be prevented by cementing oil wells so as to prevent water from entering the oil sands.

A rocking electric furnace intended to prevent the metal losses that attend the melting of brass and bronze in crucibles was designed and is now in commercial operation.

As an outcome of its work on ferro-uranium, the Bureau undertook the operation of a series of steels containing uranium, tungsten, and molybdenum. These steels are to be tested for their suitability as cannon liners.

Experiments in the electric smelting of manganese ores have shown that usable grades of ferromanganese and silicomanganese, alloys needed in steel making, can be made from low-grade and hitherto unused domestic ores, and with far less difficulty than in a blast furnace.

The producing graphite mines of the country were examined, and methods of purifying crude graphite were studied to ascertain whether domestic graphite can be used satisfactorily in the manufacture of graphite crucibles.

The Bureau coöperated with the War Industries Board in measures to insure an adequate supply of materials needed in chemical manufacture for war requirements.

In administering the act regulating the manufacture, sale, possession, and use of explosives during the war, about 11,000 carefully selected licensing agents were appointed throughout the United States and its insular possessions, magazines for storing explosives were examined, and numerous prosecutions were started against violators of the provisions of the act.

With the coöperation of manufacturers of explosives, a campaign was started to eliminate food products as constituents of explosives.

Three new mining experiment stations, at Minneapolis, Minn., Columbus, Ohio, and Bartlesville, Okla., were established.

The metallurgy of quicksilver ore was studied with reference to the improvement of metallurgical practice. Quicksilver is used as mercury fulminate in explosives.

Manganese resources of the country were examined with reference to utilizing low-grade domestic ore to replace the high-grade ores formerly imported.

Practice at steel plants was investigated to determine how alloys low in manganese could be most readily substituted for the high-manganese alloys made from foreign ores, that have been used by steel makers in this country.

Chromite deposits were examined throughout the country to ascertain how the supply of chrome needed in steel making and in other industries could be obtained from domestic ores, rather than from ores that were formerly imported.

It was determined that the sulphur mines, pyritiferous ores, and pyrite deposits in this country can supply all the raw material needed by manufacturers of sulphuric acid.

Through a census of mining engineers, metallurgists, and chemists the Bureau aided the Government in obtaining the services of thousands of experts for special duties.

Black-sand deposits in California and Oregon were examined for their importance as possible sources of gold and platinum.

American Metal Company

The Alien Property Custodian this week made the following statement regarding the American Metal Company, Limited:

The Alien Property Custodian has completed an arrangement which will eliminate all enemy interest in the above-named corporation, and will place the control of the company in the hands of five voting trustees named by him, for a period of five years. The following trustees have already been named: Hon. Henry Morgenthau and Messrs. Berthold Hochschild and Joseph F. Guffey. Mr. Hochschild is chairman of the board of directors.

The outstanding capital of the company consists of 70,000 shares, of which the Alien Property Custodian has taken over 34,644 shares belonging to alien enemies. A further amount of 18,620 shares belong to American citizens who have had control of the management of the corporation. The remaining shares are held by a group of British shareholders, principally consisting of Henry R. Merton & Co., Ltd., and the Merton Metallurgical Co.

It is the purpose of the Alien Property Custodian to offer for sale at public auction at an early date the voting-trust certificates representing 34,644 enemy shares, and two additional trustees will be named by the Alien Property Custodian after the said sale has been completed.

In order to protect any part of this important enterprise from reverting to enemy ownership after the war, and to assure to American ownership the full control over the important ore supplies owned by the company, the Alien Property Custodian and the American shareholders, who are the officers and managers of the company, organized the voting trust above mentioned. The method of control which the Custodian deemed important in the public interest could not have been put into effect without the consent of the American shareholders, who have willingly coöperated with the Custodian in all his plans.

Some statements have appeared in the press indicating that the corporation itself has been taken over by the Alien Property Custodian. This is not correct, since he took over only the shares owned by alien enemies. In accordance with his powers, he appointed directors to serve on the board of directors in order to represent the shares held by him.

In pursuance of arrangements carried on between the Alien Property Custodian and the British Embassy, the owners of the shares held in Great Britain have also agreed to deposit their shares under the voting-trust agreement, and to sell the voting trust certificates within a year, to purchasers approved by the Alien Property Custodian or his appointee.

In this manner the complete Americanization of this important enterprise will shortly be accomplished, and all persons are invited to deal with the company accordingly.

New York Section of the A. I. M. E.

On Wednesday evening, Dec. 11, the New York section of the A. I. M. E. held its regular meeting at the Machinery Club. The meeting was excellently attended; in fact, the attendance was larger than that of any previous meeting held during the year. At the conclusion of the dinner, Allen H. Rogers, chairman of the section, introduced Dr. Waldemar Lindgren.

Dr. Lindgren discussed the copper deposits of the Chuquicamata mine. After a general sketch of the mineral deposits of South America, the positions of which were illustrated by a lantern-slide map, the surroundings of the approach to Chuquicamata, the topography and the general geology of the deposit were described. The aridity of the climate as a limiting condition was explained in detail. Dr. Lindgren then gave a description of the principal deposit, illustrating his remarks by plans and sectional drawings. He pointed out the similarity of many of the features of the deposit to those at Butte, Mont. The peculiar nature of the mineralization and the presence of chlorides, nitrates, and sulphates were mentioned briefly.

L. K. Rourke was next introduced. He described the methods of mining the Chuquicamata deposit. An abstract of his remarks follows:

The experience gained in mining is the outcome of two years of operation. The deposit is mined by steam shovels and is similar in many particulars, both as to equipment and methods of operation, to other steam-shovel copper mines. The engineers decided to operate by high benches, the unit height being 150 ft. This unprecedented height was possible both on account of the climatic conditions and the important fact that the ore stood well upon steep slopes. Little trouble has been experienced from slides.

Though well-drilling rigs had been used in determining the limits and nature of the deposit, they could not be used for drilling blasting holes except upon the initial bench, which ranged in height from one to sixty feet. Fred Hellman, consulting engineer for the company, devised a system of shafts and tunnels for blasting the standard bench. These shafts and tunnels were driven in such a position as not to interfere with the steam-shovel operations. The powder chambers are loaded with black powder manufactured at Calama. A powder ratio of 0.5 to 0.6 lb. per short ton of ore is used. The ore breaks large, and a considerable amount of secondary blasting is necessary. Jackhamers are used for drilling secondary blast holes. Secondary blasting interferes considerably with steam-shovel loading and reduces the efficiency of this part of the work.

The steam-shovel equipment consists of eleven 95-ton Bucyrus steam shovels, using either oil or coal fuel; four 100-ton Bucyrus electric shovels, two in operation and two in process of erection; and one 265-ton revolving Bucyrus shovel. All of the equipment is operated by native Chilean labor. From six hours to six months is required to train a good steam-shovel engineer. At present the efficiency is low, amounting to about 30% of the loading time. In spite of this, a record of 1350 tons per shovel has been made in 10-hour operation.

For transportation 60-ton ore cars are used. On the bench, eleven 55-ton Porter locomotives and ten old American locomotives, purchased at the Panama Canal, are used to handle the cars in trains of four on 3½% grades. After leaving the bench, the cars are made up into trains of 26 cars each and hauled down a 2.6% grade, a distance of 7 km., to the car dumper at the treatment plant. Operation is possible throughout the year, the only difficulty being an occasional windstorm.

There is an ample supply of the best labor. The company provides good houses and maintains a large commissary. One of the principal operating difficulties is the 5000 miles which separates the mine from its base for machinery supplies and equipment.

G. T. Bridgman, assistant consulting mining engineer of the Chile Exploration Co., was then introduced, and briefly discussed the labor problem. He pointed out the excellent character of the Chilean laborer and indicated the close coöperation between the company and the Chilean government in all labor matters. In closing the meeting chairman Rodgers stated that future subjects to be discussed by the New York section would deal principally with foreign mining.

Steel Price Fixing Ends Dec. 31

The War Industries Board has refused a request made on Dec. 11 by representatives of the steel industry that price regulation of their output be continued after Jan. 1. Similar action will be taken by the board, it is said, in regard to all commodities over which it has exercised control. At the meeting of representatives of the steel industry with the price-fixing committee of the board, continued Government supervision was urged by various members of the Iron and Steel Institute, including Judge Elbert H. Gary.

Hitch Over Mexican Oil Bill

The Association of Petroleum Producers in Mexico has broken off the negotiations that it had been conducting with the Carranza government with a view to having the latter modify certain confiscatory features of the bill, now before the Mexican Congress, providing for the nationalization of the oil industry in that country. The features of this bill were outlined in the *Journal* of Dec. 7. If the bill becomes law, it is said that title to reserve oil properties, in which a vast amount of American and foreign capital is invested, will revert to the Mexican government. The association represents 33 American and foreign companies. It is said that a movement is on foot to broaden the scope of the organization, so as to include other interests which are concerned in the efforts of Carranza to bring about state control of the subsoil natural resources of the country.

Fuel-Oil Priorities Abolished

All priorities as to fuel oil and gas oil were abolished on Dec. 8 by the U. S. Fuel Administration. Rule No. 1 of the order issued Sept. 24, 1918, establishing priorities for the entire country in respect to the delivery of fuel oil and gas oil, creating 12 classes, and providing for serving consumers' needs in the order named, is thus completely set aside. All consumers are now on an equal basis.

Rule No. 2 of the former order, providing for priorities in the use of natural gas, in which there is a general shortage, has been modified so as to place all industrial consumers on an equal basis. The priority, however, in favor of domestic consumers and for certain limited industrial uses is maintained.

The oil industry has likewise been asked to suspend its voluntary plan to stabilize prices and obtain an uninterrupted flow of crude oil, which plan was recently extended for three months. Outstanding licenses, according to an announcement made on Dec. 15, will remain in force until peace is declared.

Engineers' Service Bureau Created

In San Francisco an "Engineers' Service Bureau" has recently been established which is intended to serve as a clearing house through which engineers in search of employment and prospective employers may get in touch with each other. This bureau is being conducted at the San Francisco Engineers' Club through the joint council of San Francisco engineering societies.

The bureau is to be provided with a complete list of engineering vacancies, and efforts will be made to keep this up to date. Applicants are to write their qualifications and experience on blank forms, which are to be sent in by mail. If a call is found by the bureau for a man with the qualifications given, applicant will be notified at once. Otherwise his application will be filed, without acknowledgment, awaiting a call. The bureau is to give information only by mail or telephone; no applicants are to be received in person.

The support of individual members of the various societies is hoped for. It is felt that, if general coöperation is secured in reporting vacancies, the bureau will be able to handle applicants effectively and the plan can be made permanent. Positions to be included within the field of the bureau's activities are such as could be filled by men with technical training and experience in the fields of the societies represented.

Metal Conditions in Central Empires*

Much has recently been said as to the use of substitute metals during the transition period after the war, and the opinion is generally held among those who have the best opportunities for judging, that Germany in particular intends to make a good deal of use of metals that have not hitherto been largely employed in manufactures. There is no doubt, for example, as to the German determination to produce and utilize aluminum to the fullest extent. Antimony will also be used more largely than formerly has been thought practicable, and zinc will be used for a rather large amount of work for which brass—and, to a lesser extent, copper—was employed before the war. Aluminum hollow ware will be placed on the market in considerable quantities, and that metal will be utilized largely for overhead conductors of electricity.

In the electrical industry, zinc and zinc-copper alloys will be employed extensively, and it is interesting to note that the possibilities of zinc are already recognized in Great Britain, and at least one electrical concern is considering to how great an extent it can be substituted for brass.

Some difference of opinion exists as to whether the Germans are as short of metals as they endeavor to lead the rest of the world to suppose, and many believe that they are busily engaged at present, by the aid of child and alien labor, in turning out hollow ware, bedstead tubing and fittings, brass-foundry (or, rather, zinc-foundry) tanks, cisterns, and similar products, so as to be in a position to rush supplies into oversea markets as soon as peace is declared and to seek to regain their lost commercial position at the earliest moment.

But, however doubtful the position may be in Germany, it appears certain that Austria-Hungary has experienced a great shortage of metals. The situation has been discussed at meetings of the Reichstat, and there has been little attempt to minimize its seriousness. This is despite the fact that Austria-Hungary was one of the first countries to take steps to conserve its metal resources. At the beginning of the war—and, according to some accounts, before that date—the Austrian Metal Co. began to buy as much iron, steel, and non-ferrous metals as possible from the Balkan States and the oversea market. During the occupation of Serbia, Austrian and German engineers and workers were rushed to the Serbian copper mines, the ore of which contains from 5 to 7% of the metal, so as to work them to their fullest extent. As a result, it is believed that the output of the mines, which was already fairly large, was increased by approximately 50 per cent.

Early in 1915 the Austrian Metal Co. increased its activities, and not only redoubled its efforts to bring in ore and metals from the Balkans and Asia, but began to buy up home stocks and turn its attention to the collection of scrap and used metal in the shape of tins, worn-out metal goods, and obsolete patterns and metal manufactures. All the metal received from these sources was remelted and supplied, presumably under some rationing scheme, to Austrian metal workers. More recently the whole business was placed under the control of the Minister of War, who became responsible for the public control of all metals, the apportioning of supplies to the various industries, and the general management of the metal business of the empire. The metal company was practically taken over by the state, and merely carried out the duties of collecting, transporting, and distributing the supplies as directed.

Some of the available figures are most illuminating. It appears that, under the new scheme of requisitioning, many, if not all, of the non-essential industries have been entirely depleted of metal. So far, no less than 8000 ordinary railway trucks full of metal have been collected, of which over two-thirds have been taken from ordinary workshops and factories. Domestic supplies have been requistioned wherever they could be found, and about 2700 truck loads of metal grates, baths, old utensils, and builders' ironmongery have been collected. The collection and utilization of this huge amount has been expensive, and in many cases it has been found necessary to remodel factory plants, take out old engines and machinery, and put in other prime movers and plant to make possible carrying on the work. In other factories all copper appliances, such as piping and vats, have been taken out and iron or lead appliances substituted. Naturally, the bulk of the supplies has been devoted to army purposes.

The following report refers to conditions in the Austrian metal industry immediately prior to the armistice, which will no doubt materially affect the appropriation of metals in Austria:

> The shortage now is such that it is believed that only sufficient metal exists to meet the army demands for a few months of 1919, and the metal used in churches and other ecclesiastical buildings is now to be drawn upon. Church fittings, door and pew furniture, rostrums and railings are all to go into the melting pot, but so far it is understood that monuments and grave ornaments are to be spared. The metal generally used for these is unsuitable for war purposes. The church bells will probably be spared for a similar reason. All door fittings of red brass, yellow brass, bronze, and copper are being collected, but it is felt that this step should have been taken earlier, as, owing to depleted staffs and inadequate methods of working, considerable delay occurs in the smelting, refining, and remanufacture of the metal thus obtained. Iron door locks and padlocks are being collected and replaced by wooden latches, wooden bolts and bars, and staples and hasps. It is reported that householders are being forced to sell their door fittings at a fixed price and replace them them-

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**Commerce Reports.* Prepared by an engineering correspondent of the *Hardware Trade Journal* (London) and designed to indicate the metal position in the Central Empires at the time of the armistice with Austria.

selves at their own cost, or failing this, the government will [illegible] the fittings and provide and fix the substitutes. Most householders are believed to be adopting the first course. Incidentally, it may be mentioned that the government is practicing what it preaches, and the door fittings have already been removed from the public buildings and replaced with more or less suitable substitutes. It is expected that from 200,000 to 300,000 door latches can be collected every month from private sources. Shop fittings in the form of shelf brackets, lamp brackets, and electroliers, locks and bolts, and metal receptacles are also being collected, but it is not expected that more than a few dozen truck loads of metal can be obtained from this source of supply.

The Austrian government had other schemes in hand, it is believed, for obtaining and utilizing metal already devoted to other purposes, but there is no need to go deeply into these. Sufficient has probably been indicated to make it clear that Austria will not be in a position to export manufactured metal goods for some time after the war.

Remember the 27th Engineers

Some day the entire history will be written of the part played by the 27th Engineers in the war. At present, with the regiment still on the other side, though its return is hoped for at an early date, those who are interested in its affairs find it necessary to content themselves with the fragments of news that are received from time to time.

Company B of the mining regiment, it has been learned, sailed for France on June 30, arriving at Brest 12 days later. Three days after debarking, together with Company C, it was sent to the front and formed part of the 1st Army Corps Reserves in the Chateau Thierry battle. On Aug. 18, it was withdrawn from this sector and moved to the St. Mihiel sector, where again it had opportunity for distinguished service. A cable from Colonel Perry, dated Dec. 16 at Givry-en-Argonne, leads one to think that the regimental headquarters are at that place or near by.

The smokes and other things received by the men through the Comfort Fund have been very welcome, and it is hoped that they will be coming along without any let-up, for the need for them still exists. It is not too late to remember the mining regiment by contributing to the Comfort Fund.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lake Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johnson	10.00
Mrs. A. E. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hurst	20.00
Lawrence Addicks	20.00
R. R. Bird	25.00
E. R. Varela	5.00
W. J. Olcott	25.00
J. E. Clewell	10.00
C. M. Eye (monthly)	10.00
A. H. Hoffman	10.00
Francis Drake	25.00
Employees of Sociedad Minera Backus y Johnston del Peru	176.29
Charles Le Vasseur (monthly)	5.00
F. [illegible]	10.00
Walter Douglas	100.00
Robert E. Dye	10.00
R. T. [illegible]	1.00
Total	$19,180.56

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

Copper Export Association

The Copper Export Association, Inc., was organized at a meeting held Dec. 17. The following directors were elected: Murry Guggenheim, Simon Guggenheim, and F. H. Brownell, of the American Smelting and Refining Co.; John D. Ryan and Cornelius F. Kelley; Benjamin B. Thayer, of the Anaconda Copper Mining Co. and the Inspiration Consolidated Copper Co.; W. D. Thornton, of the Greene Cananea Copper Co.; Charles Hayden, of the Utah Copper Co.; Charles M. Mitchell, of the Nevada Consolidated Copper Co.; D. C. Jackling, of the Ray Consolidated and Chino Copper companies; Walter Douglas and James McLean, of the Phelps Dodge Corporation; R. L. Agassiz and James McNaughton, of the Calumet & Hecla Mining Co.; Stephen Birch, of the Kennecott Copper Corporation; William A. Clark, of the United Verde Copper Co.; Archibald Douglas, of the United Verde Extension Mining Co.; Adolph Lewisohn, of the Miami Copper Co., and Gordon R. Campbell, of the Calumet & Arizona Mining Company.

The association is incorporated under the laws of Delaware, with a capital of $250,000 7% preferred stock and 500 shares of common stock of no par value. The association was formed for the purpose of handling all the export copper business of this country, and one of its principal objects is to meet foreign buying with a selling organization.

The plans under which the association will work were explained by John D. Ryan, who has been chosen president of the export association. He said that all orders for copper obtained in the foreign market will be apportioned *pro rata* among the member companies of the association. The allotments will be based on the production of the various companies for the previous 12 months.

Though no definite steps have been taken toward the fixing of an export price, it is understood that an agreement will be reached for export purposes only, the price determined upon to be quoted f.o.b. New York.

Each company in the association will receive one share of common stock, which has neither market nor par value. The common stock will not have voting privilege, but, instead, one vote will be given to each 500 tons of copper allotted for export and based on the output for the 12 months prior to the formation of the organization.

The export association is not intended to be a profit-making concern, but will practically act as a broker for its various members, and will charge a nominal brokerage commission for handling the business. Should profits accrue, they will be distributed as dividends on the preferred stock. The entire plan of the organization has been submitted to the Federal Trade Commission.

The executive committee of the association will consist of the chairman of the board, Simon Guggenheim; president, John D. Ryan; first vice-president, Walter Douglas; second vice-president R. L. Agassiz, and the following directors: James McLean, Murry Guggenheim, Cornelius F. Kelley, William A. Clark, James McNaughton, and Adolph Lewisohn.

The executive committee will choose a selling committee, which will conduct the business. The determination of policies is in the hands of the executive committee, under the board of directors.

Editorials

The 27th Engineers

AMONG the troops assigned by General Pershing, Dec. 17, for early return home, is the 27th Engineers. It was their good fortune to get to France in time to participate in the active fighting. The regiment did good work, and was cited in orders for its efficiency. It has been the expectation of Lieutenant Colonel Perry, commanding officer, that the regiment would pass Christmas in France—so we sent over a liberal allowance from the Comfort Fund to provide remembrances of the day all around—and probably it will, but, anyhow, we may expect these boys soon to be home.

The officers and men write us right along of their high appreciation of how their industry has backed them up and what a great help to them it has been. Out of the Comfort Fund we have spent money as follows (in round figures): Athletic material, $2100; smokes, $2200; games, $100; typewriting machines, $300; instruments for the band, $2200; other musical instruments, $400; wool for sweaters, socks, etc. (which the ladies have generously knit), $1200; cash for company funds, $100; assistance of needy dependents, $100; cash for buying smokes, chocolate, etc., for Christmas, $2500; total, $12,100. Contributions have aggregated $19,180. By the way, let's make it an even $20,000. We have on hand the difference between the receipts and expenditures, for the *Journal* has been glad to throw in all the administrative expenses—clerical, postage, expressage, cables, etc.—but there are some considerable expenditures that Colonel Perry has made that have not yet been reported to us, and, anyhow, we shall still have need of a lot of money in welcoming the boys home and perhaps in giving them a helping hand.

This leads to another thought. We want to get these boys back to the mines just as soon as possible. With their new discipline and training they will be a wonderfully useful bunch of miners—about 1600 of them—who will comprise fine material for shift-bosses, foremen, and positions of higher responsibility. Some of them will naturally go back to their old homes and old places, but some of them may not know just what to do. We wish that our readers who need men and have places open would let us know, and be quick about it, so that we may head in the right direction any of these boys who need guidance. Some of the men in the ranks are graduated and experienced mining engineers, men who have held positions of responsibility before they went into the service. And in this connection, do not forget the officers. Some of them also will want jobs. Here is an opportunity for the men of the mining industry, who have had to remain at home, doing their bit by producing copper, lead, zinc, iron, etc., and have all the time wished they could be with the 27th Engineers, to step forward. They have been with the regiment in spirit, and they have supported it with their generous contributions of money. Well, now, let's finish a good job by helping the boys to get reestablished, and incidentally let's put the fund up to $20,000.

More of the Tin Situation

WE HAVE previously reviewed the marvelously tangled situation existing in tin, up to the dates of writing, but the full story has not yet been told, for the simple reason that the course of events has not yet come to an end. When the Interallied Tin Executive was formed and began the exercise of its functions as a buying monopoly, persons experienced in the trade promptly prophesied that Uncle Sam would some day find himself long of the market and would lose a lot of money. The first part of this prophecy has come true, perhaps more quickly than anybody imagined. The second part is, or will be, true. The only question is, who is going to lose the money?

The United States is supposed to have bought from 10,000 to 12,000 tons of tin, which has cost 72½c. per lb. In addition thereto consumers in this country are supposed to have about 20,000 tons on hand, the supply (existing and coming) being therefore sufficient for all domestic requirements for three to six months, according to what the requirements are going to be and how much metal ought to be carried in stock, visible and invisible, for ordinary commercial safety. But, furthermore, American smelters are at present producing from Bolivian ore about 1500 tons per month, which will presently be increased to 2000 tons.

It was the intention of the authorities to distribute among consumers the purchases at cost, and so long as the Oriental sources of supply were barred off it was figured that consumers would have to pay the monopoly price. But the monopoly was not made complete, the American smelters being left free; wherefore they would presumably have preëmpted the market at prices just under that of the monopoly, which would have held the umbrella in the good old-fashioned way with which we are so familiar in copper and other things.

However, with the advent of peace, practically if not legally, the tin markets abroad were set free, the Interallied Tin Executive dissolved on Dec. 11, and the world-market price fell to a level corresponding with about 57c., New York. The problem is now what to do with the American purchases that cost 72½c. The several persons who participated in the arrangement of this business are now assiduously endeavoring to disclaim responsibility, and the War Industries Board is evincing a tendency to take other people of the tin trade into its confidence.

The Tin Importers' Association, which properly protested against the previous arrangement, is now responding to a suggestion from the War Industries Board that the importers and consumers coöperate in some way to relieve the United States Steel Products

Co. The Association has therefore submitted a plan for the disposition of the costly stock by a sweetening process. Without going into details, the idea in the main is to feed out the accumulation of dear tin to consumers and let them have a little cheaper tin bought in the open market to make the dose more palatable. To carry out this idea, it is, of course, necessary to put restrictions on the American smelters who are producing tin from Bolivian ore under natural conditions.

We think that this plan is fundamentally wrong and proposes a cure that is as dangerous as the disease. The authorities and interests that went into the great gamble in tin, and lost, ought to face the music. Assuming that the War Industries Board is the responsible party, the people of the country as a whole ought to foot the bill, and not alone the consumers of tin. The Government may properly invite the coöperation of tin importers and consumers with respect to marketing the surplus, in order that the liquidation may proceed with the least possible disturbance; but there ought to be established in this country a free and unrestricted market for tin just as soon as possible. The maintenance of a high artificial price here while the rest of the world is enjoying a free and much lower price would be not only preposterous but also hazardous to our broader economic interests.

Standard Mining Equipment

SUFFICIENT equipment, well cared for and accessible, is essential in efficient mine management, and the various points regarding standard equipment brought out by Charles A. Mitke in his article in this issue are examples of well-conducted operations. Not only is it necessary to supply proper tools, but a place to put them should also be provided, so that each operation may be conducted with speed and dispatch. Considering the old slipshod methods, which, unfortunately, still prevail in some districts, it is not difficult to understand the comparatively high costs, and why a low "tons-per-man" figure was so often to be found. Operators are frequently prone to attribute laziness to their employees, and though this may sometimes be true, not infrequently a close study of underground conditions will show that the men are not to blame, and that the shortcoming is due to lack of system in the transmission and distribution of necessary supplies. The distributive ideas suggested by Mr. Mitke are examples of successful administration, and cover a wide variation of conditions.

The modern machine shop or warehouse furnishes an excellent example of handling tools or supplies. The intricate yet simple manner of "checking out" or "checking in" is merely the outcome of conditions created by the necessity of managing an establishment economically and efficiently, and though this principle cannot be brought to such a fine point in underground mine work, the results that may be achieved by careful supervision of supplies are well worth considering by those who have given the matter little attention. It is not unusual for an examination of old mine workings to disclose a veritable treasure trove in the shape of old shovels, picks, and drill steel, some of which are worthless from the standpoint of further usefulness; but the finding of such tools and material demonstrates the sad lack of a "check" system, which, if enforced, might have saved considerable on the cost sheet.

Too much attention cannot be paid to a frequent use of the Paynter tester, for the practice of assuming that a drill is doing its best work merely because "it sounds that way" leads inevitably to misjudgment of the drilling machines. Any well-working machine must be kept in repair, and it is not to be expected that careless tinkering with a drill is conductive to good results. Both repair work and testing are best done at a well-ordered shop where the right facilities are provided.

Standard equipment for drifting and other operations will, of course, vary somewhat with localities, and can best be determined by the particular conditions encountered, but in the main it may be said that Mr. Mitke's lists are typical. In conclusion, the fundamental ideas are well emphasized and the article merits the attention of mining men. Each step should mesh with the subsequent one, and so build up a smooth-working, well-planned order of operation.

German Propaganda in Mexico

GERMAN propaganda still continues in Mexico. When news of the armistice was received in the capital, the German houses hoisted their national flag and published the news: "Victory has come to us. We have given peace to the world." The same sort of misrepresentation was made in the provincial cities, but it was so raw that the deception of even the most ignorant *pelados* lasted for only a few days.

However, the sentiment of the Carranza government seems to have been distinctly pro-German, and even more distinctly anti-American. That government is now promoting legislation leading to the confiscation of all foreign-owned property, and it is thought likely that such legislation will be consummated. In the meanwhile, interests owning property in Mexico have been holding meetings in New York for the organization of an association to take protective measures.

There is a movement to have the Mexican situation considered in the peace conference at Paris. It is thought that if there is going to be a general cleaning up of evil conditions the plans might as well be given a worldwide scope and include Mexico, where there is no doubt of the wickedness of the situation. Great Britain and France have extensive interests in Mexico, and they may well demand that America abolish the nuisances existing south of the Rio Grande.

The use of carbide cans for making fuse cans—receptacles for the carrying of capped fuses to working places underground—as described by Mr. Mitke in the Dec. 7 issue of the *Journal*, is not only an economy but a practice that is worth adopting. How often have we seen a miner loop a coil of capped fuses over his arm and start up a raise on his way to the stope? It is true that few accidents are directly traceable to the accidental explosion of caps handled in this manner, but the precaution advocated would not only prevent such accidents, but would keep fuse and cap in good condition, preventing mechanical injury to the fuse and precluding accidental wetting. We believe that the practice will materially lessen the number of misfires.

BY THE WAY

The U. S. Fuel Administration is preparing a compilation of all rules and regulations promulgated during its period of activity. It will be brought down to Jan. 1, 1919, will be issued as soon thereafter as possible, and will be a bound volume of perhaps 500 pages. Dr. Eliot's five-foot shelf must now be lengthened.

Westward the wave of welfare work wends its way—or is it coming eastward? Jerome, Ariz., has evidently decided to clean house, now that the war is over. Five hundred burros are wanted at once by the Street Commissioner, says the *Jerome News*, to consume the refuse scattered around the town. If he cannot get the necessary number of burros, he will take goats, but he prefers the meek, gentle, and appetiferous ass of the Scriptures.

All engineers should systematize and standardize their work, said Charles T. Main in his recent address before the American Society of Mechanical Engineers, when retiring as its president. True efficiency consists in the consolidation of interests, and not in segregation, so men of one branch of engineering should act in coöperation with other engineers. More attention must be paid to human engineering, or the arousing of the interest and enthusiasm of labor in its work, thus creating a contented construction unit instead of a discontented one.

The actual defenders of the red flag do not know or have forgotten that red was formerly the color of royalty, until the epoch when Henry VI, King of England, took the title of King of France, says *Financial America*. Then red came to be considered as an inimical color in France, and was replaced by white. During the French Revolution, the red flag was temporarily the emblem of order destined to safeguard the citizens. Opinion changed, however, during the Second Republic. In a circular of the French government to the prefects we read: "The red flag is an appeal to insurrection, recalling memories of bloodshed and mourning. To hoist this emblem means to excite disobedience of the law and acts of violence."

The hepar test for sulphur is brought to mind by a recent press dispatch from Paris. Gassed money, it seems, is refused in trade by the townspeople. A Young Men's Christian Association secretary in a village protested when an aged woman storekeeper refused the jet-black coins he offered, briefly explaining, "No good." "But," insisted the Red Triangle man, "those coins are perfectly good. They were new and shiny when I put them in my pocket. I have been through a gas attack, and the fumes have turned them black. See—" He took out his knife and scraped until the bright metal was revealed. "Non," replied madame, still unconvinced. "Ce n'est pas bon." And she went on to explain that after a coin had been gassed she did not want to have anything to do with it.

"Hoisting machinery of novel construction," installed in 1876 by the Savage company on the Comstock lode, is described by Dan De Quille as having a reel 15 ft. long, 22 ft. in diameter at one end and 13 ft. at the other. "It was suspended upon a wrought-iron shaft about 16 in. in diameter, the ends of which revolved in ponderous bearings. The shell of the reel was covered with thick wooden staves, over which were bolted heavy iron plates. In this iron armor was a deep groove, which ran in a spiral manner from the smaller to the larger end, just as the thread of a screw is seen to run. The cable was round, 4000 ft. long, and weighed 25,190 lb. For 1500 ft. it was two inches in diameter, then tapering gradually till at the lower end it was one and three-quarter inches. The taper was made by drawing each wire slightly smaller for the last 2500 ft. of its length."

A museum and library, to be known as the Thompson Hickman Memorial, is to be erected by Col. William B. Thompson and Mrs. Thompson at Virginia City, Mont., to the memory of their parents. The site selected is on the main street of the town and the motor route from Yellowstone Park to the West. The ground, acquired from various owners, will form a small park, when completed, in the center of which the memorial will stand. In style, the building is a simple, classic Neo-Colonial structure, comforming in design to that of several good examples of early work in Virginia City. The stone of which the memorial is to be built was quarried near the site and was all cut by hand. Thus the building, though answering every modern need, will completely conform to the spirit of the locality. Situated on a slope, it will be two stories high on the main street and one story high on the street above. The lower level will contain the museum, and the library will be on the upper. The library will consist of a long, large room with fireplaces at each end built of stone taken from the famous gold area just outside the town. Frank A. Colby, of New York, is the architect.

"So 'ere's Christmus raound again, m'son," remarked Cap'n Dick. "Dam-me, do take one back some'ow; although I tell'e these 'ere 'apnin's now-a-days do differ from times we 'ad back long we. 'Ow's it come thee young fellers ar'nt h'out singin' Christmus curls? W'y, dam-me, back Redruth, tha 'ol bloody mine shif' 'd be h'out by naow, in groups, an' singin' curls. Mean to tell me thee never 'erd Christmus curls—' 'Ark tha 'Erald H'angles Sing' an 'ymns like they? Gos' along do; thee mus' 'ave. Well, any'ow, m'son, I'll 'ave to tell 'e this 'ere bit. One Christmus, thirty year h'ago, h'out we started; h'eight o' we there were. Firs' we'd gaw to one 'ouse, then to t'other, singin' laoud an lusty, an h'each time tha master o' tha 'ouse 'd call in all o' we an treat us 'andsome. Finally we reached Squeer 'Odges 'ouse, an 'e, min' you, bloody near h'owned tha mine w'ere ussen worked to. So coorse we was boun' to make h'our bes' h'efforts 'ere. An h'off we started, singin' laoud an lusty. 'Long baout time we struck second verse, 'ere come a gert bloody 'ound 'oo perched long side o' we, 'is 'ead h'up in tha h'air, an started 'owlin' sumpthin h'awful. Jan Trevarthan, 'im 'oo wuz leadin' we, e gaws h'over an 'its 'im a gert clout on tha 'ead an' sez 'e, 'Gos along do, what's tha matter with 'e? Th'art never been to practus.' "

NEW PUBLICATIONS

Johnson's Standard First Aid Manual. Edited by Fred B. Kilmer. 6 x 8½, pp. 143, illus. Johnson & Johnson, New Brunswick, N. J.

A valuable treatise on the subject of First Aid to the Injured. The book contains suggestions, expressed in simple terms, for the relief of injured persons and the saving of life and limb in accidents, and also advises on methods for preventing the spread of communicable diseases.

Twenty-Third Annual Report for 1917 of the Rhodesia Chamber of Mines, Inc., Bulawayo. Pp. 79. Argus Printing and Publishing Co., Bulawayo, South Africa.

The report of the executive committee of the Rhodesia Chamber of Mines for the year 1917 contains extensive information in connection with all matters relating to the mining industry in the country. The total mineral production for 1917 was valued at £4,639,335, as compared with £4,829,704 for 1916.

Chief Sources of Metals in the British Empire. Maps and diagrams; 26 x 31¼; 5s. 6d. Mounted on linen. The Imperial Institute, London, S. W., England.

The map shows the occurrence in each British country of important metallic ores and the existence of deposits at present unworked, and the attached diagrams give the production of each country, the total British output and the world's output of each important metal or ore. The publication has been carefully prepared with the advice of the Imperial Institute Committee on Mineral Resources.

Maximum Base Prices, Differentials, and Extras on Iron, Steel, and Non-Ferrous Products. Fixed under U. S. Government supervision. 6 x 8¼, pp. 128, illus., paper; third edition; $1. The Penton Publishing Co., Cleveland, Ohio.

A manual of price regulation embracing the complete record of official announcements covering prices and distribution, personnel of Government price authorities, comparative price data, war service committees, preference list of industries, and other original features. The data are well arranged, classified, and conveniently indexed.

Manganiferous Iron Ores of the Cuyuna District, Minnesota. By Edmund Newton. Pp. 126, illus. Minnesota School of Mines, Experimental Station, University of Minnesota, Minneapolis.

The bulletin contains a brief history of the Cuyuna Range, with reference made to the geology, character of the ores and mining conditions. Experimental data on various methods of beneficiation of the iron-manganese ores bear out the statement that little economic improvement is afforded by present methods. The latter part of the edition is devoted to information on the metallurgy of manganese, of iron and steel and that of Cuyuna ores.

The Zinc Industry. By Ernest A. Smith. 5½ x 8½, pp. 223, illus.; $3.50. Longmans, Green & Co., London and New York.

This is a compilation treating of the history of zinc, its ores and sources of their supply, marketing conditions, methods of zinc smelting, and other metallurgical processes, the physical and chemical properties of the metal, general commercial conditions, and industrial applications. As a general survey of the present status of the industry as a whole, it affords a good idea of things as they are. It will undoubtedly be a useful book to the layman, to the student, and as a convenient reference book generally, but the expert should not expect to derive any new ideas from it. The book concludes with an elaborate bibliography, which ought to be useful, but in which we discern some glaring errors.

American Engineers Behind the Battle Lines in France. By Robert K. Tomlin, Jr. 8½ x 12, pp. 91, illus. McGraw-Hill Book Co., New York.

This series of articles prepared by Mr. Tomlin, who was formerly managing editor of *Engineering News-Record* and more recently war correspondent of the McGraw-Hill engineering publications, deals with various problems encountered by American engineers in France. The treatment of each subject is pioneer work, as no other technical publication in this country was similarly represented at the front. The many details relating to roadbuilding, railway development and construction, water supplies and other industrial problems indicate the immense labor necessary in carrying on this important part of the great conflict.

Report on the Sources and Production of Iron and Other Metalliferous Ores Used in the Iron and Steel Industry. Pp. 180. 2s. Advisory Council, Department of Scientific and Industrial Research, London.

A revised and enlarged edition of a previous report of the same nature. It does not claim to give the results of independent research, but will be of value in providing, in condensed and classified form, information already published in many separate papers and returns.

The report is in three parts, as follows: I—Notes on the Iron Ores of the United Kingdom and British Dominions. II—Notes on Iron-Ore Deposits in Foreign Countries. III—Notes on the Ores of the Principal Metals Other Than Iron Used in the Iron and Steel Industries.

Part I deals with statistics of production of iron ore and with notes on the iron ores of the United Kingdom and British dominions. Much of this information is already available to the public in well-known statistical publications, but it has been included in Part I. of the report because it is felt to be supplementary to that contained in Parts II and III and to be necessary to a comprehensive review of the sources and production of iron and steel within the British Empire.

Parts II and III have been compiled from a large number of sources and have been brought as far up to date as possible. They contain information which hitherto has not been available in collected form.

The Flotation Process. By Herbert A. Megraw. 6 x 9, pp. 359, illustrated; $3.50. Second edition, revised and enlarged. McGraw-Hill Book Co., New York.

A second edition of this well-known treatise will be welcomed by metallurgists and engineers who are anxious to keep abreast of recent developments in this most fascinating branch of concentration practice; and readers will share with Mr. Megraw the regret that two important phases of the question remain in an aggravating condition of indecision. The theory of the process is still beclouded and unstated. Patent litigation is still in progress, and no definite conclusion can be anticipated.

A small amount of matter has been deleted from the previous edition, but in spite of this a net gain of about 100 pages is to be noted. The new matter will greatly enhance the value of the treatise. Considerable space has been taken up in completing the account of all patent litigation to date. The chapter dealing with the theory of flotation has an additional section on "Films and Their Action." and another on "Froth Formation." The information with regard to oils has been supplemented with some extra matter on sagebrush oil; and additional data on the quantity of oil to be used are noted. Sundry new equipment is described under "Flotation Processes and Apparatus," and important facts have been added to complete the chapter which deals with the testing of ores for the process. New chapters have been written dealing with petrography in flotation, and with details of equipment and practice at the plants of the Magma Copper Co., the Burro Mountain Co., and the Consolidated Arizona Copper Company.

This new edition should be in the hands of all who are interested in the flotation process. It will prove an invaluable aid to the professional engineer, and a reliable textbook for the student.

Personals

Have You Contributed to the Association of the 27th Engineers?

Fred J. Pope, of New York, is making an extensive metallurgical examination in Nevada.

Mark R. Lamb, mining engineer, sailed on the "Adriatic," Dec. 16, on a business trip to France.

Wilbur Van Evera, manager of mines for the Hill Mines Co., Ironton, Minn., was in New York recently.

G. H. Dudley, former manager of the Standard mines, is now in charge of leases near Metcalf, Pinal County, Arizona.

Huntington Adams, mining engineer, has gone to Antofagasta, Chile, to begin development work on a nitrate property there.

Preston Locke, resident engineer for the Northwest department of the American Smelting and Refining Co., has moved his office from Spokane to Seattle, Washington.

F. H. Skeel, mining engineer of Wallace, Idaho, has returned from Camp Humphries, where he had been in training for service in France as captain in an engineer regiment.

A. J. Thompson, manager of the Kitelas Mountain Copper Co., of Usk, B. C., is visiting Portland, Ore., to spend the holidays and to confer with officials of the company.

Ott F. Heizer, mining engineer, has resigned as superintendent of the Sheepranch mine, Sheepranch, Calif., and is now manager of the Grizzly Mining Co., Tuolumne, California.

T. Ernest Godson, mining commissioner for Ontario, and **T. F. Sutherland,** chief inspector of mines for that province, have been inspecting mining districts of British Columbia.

A. A. Hassan is examining manganese deposits in Hants and Colchester counties, Nova Scotia, with a view to development there. He will return to New York the latter part of December.

W. L. Creden, general manager of the Davis-Daly Copper Co., has resigned to give more time to his practice of consulting engineer. He will remain with the company in an advisory capacity.

F. E. Blackwell, of Ironwood, Mich., has been appointed chief engineer for the McKinney Steel Co.'s operations on the Menominee, Gogebic, and Mesabi ranges. For some years he had been superintendent of the Newport Iron Co.

William Pascoe, superintendent of the Merritt Development Co. and the Cuyuna-Minneapolis Iron Co., at Ironton, Minn., has resigned. **C. E. Ober,** superintendent for Coats & Tweed, on the Cuyuna Range, is his successor.

Dr. Horace B. Patton is in Wyoming for the purpose of securing data of oil and gas production and valuation. He has undertaken emergency war work for the Government under the Commissioner of Internal Revenue.

John W. Sherman, of Tonopah, Nev., manager of the West End, MacNamara and Halifax mines, has resigned to become manager of a Searles Lake potash company with headquarters at Oakland. **H. D. Budelman** has become his successor at Tonopah.

E. H. Dickenson, formerly with the Mond Nickel Co.'s Bruce Mines, Ontario, the Beatson Copper Co., LaTouche, Alaska, and the Nevada Consolidated Copper Co., at Ely, Nev., has recently been appointed general manager of mines for the Tata Iron and Steel Co., Ltd., Sakchi, India.

W. H. Staver, mining engineer, has returned from Brazil, where he was engaged in mining manganese and chrome ores for E. J. Lavino & Co., of Philadelphia, and the International Ore Corporation, Ltd., of Canada. He has opened an office in the Mills Bldg., 15 Broad St., New York.

C. A. Burdick is now in British Columbia, having taken over the work of consulting engineer and general manager of the Nechako River Mines, Inc., in the Prince George district. When the affairs of the company are straightened out there, he will probably continue as consulting engineer.

Francis A. Thomson, dean of the Idaho School of Mines at Moscow, has recently been in the Coeur d'Alene district arranging for a vocational system of training for miners under the supervision of the School of Mines. In this he has the cordial coöperation of the local operators, and he expects to have the system in working order at an early date.

J. C. Barr, general manager of the Pittsburgh Steel Ore Co., Riverton, Minn., has associated himself with **Frank Hutchinson,** chief engineer of the company. They will open an office at 801 Alworth Bldg., Duluth, Minn., as consulting engineers. Mr. Barr will continue to look after the interests of the Pittsburgh Steel Ore Co.'s Rowe mine at Riverton.

T. C. Roberts recently registered at the office of the American Institute of Mining Engineers. Others who registered during the last week were W. E. Ruder, of Schenectady, N. Y.; Frank L. Cole, of Manila, P. I.; Bennett R. Bates, of Berkeley, Calif.; Lieut. E. Ross Housholder; D. C. Gilbert, of Fort Wayne, Ind.; Warren D. Thompson; and Lieut. Don Carlos Billick, of the U. S. Ordnance Department.

Obituary

Waterfield Painter, mining engineer of Nevada, died recently at Packard of pneumonia, aged 24 years. He was a graduate of the Mackay School of Mines.

E. H. Wilson, mining engineer, died Nov. 27. He was graduated from the Washington University of St. Louis in 1870 and began at once to practice civil engineering. In 1884 he went into general engineering practice with John Gillie, now general manager of the Anaconda Copper Mining Co. Some years later he became connected with the Heinze interests in Butte, Mont., and for the last 10 years had been an examining engineer for many properties. In 1891, Mr. Wilson was elected president of the Montana Society of Mining Engineers.

Thomas T. Walters, of Ishpeming, Mich., died on Dec. 11, of heart failure. Captain Walters was one of the best-known mining men in the Lake Superior iron districts. He was born in Devonshire, England, on June 23, 1847, and started work in the mines there at the age of 7 years. In 1872 he came to the United States, and, after a year's work in the Pennsylvania coal mines, moved to Ishpeming, Mich. He was active in the development of the Saginaw, Mitchell, and St. Lawrence mines, and in 1885 accepted the superintendency of the Lake Angeline mine, which was considered one of the most successful mines in the Lake Superior district. Captain Walters became general superintendent for the Jones & Laughlin interests in the Lake Superior district in 1897, and held that position until a few years ago, when he retired from mining.

Societies

American Society of Civil Engineers met in New York on Dec. 18. Major Leonard S. Doten, Q. M. C., was announced as the speaker of the evening, his subject being "Sewage and Wastes Disposal for the U. S. Army."

Mining and Metallurgical Society of America will hold its annual meeting at the Engineers' Club, 32 West 40th St., New York, on Jan. 14, 1919. The December meeting of the New York section of the society was held at Columbia University Club on the evening of Dec. 16. The subject discussed was, "Methods of Combating Influenza and Pneumonia." The speakers of the evening were Dr. Charles T. Baldwin, of Derby, Conn., and Dr. William H. Park, of the New York City Board of Health.

Industrial News

Utah-Apex Mining Co. held its annual meeting recently. The following directors were elected: R. F. Haffenraffer, John J. Murphy, M. P. Duvally, M. W. Saugy and George F. McGahey.

Verde Combination Copper Co. at its annual meeting of stockholders on Dec. 2 elected the following board of directors: John L. Dyer, David Morgan, James F. Primm, J. C. Callahan, James M. Layman, John S. Eberman and William N. Richards. The following officers were elected by the board: John L. Dyer, president; David Morgan, vice-president; James F. Primm, treasurer; J. C. Callahan, secretary, and W. B. Kennedy, assistant secretary and treasurer. David Morgan will continue as general manager of the company.

Trade Catalogs

Cutters. Cleveland Milling Machine Co., Cleveland, Ohio. 3½ x 6; pp. 18; illustrated monthly stock list, Dec. 1, 1918.

Mallet Articulated Locomotives. Baldwin Locomotive Works, Philadelphia, Penn. 9 x 6; 44 pp.; illustrated. A pamphlet descriptive of Mallet locomotives.

Ruth Flotation Machine. The Ruth Co., Box 57, Denver, Colo. 6 x 9; 11 pp.; illustrated. A bulletin giving the details of the machine and its operation.

Adamite. Pittsburgh Iron and Steel Foundries Co., Pittsburgh, Penn. 5⅜ x 8; 32 pp.; illustrated. A pamphlet descriptive of adamite, a high-carbon alloy of chromium and nickel.

Lift Trucks. Barrett-Cravens Co., 711 Transportation Bldg., Chicago, Ill. Thirty-two pp.; illustrated. A pamphlet entitled "How to Save Handling Expense in Factory, Warehouse, and Stockroom," describing in detail the modern development of the lift truck as a means of handling material in factories, warehouses, and stockrooms.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Boring Tool. Edward W. Clark, Los Angeles, Calif., assignor of one-half to Alvin Wells, Los Angeles, Calif. (U. S. No. 1,281,519; Oct. 15, 1918.)

Casting Metals, Mold for. Michael Smith, Passaic, N. J. (U. S. No. 1,281,679; Oct. 15, 1918.)

Concentration, Apparatus for Ore. Frank Groch, Cobalt, Ont., Canada. (U. S. No. 1,281,351; Oct. 15, 1918.)

Furnace for Annealing or Heat Treating. William N. Best, Brooklyn, N. Y. (U. S. No. 1,281,489; Oct. 15, 1918.)

Furnace, Electric. Jens Orten Boving, London, England. (U. S. No. 1,281,280; Oct. 15, 1918.)

Galvanizing-Pot. Luther L. Knox, Bellevue, Penn., assignor to Blaw-Knox Co., Pittsburgh, Penn. (U. S. No. 1,282,862-863; Oct. 29, 1918.)

Oil from Shales and Other Carbonaceous Materials, Apparatus for Recovering. George W. Wallace, East St. Louis, Ill., assignor, by mesne assignments, to Wallace Coke, Oil and Byproducts Co., East St. Louis, Ill. (U. S. No. 1,283,000; Oct. 29, 1918.)

Oil Shales—Process for Distilling Carbonaceous Materials. George W. Wallace, East St. Louis, Ill., assignor, by mesne assignments, to Wallace Coke, Oil and Byproducts Co., East St. Louis, Ill. (U. S. No. 1,283,001; Oct. 29, 1918.)

Ore Reduction, Machine for. Richard P. Park, Melbourne, Victoria, Australia. (U. S. No. 1,281,646; Oct. 15, 1918.)

Phosphorus, Phosphoric Acid, Etc., Process for Making. William H. Waggaman, Cary R. Wagner and Harry Bryan, Washington, D. C. Dedicated to the public. (U. S. No. 1,282,994; Oct. 29, 1918.)

Potash—Decomposition of Refractory Alkali-Metal-Bearing and Aluminiferous Minerals. Waitstill H. Swenarton, Montclair, N. J. (U. S. No. 1,277,773; Sept. 3, 1918.)

Precipitation, Apparatus for. David Creel Walker, Anaconda, Mont. (U. S. No. 1,281,443; Oct. 15, 1918.)

Pump, Centrifugal. Frank L. Antisell, Perth Amboy, N. J. (U. S. No. 1,281,478; Oct. 15, 1918.)

Rock Drill, Power Driven. Moses Kellow, Penrhyndeudraeth, Wales. (U. S. Nos. 1,281,391 and 1,281,785-6-7; Oct. 15, 1918.)

Silica Brick, Machine for Making. Vincent H. Soisson, Connellsville, Penn. (U. S. No. 1,282,970; Oct. 29, 1918.)

Sluice Box. John C. Lesher, San Francisco, Calif. (U. S. No. 1,281,596; Oct. 15, 1918.)

Tin—Chlorine Detinning Process. Walther Zacharias, Pittsburgh, Penn., (U. S. No. 1,283,016; Oct. 29, 1918.)

Zinc Retort Furnace. Archibald Jones, Langeloth, Penn., assignor to Metallurgical Co. of America, New York, N. Y. (U. S. No. [illegible]; [illegible] 1918.)

Editorial Correspondence

SAN FRANCISCO—Dec. 13

A Meeting of Chrome Producers of Siskiyou County was held at Yreka the first week in December, having been called at the instance of the Northern California Counties Association, which is striving to help in the chrome situation. About 20 of the smaller operators were represented. They are holding 2500 tons of ore ready for shipment. For various reasons none of the large producers were present. The opinion was generally held that assistance should be lent the Pacific Coast Chrome Producers' Association in stabilizing market and price.

Hydraulic and Placer Mining will be greatly augmented in California by the abundant rains during November. In northern California the rains have been abnormally heavy. The total precipitation at San Francisco, which may be taken as representative of the northern part of the state, was 5.6 in. in November, as compared to the normal of 2.47 in. The records show only two years in the last 47 years when the November rains have exceeded the present. December is also making a record at the beginning. This will aid mining and metallurgical operations and assures an abundance of electric power for mills, mines, and dredges. With the possible relief to gold miners from the unusual burdens of high freight costs and scarcity of labor, the coming season should show an improvement in mining in the state.

The New Oil Field Near Casmalia, developed within the last two years, has 63 wells producing a total daily output of 8500 bbl. Fifty of these wells have been brought in during the last year. They are about 2000 ft. deep and required from two to five months drilling. R. J. McLaughlin, state oil and gas supervisor, reports that the water conditions offer a serious obstacle to development, about 3800 bbl. of water being produced daily, or 61 bbl. per well. Unique geological conditions account for the trouble. The oil-bearing formation appears to be fractured shale, which lacks distinct beds of clay or other formations impervious to water. All wells were tested after cementing, and yet many later developed water. The operators were advised that simple mechanical work should be supplemented by thorough geologic and engineering studies. The advice was acted upon, and their engineering departments are now coöperating with the state supervisor.

BUTTE, MONT.—Dec. 13

The I. W. W. Element recently demonstrated to the public once again that it is unable to control the labor organizations of the Butte district. Believing there was an opportunity to shut the mines down through a strike, to be declared on the strength of the Mooney case, an effort was made to have the local unions vote on the question of protesting against Mooney's imprisonment. The leading locals, such as those of the engineers and machinists, refused to do so, though the I. W. W. miners' union voted unanimously to strike. When it was found that the support of the other groups could not be obtained, a statement was issued at the last minute declaring the strike off until a conference could be held in Chicago.

SPOKANE, WASH.—Dec. 13

Activity at the Trail Smeltery of the Consolidated Mining and Smelting Co. of Canada is not expected to decrease. The Canada Copper Corporation, it is expected, will soon produce from its 2000-ton concentrator now under construction at Allenby. It is understood that the latter company has made arrangements to ship the concentrates to Trail. This may require an enlargement of the Trail copper refinery. More copper ores are also expected from the Consolidated company's mines at Rossland.

Magnesite Mining must be protected by a tariff or receive other Government aid in the opinion of Spokane mining men, who have sent three representatives to Washington to see what can be done. Approximately $1,000,000 was expended in Stevens County, Wash., in the last two years in magnesite plants, besides the building of a railroad to some of the quarries. Before the war Austrian magnesite was landed in New York as ballast for $7 to $8 a ton. Upon shutting off this supply the price rose, and the Stevens County industry was developed hastily but at large expense. The delegation to Washington consists of Roy Bishop, manager of the Northwest Magnesite Co.; Charles A. Irwin, manager of the International Portland Cement Co., which is calcining magnesite; and H. F. Wierum, manager of the American Mineral Production Company.

SALT LAKE CITY—Dec. 12

Inspection of Utah Mines for the coming year will be under the supervision of Carl A. Allen, of the U. S. Bureau of Mines, according to an agreement to this effect between the State Industrial Commission and the Federal Government. John Crawford will continue as coal-mine inspector, and William T. Harrison has been appointed for inspection work in metal mines.

Taxable Property in Utah in 1918, as given by the State Board of Equalization, shows an aggregate value of $644,203,919, divided as follows: Real estate, $199,630,625; improvements, $11,318,239; livestock, $47,233,882; personal property, $129,452,144; public service corporations and mining companies, $156,568,929. As a separate item, the property on which the occupation and privilege tax is levied is valued at $32,962,103.

A List of Utah Mining Companies and operators who have failed to pay the occupation and privilege tax and 3% tax on the proceeds of mines has been completed by State Treasurer D. O. Larson. The properties are being advertised and will be offered for sale on the third Monday of the current month. There is a penalty of 5% for unpaid taxes. The mining companies will undoubtedly ask for a restraining order enjoining sales, and the matter will be taken into the courts and the constitutionality of the act determined.

Before the Mine Taxation Amendment to the State Constitution can become effective, it will be necessary for the next Legislature to pass a law fixing the multiple or submultiple of net proceeds of mines to be used as a basis in determining the valuation of the metalliferous mines and the manner of assessing coal lands. This action will be necessary, as stated by the State Board of Equalization, in a report to the Governor filed Dec. 11, which settles the question brought up before the election in November as to whether the amendment would be self-executing. With regard to the amendment, the board says: "At the recent election Section 4 of Article 13 of the constitution was amended, changing the basis of assessment of mining property. This class of property cannot be assessed until the Legislature shall have passed an act fixing the multiple or submultiple of net proceeds of mines to be used as a basis in determining the valuation of the metalliferous mines and the manner of assessing coal lands. It is extremely important that the Legislature should act early in the enactment of a law upon this subject, so that the board may make the assessment within the time fixed by law for completing these assessments. In connection with this matter, we desire to recommend that the Legislature require mining companies to include in their reports the net proceeds of all lessees operating under contract with the respective companies." The assessment of the net proceeds of mine lessees has been one of the difficult features of the enforcement of the occupation tax, and the board is desirous of obviating it in the future. The law requires all property to be assessed as of the first day of January. "Under our present laws there is some uncertainty as to whether reduction mills and smelteries operating in connection with mines, and yet situated some distance from the mines, shall be assessed by the county assessor or by this board." The State Board of Equalization recommends that the laws be amended to make it clear whose duty it shall be to assess this property. The next meeting of the Legislature will be early in January, when the matters referred to above will undoubtedly be acted upon.

DENVER—Dec. 14

The Community Sampler movement is gaining headway. The committee in charge of organization has formulated general plans for action, and the following pledge is being circulated among subscribers who intend to give the project financial support: "We, the undersigned persons, hereby agree to organize the Boulder Ore Sampling Co., under the laws of Colorado, with a capital stock of 2500 shares of the par value of $10 per share, for the purpose of taking over the ore sampling works of the W. J. Chamberlain Ore Co., and we hereby agree to subscribe for the capital stock of said company at par in the amount set opposite our respective names, provided that this subscription shall not be binding and subject to the call of the treasurer of said company until the full amount of 1000 shares has been subscribed at par." A number of the leading merchants and mining men of Boulder have already subscribed their names, and others have promised to do so. The coöperative features of the enterprise appeal to those interested.

DULUTH, MINN.—Dec. 16

Cuyuna Shipments for season of 1918 totaled 2,432,838 tons, as against 2,422,884 tons in 1917. It is estimated that approximately 700,000 tons of manganiferous iron ores was shipped this year, as compared with 500,000 tons in 1917. Of the 1918 shipments, the Soo handled 1,756,365 tons and the Northern Pacific 676,473 tons.

The Cuyuna-Duluth, Croft, Thompson, Preston and Gloria Mines closed early in December. All are underground mines, the Gloria and Preston being new developments of manganiferous ore, and the Croft, Thompson and Cuyuna-Duluth producers of straight iron ore. High cost and present inefficiency of labor, coupled with the uncertainty in regard to ore prices, are given as the reasons for shutting down. It is believed shut-downs are only temporary.

Claiming That the Oliver Iron Mining Co. has been using an ore washer for 10 years on the basic principles of one he designed, Capt. Alexander McDougall, president of the McDougall Shipbuilding Co., brought suit on Dec. 16 for $40,000,000 against the mining company in the Federal Court. Captain McDougall asked for an injunction, contending that John C. Greenway, of the Oliver company, obtained on Apr. 7, 1908, a patent on an ore washer after seeing plans of one which Captain McDougall himself had patented a few weeks before. He holds that Greenway's contrivance, though identical with his own, owed its origin to the plans which he exhibited. In asking damages Captain McDougall stated that the machinery of the Oliver company had been in operation 10 years and estimated that 20,000,000 tons of ore had been washed, the process enhancing the valution of each ton $2. The court took no action.

HOUGHTON, MICH.—Dec. 18

The Influx of Common Labor into northern Michigan has been rapid, and all mines in the copper district, except two, have all the trammers that can be used. For the last year there has been no difficulty in securing all the skilled laborers needed, but trammers were always in demand. The wages paid the latter and the contracts made were so attractive that many miners became trammers. Now the situation has changed. A limited number of additional miners could still be used at practically all the mines, and their employment would necessitate more trammers. Production of rock has not reached the total which might be looked for if the labor situation could be arranged satisfactorily to all concerned, but the change for the better is pronounced.

The Osceola Consolidated Mining Co. and the Isle Royale Copper Co. are both without representatives upon their boards of their largest individual shareholding interests. Three years ago, James M. Turner, of Lansing, Mich., owner of a few shares of Osceola stock, secured an injunction restraining any Calumet & Hecla directors from serving on the Osceola board. The injunction is still in force. Calumet & Hecla owns 33,560 shares of the Osceola's total of 96,150 outstanding. There was some effort to adjudicate the case, but the understanding now is that the Calumet & Hecla management will continue without such direct representation. The property continues under direction of James McNaughton, who likewise is managing head of the Calumet & Hecla and subsidiaries. Practically, Calumet & Hecla interests in the Osceola corporation are being looked after, yet the opportunities for using legal process to the detriment of shareholders is readily discerned. It must not be understood that the courts have ruled that Calumet & Hecla is prohibited from voting its stock at elections of officers, but simply that it cannot elect Calumet & Hecla directors to the Osceola board. It is the practical working out of the interlocking directorate law. In theory the law seemed idealistic. In practice it actually puts men on directorates who are not vitally interested directly or indirectly, in the corporation's success. It makes so-called "dummy" directors, instead of abolishing them. The Federal courts have taken the same position as the state courts, acting, of course, under a different statute. The Federal action was secured through Judge Sessions, whose injunction was upheld by the U. S. Court of Appeals. A new hearing relating to the directorate of the Isle Royale company comes up in January before Judge Sessions, who will sit at the Soo. It is believed that the action will be dismissed by agreement with the applicant for the injunction.

VICTORIA, B. C.—Dec. 13

Sales of Crown Granted Mineral Claims which are in arrears in respect of taxes are being advertised in different sections of British Columbia. Since the outbreak of the war the regulations in regard to provincial dues have not been rigorously applied, but from now on the authorities are likely to demand strict compliance with the laws. This of course does not mean that the terms of the Allied Forces Exemption Act which protects soldiers, sailors and their relatives while the former are on active service are to be canceled or in any way disregarded.

TORONTO, ONT.—Dec. 14

Mining Districts of Northern Ontario are receiving large numbers of laborers, owing to munition plants closing down. At Cobalt, where labor shortage a month ago was estimated at 300, the deficiency has been nearly made up. There is still a shortage at Porcupine and other gold camps, but men are being taken on every day, and there is every prospect that the mines will be well supplied with labor during the winter. The improvement in the situation has already increased production at some of the Porcupine mines.

The Mining News

ALASKA

KENNECOTT PRODUCTION for November reported in issue of Dec. 14 included Braden output.

ARIZONA

Cochise County

GOLD RIDGE (Dos Cabezas)—A. J. Wilson, lessee, hauling ore to Golden Rule mill at Dragoon.

ARIZONA UNITED (Johnson)—Planning 800-ft. two-compartment vertical shaft. Will install new hoist. J. M. Libbey, manager.

KEYSTONE COPPER (Johnson)—Copper ore cut in fifth level crosscut from main shaft.

Gila County

IRON CAP (Copper Hill)—Plans to build high-tension transmission line to Inspiration power plant and to buy power of latter. Expect to install new crushers, skips, headframes, etc. Ten months' production in 1918, 7,800,000 lb. of copper.

ARIZONA COMMERCIAL (Globe)—Will drain 16 level and open drift. Working all levels from surface to 12th. Ore found east of Budget fault above 7 level. New three-compartment shaft down 130 ft. Raising from 12 level to meet it.

Greenlee County

GOLDFIELD EXTENSION (Duncan)—Work stopped on Ash Peak property, after two years' development.

Mohave County

EMERALD ISLE (Chloride)—Completing incline to tap ore pocket of gloryhole producing carbonate ores for electrolytic plant. Latter turning out 2500 lb. of copper a day. Estimated 300,000 tons of 3 % ore in sight.

HACKBERRY (Hackberry)—All machinery of mill on ground and assembly to be complete in January.

CONNELLY (Kingman)—J. J. Connelly shipping 3000 sacks of $140 gold ore from mine near Cerbat.

CATHERINE (Oatman)—Mine west of Oatman, near Colorado River, to be worked by Arizona Pyramid Mines Co. Will open developed orebody on 400 level. R. S. Billings and Charles Foster, latter of New York, in charge.

Pima County

GUNSIGHT (Ajo)—Five-stamp concentrator running on silver-lead ore.

NEW CORNELIA (Ajo)—Steam shovels working into undrilled ground find leaching carbonate ore continuous. Ajo Consolidated shaft workings in 4% sulphide ore, shipping grade. Influenza cuts output.

OLD HAT DISTRICT (Tucson)—Litigation affecting Daily-Arizona and Stratton properties settled. Stratton Copper Co. and Old Hat Copper Co. will be succeeded by Stratton Mining Co., with C. N. Wilson, president and general manager. Daily-Arizona has let contract for development work. W. H. Daily is manager and secretary.

Pinal County

BROKEN HILL (Ray)—Work started on 5000-ft. tunnel, with portal half mile from Ray, to cut present workings at about 900 ft. Most of way through Ray Consolidated ground. Large water flow to be tapped.

RAY CONSOLIDATED (Ray)—November production was 7,020,000 lb. of copper.

Santa Cruz County

HARDSHELL (Patagonia)—Bonded by R. R. Richardson to W. H. Welch and others. Producing silver and manganese ores.

HERMOSA (Patagonia)—Silver property in Harshaw camp, owned by James E. Corcoran, of Bradford, Penn., under lease to R. R. Richardson. Preparing to ship silver ore.

WEILAND & WILSON (Patagonia)—Leased to August Brodine, who has struck new copper deposit.

Yavapai County

KAY (Cañon)—Work concentrated on sinking to 650 level, on which main exploration plans will be worked out. George W. Long is managing director.

STERLING (Humboldt)—Sold by C. P. Wingfield to Usona Gold and Copper Mining Co., which has been operating property.

GADSDEN (Jerome)—Preparing to install 1000-gal. pump, to handle increased flow expected when 1200-level drift reaches objective fault. Now lifting 300 gal. a minute.

VERDE COMBINATION (Jerome)—Annual meeting decided to sink 200 ft. from present 1100 level and then start lateral development. During last year 5441 ft. of work done. John L. Dyer, El Paso, Tex., reëlected president.

VERDE SQUAW (Jerome)—Crosscut from 175 level in schist with much iron oxide.

YEAGER CANYON (Jerome)—Shipping ore to Clifton smeltery of Shannon Copper Co., owner.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Winze being sunk from 3500 level in good ore.

McGEE MINES (Sutter Creek)—Amador Queen, Aetna, and other properties of W. J. McGee, U. S. subtreasurer of San Francisco, to be incorporated and developed.

OLD EUREKA (Sutter Creek)—Deepening shaft to 3100 ft. by contract system. Now at 2860 ft. Extensive development to follow. Good ore on 1200, 1600, and 2100 levels.

Inyo County

MONTEZUMA MINES (Bishop)—To develop lead carbonate ore eight miles south of Big Pine on west slope of Inyo Mountains.

Kern County

ARMADA TUNGSTEN (Inyokern)—Sold to Los Angeles syndicate by James Halsey and Peter Hughes, of Kernville.

Nevada County

MURCHIE MINES (Nevada City)—Sold to satisfy judgment held by C. F. Humphry, of San Francisco. Includes 325 acres, mill, hoist, and surface improvements. In litigation several years.

Placer County

EXCELSIOR GRAVEL (Forest Hill)—Closed because of high mining costs.

Riverside County

NEW LA PAZ (Blythe)—Machinery arriving for new installation; will also build 1,750,000-gal. reservoir. Sixteen men employed. Edwin York, manager.

San Bernardino County

POMONA OIL (Los Angeles)—To install equipment and drill for oil on north slope of Puente Hills.

Shasta County

BALAKLALA CONSOLIDATED (Coram)—Daily production of 300 tons shipped to Mammoth smeltery at Kennett.

KEYSTONE COPPER (Kennett)—Sold to Mammoth Copper Co. Long under development.

MAMMOTH (Kennett)—Smeltery production in November is estimated at 1,140,000 lb. of copper.

Siskiyou County

SUGAR HILL (Etna Mills)—Twenty-four quartz and placer claims sold to A Ronalds, of Seattle, Washington.

COLORADO

Boulder County

NATIONAL ORE AND METALS (Boulder)—Mill producing 40 tons of fluorspar concentrates daily.

VICTOR (Boulder)—Sinking main shaft to be resumed. Will drift northeast to prospect Master Key property. N. G. Olsen, manager.

GOLDEN AGE (Springdale)—Producing daily 15 to 20 tons of fluorspar concentrates running 87-90% CaF and 5-7% SiO_2. Enlarging mill and adding six Wilfley tables. George W. Cheseboro, manager.

Mineral County

AMERICAN FLUORSPAR (Creede)—Mill producing about 50 tons of fluorspar concentrates daily. Mined at Wagon Wheel Gap. S. B. Collins, manager.

Ouray County

McLENNAN-DUNMORE (Ouray)—Tungsten property on Mount Hayden secured under bond and lease by M. de Galyer. Small crew developing; Carl Skoog, superintendent. Will treat ore in Gold Crown flotation plant at Ouray. Latter to be overhauled and remodeled to treat tungsten ore and miscellaneous custom ores.

San Juan County

SILVERTON SHIPMENTS during November were: Mayflower Leasing, 8 cars; Sunnyside and Gennessee, 6 cars each; Iowa-Tiger, 5; Pride of the West, 2; Mears-Wilfley, S. D. & G. Leasing, King

Leasing. Dives Leasing and Highland Mary, one car each; miscellaneous small lots, 13 cars; total, 45 cars.

IDAHO

Boundary County

IDAHO LEAD AND COPPER (Leonia)—President E. J. Merrin reports strike in tunnel No. 3 on Eureka claim. Work resumed since armistice was signed.

Shoshone County

PINE CREEK R. R.—After repairing two and one-quarter miles of washed-out track, work suspended until spring. Rails and ties on hand sufficient to complete branch to Constitution mine.

NABOB CONSOLIDATED (Beeler)—Instead of building new mill, as announced, company is moving Stewart 150-ton mill from Government Gulch, near Kellogg. Nabob controlled by Stewart.

COEUR D'ALENE ANTIMONY (Kellogg)—Mill closed because of poor market. Will continue development. Eighty tons of concentrates on hand.

ST. LAWRENCE (Saltese, Mont.)—Copper ore cut in lower tunnel. Raising in ore 200 ft. to upper workings. Upon connecting, will begin shipping, hauling six miles to railroad.

HECLA (Wallace)—Station at 2000 level nearing completion.

WESTERN UNION (Wallace)—Drift into Aurora ground has about 500 ft. to run to point under old workings. Ore indications favorable.

YANKEE BOY (Wallace) — Palmer, Newton & Co., lessees of upper workings, shipped two cars of ore, one averaging 200 oz. silver and the other 340 ounces.

MICHIGAN

Copper District

FRANKLIN (Demmon)—All rock coming from No. 1 shaft, where 30 drills are working. Drifting north and south at No. 2 shaft, four drills running. Will install mechanical haulage in No. 2 when ready to stope.

MINNESOTA

Cuyuna Range

PORTSMOUTH (Crosby) — Formerly known as Gordon. Being stripped by Gordon Mining Co., a Coates & Tweed enterprise. Will be 1919 producer.

NORTHLAND (Cuyuna)—Property, carrying both manganiferous and iron ores, being developed by shaft by Northern Minnesota Ore Co. Will start drifting Jan. 1. Mine buildings completed and machinery installed. Grading of railway spur in progress. Sixteen substantial dwellings built on town site of Pershing, platted and improved by company. Will be 1919 producer. Charles W. Potts, president.

ARMOUR NO. 2 (Ironton)—Sinking shaft to deeper level.

CUYUNA-MILLE LACS (Ironton) — Shipped 175,000 tons of manganiferous iron ores this season.

CUYUNA-SULTANA (Ironton)—Shipped 63,000 tons of manganiferous iron ore this season.

HOPKINS (Ironton) — Shipped 75,000 tons of manganiferous iron ore in 1918. Breitung & Co., owner.

JOAN NO. 4 (Ironton)—Producing 100 tons high-grade manganiferous ore per day.

MAHNOMEN (Ironton)—Largest producer on Cuyuna Range; shipped 340,000 tons this season, approximately 150,000 tons being manganiferous. Stripping stopped Dec. 1 on Mangan No. 2 property, on which option was taken recently.

SAGAMORE (Riverton)—John A. Savage & Co developing Ash Iron Co.'s manganiferous iron property on Section 19-46-29. Circular excavation made to ore with centrifugal pump. Shaft will be sunk in this excavation and drift run in orebody for drainage, in connection with proposed open pit to be stripped by Winston-Dear, of Hibbing. John Murphy, general superintendent.

ADBAR DEVELOPMENT (Trommald)—Sinking on Section 5-46-29, and will develop body of manganiferous iron ore.

ONAHMAN IRON (Trommald)—Shipped [illegible] tons manganiferous ore from Ferro and Algoma mines this season.

WILCOX (Woodrow)—Hoisting 400 tons per day. Will increase to 600 tons, if labor can be secured.

MONTANA

Silver Bow County

ANACONDA (Butte)—Work resumed at Alice and Leona mines, both zinc producers. Former down three months; latter, three weeks. Gas from fire in old stope on 900 level of Never Sweat, on Dec. 11, stopped work temporarily in this and Anaconda mine adjoining. Fire brought under control and damage slight. Fireproof cement shaft in High Ore mine practically complete. Labor scarce. Coal properties producing steadily. Brickwork on new Washoe stack recently completed. Great Falls plant producing 125 tons zinc daily; cleaning up zinc concentrates on hand; custom shipments from Butte & Superior and other properties temporarily stopped. Ferromanganese plant at Great Falls shut down Dec. 6.

BUTTE COPPER AND ZINC (Butte)—Work resumed Dec. 11 after temporary halt due to hoist accident.

NORTH BUTTE (Butte)—Nineteen damage suits for deaths of miners in fire of June 6, 1917, thrown out of court by District Judge J. J. Lynch. Montana compensation law provides $4000 for death. Minimum sued for was $10,000. November output was: Copper, 1,802,885 lb.; silver, 72,748 oz.; and gold, 115 oz.; all less than October output.

NEVADA

White Pine County

NEVADA CONSOLIDATED (McGill)—November production was 6,601,000 lb. of copper.

NEW MEXICO

Grant County

CHINO COPPER (Santa Rita)—November production was 6,464,285 lb. of copper.

SOUTH DAKOTA

Lawrence County

HOMESTAKE (Lead)—Installing two I-R direct-connected, motor-driven compressors, each with capacity 4500 cu.ft. free air per min., to replace 7500-cu.ft. compressor and others now in use, thus saving power. Brig and Golden Gate hoists electrified. Labor situation easier. Golden Star mill to resume about Jan. 1; Mineral Point will probably resume soon after.

Pennington County

AMERICAN TIN AND TUNGSTEN (Hill City)—Installing 60-hp. hoist and one-ton skip at Cowboy mine. Stoping between 300 and 400 levels. Deepening Mohawk shaft and developing. Will ship from both properties to company plant. Remodeling of latter calls for Telsmith gyratory, Hardinge mill, three Richards Pulsator classifiers, Deister Plato slimer, and electric furnace for smelting tin concentrates. Mill running by Mar. 15 on 75 tons daily. Ralph A. Mayer, general manager.

BOB INGERSOLL (Keystone)—Leased by A. T. Roos and associates. Shipping columbite-tantalite to Eastern market. Amblygonite also recovered, but has no market.

UTAH

Beaver County

UTAH SULPHUR (Morrissey)—First unit of plant ready for production. Situated at Morrissey, on Arrow Head trail near Cove Fort. Railroad shipping point, Black Rock. Office, Salt Lake City. Directors: M. P. Morrissey, Jacob Karlen, Jr., C. W. Peterson, Caspar Staub, and Charles Daniels.

Juab County

TINTIC SHIPMENTS for week ended Dec. 6 were 134 cars, from 21 shippers, as compared with 106 cars the week preceding. Dragon Consolidated, Tintic Standard, and Chief Consolidated led in output, with 26, 23, and 15 cars, respectively.

Salt Lake County

UTAH COPPER (Salt Lake City)—November production was 16,500,000 lb. of copper.

Tooele County

WESTERN UTAH COPPER (Goodwin)—Completing superstructure of new 50-ton mill and assembling machinery. Will treat copper and tungsten ores from mine at Gold Hill and from Yellow Hammer property. Deep Creek R. R. building 400-ft. spur to plant. Duncan MacVichie, general manager.

CANADA

British Columbia

GOLD DISCOVERIES reported in Chu Chua district, on Thompson River, four miles from Canadian Pacific Railroad.

SKYLINE (Ainsworth)—Shipped first carload of ore. Owned by A. W. McCune, of Salt Lake City.

HOMESTAKE (Kamloops) — La Rose Mines, Cobalt, Ont., paid $2000 cash on option. Balance of payment spread over two and one-half years.

QUEEN BESS MINES (Kamloops)—New concentrator almost ready. Mine equipment purchased in last eight months cost $50,000. Shaft down 300 feet.

VOIGHT (Princeton) — Representatives of Consolidated Mining and Smelting Co. inspecting recently acquired claims.

LE ROI NO. 2, LTD. (Rossland)—Produced 19,000 tons of ore in year ended Sept. 30. Ore found in old No. 1 mine.

UTICA (Slocan)—Five carloads of ore shipped since Charles F. Caldwell resumed management.

CONSOLIDATED MINING AND SMELTING (Trail)—Smeltery handicapped by influenza in first part of December. Shippers asked to cut shipments temporarily.

Ontario

OCTOBER SHIPMENTS over Temiskaming & Northern Ontario Ry. were: Buffalo, 583; Beaver, 43; Coniagas, 86; Dominion Reduction, 84; Foster, 44; Kerr Lake, 31; La Rose, 57; Mining Corporation, 255; McKinley-Darragh, 274; Nipissing, 150; O'Brien, 64; Penn-Canadian, 33; Peterson Lake, 51; Right of Way, 35; Keeley, 40; and Casey Cobalt, 53. Total 1883 tons, of which Deloro S. and R. Co. received 732; Coniagas Reduction, 312; Metals Chemical (Welland), 150, and A. S. and R., 688 tons.

ADANAC (Cobalt)—Decided to increase working force, on account of favorable development.

ALLIED GOLD MINES (Boston Creek)—Organized by Detroit interests to operate various claims, including O'Donald and Cullen-Renaud groups. Contract let for 1500 ft. of drilling on O'Donald, and another for sinking 50-ft. shaft on Cullen-Renaud.

CONIAGAS (Cobalt)—Option dropped on Ankerite property at Porcupine after spending approximately $300,000. Plant moved to Maidens MacDonald property, adjoining, which Coniagas owns outright.

NIPISSING (Cobalt)—Treated 181 tons of high-grade during November and shipped refinery 401,552 oz. Low-grade mill treated 6345 tons and produced 171,607 oz. Exploration work during month encountered several low-grade silver veins.

KIRKLAND LAKE (Kirkland Lake)—New 150-ton mill completed and being tried out. Expected to be in operation by Jan. 1.

TECK HUGHES (Kirkland Lake)—Mill operating at reduced capacity. About 2000 tons treated during November.

BILSKY (Porcupine)—Property adjoining that of Davidson Gold Mines now controlled by latter.

DAVIDSON (Porcupine)—Large pumps installed to overcome recent heavy flow of water. Sinking expected to start again soon.

PITTSBURG-LORRAIN (South Lorrain)—Mine closed.

MEXICO

Sonora

MAUTO (Carbo)—Being reopened by a Nogales company, headed by J. C. Underwood, with D. L. Fain as manager.

SAN GERONIMO (Carbo)—Lead-silver property being reopened by an American company; M. P. Dalton, president. Mine has 200-ton reduction plant.

PROGRESO (Ures)—Building new mill and pushing development work. Andrew Macfarlane, manager.

AFRICA

Belgian Congo

UNION MINIERE DU HAUT KATANGA (Elizabethville)—October production of copper was 3,306,900 lb.; November, 551,150 lb. Decrease in November due to influenza.

ASIA

Chosen

ORIENTAL CONSOLIDATED (Unsan)—November clean-up was $122,000. Ore milled above average.

SOUTH AMERICA

Brazil

COMPANHIA SIDERUGICA MINERIA (Sabara, Minas Geraes)—Will complete new iron and steel plant soon. Capacity of furnace 25 to 35 tons of ore. Largest in country. Equipment includes regenerators, two 300-hp. gas motors, air compressor, triphase A. C. 200-kw. dynamo, and apparatus for purifying furnace gases. Compressor driven by 150-hp. motor. Abundant fuel on hand.

Peru

CERRO DE PASCO (La Fundicion)—November production of blister copper was 5,398,000 pounds.

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver		Dec.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
12	4.7570	101⅛	48 1/16	16	4.7575	101⅛	48 1/16
13	4.7570	101⅛	48 1/16	17	4.7570	101⅛	48 1/16
14	4.7575	101⅛	48 1/16	18	4.7550	101⅛	48 1/16

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Dec.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot.	N. Y.	St. L.	St. L.
12	*	†	7.05	6.75	7.90 @8.00
13	*	†	7.05	6.75	7.90 @8.00
14	*	†	7.05	6.75	7.90 @8.00
16	*	†	7.05	6.75	7.80 @7.90
17	*	†	7.05	6.75	7.75 @7.85
18	*	†	7.05	6.75	7.70 @7.80

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

* No market. Producers ask 26c. No buyers.

† No market. Major supplies held for distribution at an arbitrary price of 72½c.

LONDON

Dec.	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
12	122	122	137	275	270	40½	39½	56
13	122	122	137	274	269	40½	39½	56
14	...	...	...	...	...	...	...	..
16	122	122	137	272	270	40½	39½	56
17	122	122	137	272	270	40½	39½	56
18	122	122	137	260	257	40½	39½	56

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

The situation remains in general about as reported last week. Special attention is being directed by the several producers to the matter of liquidation of Governmental stocks, so as to arrange for that necessary operation with the minimum of disturbance.

Secretary Baker said on Dec. 12 that in letting go of its considerable holdings of copper, steel, lead, and other products, the War Department will consult both the producers and the consumers of the commodities and will arrange for the sales at such times and at such prices as will not disturb the market or impede production.

Copper—No business was done by the producers, and the condition of "no market" continues. There was gossip about copper being offered for resale by oversupplied consumers at 22c. and even lower figures, but those reports were unconfirmed. According to dispatches from Washington today, the Government has sufficient copper on hand to supply Army and Navy requirements for more than a year.

The copper producers have been invited to meet in Washington with the price-fixing committee of the War Industries Board next Friday to consider the matter of fixing the price for copper after Jan. 1. It seems to us that the price-fixing committee is lacking in sense of humor.

Copper Sheets—The base price of copper sheets is 35½@36c. per lb. Copper wire is quoted at 28c. per lb. f.o.b. mill, carload lots.

Lead

Lead—The committee met last Friday. Many of the producers went to the meeting with full expectation that the committee would be dissolved then and there and that the market would be allowed to take its own course; but after consideration of the matter it was decided to postpone action until Dec. 20, and now it seems not unlikely that the existence of the committee and the maintenance of the present prices by agreement will be continued until the end of the year. During this week the committee received orders aggregating a few hundred tons.

The War Trade Board announces that List of Restricted Imports No. 2 (W. T. B. R. 98, issued Apr. 22, 1918), Item 115, restricting the importation of lead, has been amended to permit the issuance of licenses for the importation of lead bullion, as classified under Paragraph 153 of the Tariff Act of 1913, when originating in Mexico and coming by ocean transportation.

We reported the advance in lead price in London from £29 to £40 on Nov. 28, but there is some doubt whether the actual date was not Nov. 25 or 26. Cable dispatches are delayed and irregular in their coming, and it is difficult to determine the dates of filing. Full advices by mail have not yet been received. However, the reason for the advance was to adjust the London price to the approximate level of importing costs. This has thrown the London market out of joint with our own; but exporters of lead are now unable to ship anything from here, owing to what is practically an embargo.

Tin

Tin—There is no change in the general situation, which is discussed editorially. The Interallied Tin Executive dissolved on Dec. 11. Free buying is again permissible in primary markets.

Under the style of "Comptoir Français de l'Etain" a company has been formed in Paris with a capital of five million francs to control the tin trade in France. The company will sell tin on the conditions fixed in the agreement between the French government, the importers, and the producers.

Zinc

Zinc—The market exhibited increasing weakness during the week on free offers to sell, without much actual business resulting. At the close, January spelter was on the basis of 7¾@7.80c., while contracts for delivery during the first quarter were available at 7⅝@7⅞c. December spelter was still held at a premium, but there were no buyers except for trifling quantities.

Zinc producers have been disturbed by the repudiation of Governmental orders given by telegraph, by letter, etc. In some cases shipments on such orders had actually been begun, but they have been repudiated nevertheless. Nothing but orders executed according to prescribed forms are being recognized.

High-grade spelter is quoted at 9c. and possibly would be available at a little less on any firm bid. Domestic consumers appear to be oversupplied.

The restrictive maximum prices for rolled plate and sheet zinc are to be abolished Jan. 1, 1919.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb. There is much aluminum on the market, but there are very few transactions.

Antimony—The market declined rather sharply on small business. During the early part of the week the metal was offered in carload lots at 8¼@8⅜c., on Monday it was 8c., and yesterday it was 7¾c. We quote 7⅝@7⅞c. at the close.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $[illegible] per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@1.75 per pound.

Nickel—Market quotation: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—The New York market was weaker. We quote $118. San Francisco telegraphed $117.50, unsteady.

All Government restrictions on the sale of quicksilver expire by limitation at the end of 1918 and producers and importers alike may sell freely in the open market thereafter.

Gold, Silver and Platinum

The general stock of money in the United States on Dec. 1 totaled $7,669,576,580; of this $3,080,043,323 was in gold coin and bullion, $414,514,930 in standard silver dollars, and $237,904,206 in subsidiary silver. The money in circulation on Dec. 1, 1918, was $5,993,627,863, or $56.23 per capita. On Dec. 1, 1917, the per-capita circulation was $48.50.

Silver—There has been no change in the silver quotation for London or New York for the last week, as price continues stabilized under Federal control. There is no prospect of any relaxation of the control of the market for some time to come, owing to the requirements of the Indian government for coinage. Exports from New York to London from Nov. 30 to Dec. 14 amounted to 2,258,615 ounces.

Mexican dollars at New York: Dec. 12, 77½; Dec. 13, 77½; Dec. 14, 77½; Dec. 16, 77½; Dec. 17, 77½; Dec. 18, 77½.

Platinum—In good demand and firm at $150@108.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 14—Blende, per ton, high, $76; basis 60% zinc, premium price dropped; Class B, $46; Prime Western, $45@42.50; sludge and flotation, $40@37.50; calamine, $38@30. Average selling prices: Blende, $44.16; calamine, $36.06; all zinc ores, $43.95.

Lead, high, $103.75; basis 80% lead, $100@80; average selling price, all grades of lead, $85.39 per ton.

Shipments the week: Blende, 8694; calamine, 228; lead, 1577 tons. Value, all ores the week, $526,840.

Buying on the premium schedule as fixed during the war is ended, and the smelters are completing the taking of their allocation. Though there is no buying, settlements will still be made on the $75 premium basis next week, after which premium grades, or blende assaying above 60% zinc, under 1% iron, and under 0.15% lead, will go again upon the competitive market

A large portion of the lead tonnage being shipped is still settled for on $100 basis, but purchases are made on an $80 basis.

Platteville, Wis., Dec. 14—Blende basis 60% zinc, highest settlement price reported, $75; $60, base price for premium grade, $75; base price for high-lead blende, $45 per ton.

Lead ore, basis 80% lead, $75 per ton. One buyer of high-grade blende stated that he was out of the market pending the readjustment to follow the expiration of the Government schedule. Shipments reported for the week were 1149 tons blende, 41 tons galena, and 65 tons sulphur ore. For the year to date, the totals are 118,853 tons blende, 7688 tons galena, and [illegible] tons sulphur ore. During the week 2364 tons blende was shipped to separating plants.

Other Ores

Manganese and Chrome Ore situation unchanged. Washington is not going to give any relief

Molybdenite—A little business was done at 85c. per lb. of molybdenum sulphide contents.

Tungsten Ore—A little business was done in scheelite at $20@21 per unit, and later at $23.

Pyrites—Spanish pyrites is quoted, subject to the raising of the embago, at 16½c. on the basis of 10s. ocean freight. Restrictions still continue. It is predicted that they will be removed before the end of the year. Domestic pyrites in Georgia mines has sold at prices ranging from 25 to 32c. f.o.b. mine.

Iron Trade Review

PITTSBURGH—Dec. 17

The market for unfinished and finished steel has become quotable at the reductions which the general committee of the American Iron and Steel Institute had intended to propose to the War Industries Board at the conference of Dec. 11, but which the board refused to have read into the record of the meeting. The pig-iron market has not become quotable at the reduction, though doubtless the reduction will occur. The divergence is caused simply by the majority of steel producers announcing that they are ready to book business, for delivery after Jan. 1, at the reductions, though blast furnaces do not make similar announcements. There is practically no inquiry, and they are thus under no obligation to quote at all.

The suggested reductions are: $3 a ton on pig iron, making basis prices at furnace $32.20 for bessemer, $30 for basic and forge, $31 for No. 2 foundry (1.75 to 2.25 silicon) and $31.50 for malleable; $4 a gross ton on unfinished steel, except rods, making billets $43.50, sheet bars and small billets $47 and slabs $46, leaving rods at $57; bars, $4 a net ton to 2.70c.; shapes, $4 to 2.80c.; plates, $5 to 3.00c.; black sheets, $6 to 4.70c. for 28 gage; galvanized sheets, $4 to 6.05c. for 28 gage; tin plates, 40c. a box to $7.35, and steel tubular goods, $6 to a 54% basing discount. No change is to be recorded in wire products.

The market has been made still quieter by the reductions, as was to be expected, and it is regarded as fortunate that the change should come just before the holidays, when the market is always dull naturally. It is an advantage to buyers that the reduced prices are quotable as in force Jan. 1, the inventory date, as otherwise they might be forced to show profits in income-tax statements absolutely impossible to realize.

The manufacture of war material has almost entirely ceased, owing to rapid cancellation of contracts. Mills are shipping freely to commercial customers, who are becoming stocked up, and it will be necessary to curtail production. A fortnight's closing over the holidays may occur with many plants, though no formal announcements have yet been made.

Pig Iron—Doubtless the pig-iron market will decline, but it has not done so. There are practically no sales at any price, and no offerings at the suggested reductions. The market is therefore quotable nominal at the Government limits, as formerly: Bessemer, $35.20; basic, $33; No. 2 foundry, $34; malleable, $34.50; forge, $33, f.o.b. basing point, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less. The only sale reported is 50 tons of off bessemer or basic, for use as malleable, at $31.50, Valley.

Steel—Offerings of discard steel have increased, and $40 is about the highest asking price, representing about $3 decline. Regular soft steel is offered at the reduced prices noted above, but there is practically no buying.

Ferroalloys—The market still fails to declare itself, the gap between ferromanganese and spiegeleisen values in war time and prospective values in future being so wide that neither sellers nor buyers are disposed to act. Resale ferromanganese has been offered at $240, delivered, $10 under the old price, without finding takers. Furnaces recently reduced spiegeleisen asking prices $5, to $70, furnace, but there is no buying.

Coke—Coke is scarce, and furnaces fear the Fuel Administration will relinquish its control whereupon the price might go up when furnaces and steel mills are endeavoring to meet the situation by reducing their prices. Moreover, there are coke contracts for all or half of next year specifying Government price at time of delivery or, if no Government price exists, then the last Government price; hence furnaces hope the Fuel Administration will before it ceases to exist, make a reduction in coke commensurate with the reduction in pig iron that is practically certain to occur. At the moment the market for Connellsville coke is quotable firm at Government limits: Furnace, $6; foundry, $7; crushed, over ¾-in., $7.30; clean screenings, over ½ in., $5.50, per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.....	56.775	75.630	88.702	26.960	36.682	44.356
Feb.....	56.755	77.585	85.716	26.975	37.742	42.792
Mar.....	57.935	73.861	88.082	27.597	36.410	43.620
April....	64.415	73.875	95.346	30.662	36.963	47.215
May....	74.269	74.745	99.505	35.477	37.940	48.980
June....	65.024	76.971	99.500	31.060	39.065	48.875
July.....	62.940	79.010	99.625	30.000	40.110	48.813
Aug.....	66.083	85.407	100.292	31.498	43.418	49.077
Sept.....	68.515	100.740	101.125	32.584	50.920	49.500
Oct.....	67.855	87.332	101.125	32.361	44.324	49.500
Nov.....	71.604	85.891	101.125	34.192	43.584	48.969
Dec.....	75.765	85.960	......	36.410	43.052	......
Year..	65.661	81.417	......	31.315	40.851	......

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan...	28.673	23.500	131.921	110.000	142.895	125.000
Feb...	31.750	23.500	137.895	110.000	148.100	125.000
Mar....	31.481	23.500	136.750	110.000	151.000	125.000
April..	27.935	23.500	133.842	110.000	147.158	125.000
May..	28.788	23.500	130.000	110.000	142.000	125.000
June..	29.962	23.500	130.000	110.000	142.000	125.000
July....	26.620	25.904	128.409	119.913	140.409	134.913
Aug. .	25.380	26.000	122.391	122.000	137.000	137.000
Sept...	25.073	26.000	117.500	122.000	135.250	137.000
Oct...	23.500	26.000	110.000	122.000	125.000	137.000
Nov....	23.500	26.000	110.000	122.000	125.000	137.000
Dec...	23.500	......	110.000	......	125.000	......
Year	27.180	......	124.892	......	138.401	......

Tin	New York		London	
	1917	1918	1917	1918
January..........	44.175	85.500	185.813	293.227
February..........	51.420	92.000	198.974	311.525
March..........	54.388	(a)	207.443	318.875
April..........	55.910	(a)	220.171	329.905
May..........	63.173	(a)	245.114	364.217
June..........	62.053	(a)	242.083	331.925
July..........	62.570	(a)	242.181	360.347
August..........	62.681	(a)	243.978	380.900
September..........	61.542	(a)	244.038	343.905
October..........	61.851	(a)	247.467	335.543
November..........	74.740	(a)	274.943	323.550
December..........	87.120	......	298.556	......
Av. year..........	61.802	......	237.563	......

(a) No average computed.

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January....	7.626	6.782	7.530	6.684	30.500	29.50
February...	8.636	6.973	8.595	6.899	30.500	29.50
March......	9.199	7.201	9.120	7.091	30.500	29.50
April......	9.288	6.772	9.158	6.701	30.500	29.50
May......	10.207	6.818	10.202	6.704	30.500	29.50
June......	11.171	7.611	11.123	7.511	30.500	29.50
July......	10.710	8.033	10.644	7.750	30.500	29.50
August.....	10.594	8.050	10.518	7.750	30.500	29.50
September..	8.680	8.050	8.611	7.750	30.500	29.50
October.....	6.710	8.050	6.650	7.750	30.500	29.50
November..	6.249	8.050	6.187	7.750	30.500	30.60
December....	6.375	......	6.312	......	30.500	......
Year.....	8.787	......	8.721	......	30.500	......

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January...	9.619	7.836	9.449	7.661	48.329	54.000
February..	10.045	7.814	9.875	7.639	47.000	54.000
March.....	10.300	7.461	10.130	7.286	47.000	54.000
April......	9.459	6.890	9.289	6.715	54.632	54.000
May......	9.362	7.314	9.192	7.114	54.000	54.000
June......	9.371	8.021	9.201	7.791	54.000	54.000
July......	8.643	8.688	8.473	8.338	54.000	54.000
August....	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October....	7.983	8.801	7.813	8.451	54.000	54.000
November.	7.847	8.491	7.672	8.141	54.000	54.100
December .	7.685	......	7.510	......	54.000	......
Year....	8.901	......	8.813	......	52.413	......

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January...	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February.	36.37	37.25	30.95	33.95	30.95	33.95
March.....	37.37	37.25	33.49	33.95	35.91	33.95
April	42.23	36.15	38.90	32.95	40.06	33.95
May	46.94	36.20	42.84	33.00	43.60	34.00
June......	54.22	36.36	50.05	33.16	50.14	34.16
July	57.45	36.60	53.80	33.40	53.95	34.40
August ..	54.17	36.60	50.37	33.40	53.95	34.40
September	46.40	36.60	42.24	33.40	48.58	34.40
October..	37.25	36.60	33.95	34.40	33.95	35.40
November	37.25	36.60	33.95	34.40	33.95	35.40
December .	37.25		33.95		33.95	...
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 17
Alaska Gold M....	4
Alaska Juneau.....	1⅞
Am.Sm.&Ref.,com..	82½
Am.Sm. & Ref., pf...	107¾
Am.Sm.Sec., pf., A.	93
Am. Zinc..........	13⅜
Am. Zinc, pf.......	45½
Anaconda..........	65
Batopilas Min......	1⅛
Bethlehem Steel.....	64
Butte & Superior...	20⅛
Butte Cop. & Zinc..	7⅛
Cerro de Pasco.....	34
Chile Cop..........	19¼
Chino..............	34⅝
Colo. Fuel & Iron...	39¼
Crucible Steel......	58
Crucible Steel, pf...	87¼
Dome Mines........	12½
Federal M. & S.....	10⅛
Federal M. & S., pf..	39⅝
Greater Nor., ore ctf	33
Greene Cananea....	46¼
Gulf States Steel....	62
Homestake.........	94
Inspiration Con....	47
International Nickel	32¾
Kennecott.........	34¼
Lackawanna Steel..	69½
Mexican Petrol.....	167¾
Miami Copper.....	24⅜
Nat'l Lead, com....	65
National Lead, pf..	106
Nev. Consol........	17½
Ontario Min........	‡8¼
Ray Con...........	21⅜
Republic I.&S.,com.	75⅞
Republic I.&S., pf..	98½
Sloss-Sheffield......	51
Tennessee C. & C...	14⅝
U. S. Steel, com....	96½
U. S. Steel, pf......	112⅞
Utah Copper.......	74¾
Va. Iron C. & C....	56½

BOSTON CURB*	Dec. 16
Alaska Mines Corp.	‡.12
Boston Ely.........	.85
Boston & Mont.....	.52
Butte & Lon'n Dev.	.14
Calaveras..........	1½
Chief Con..........	3¼
Contact............	.05
Corbin.............	.25
Cortez.............	.16
Crown Reserve......	.18
Crystal Cop........	.29
Eagle & Blue Bell...	2¼
First Nat. Cop.....	2⅛
Houghton Copper...	.30
Intermountain......	‡.05
Iron Blossom.......	.50
Iron Cap...........	16
Majestic...........	.25
Mexican Metals....	.33
Mines of America..	.75
Mojave Tungsten..	.06
Nat. Zinc & Lead...	.11
Nevada-Douglas...	.35
New Baltic.........	1
New Cornelia......	16½
Oneco.............	.25
Pacific Mines......	‡.35
Rex Cons..........	.05
Yukon Gold........	1

SAN FRAN.*	Dec. 17
Alta..............	.03
Andes.............	.04
Best & Belcher.....	.01
Caledonia.........	.01
Challenge Con.....	.03
Confidence........	.09
Con. Virginia......	.07
Gould & Curry.....	.01
Hale & Norcross...	.02
Jacket-Cr. Pt......	.04
Mexican...........	.03
Occidental.........	.40
Ophir.............	.01
Overman..........	.01
Savage............	‡.02
Sierra Nevada.....	.07
Union Con.........	.06
Utah Con..........	.01
Belmont...........	2.85
Jim Butler.........	.35
MacNamara........	.20
Midway...........	.18
Mont.-Tonopah....	.15
North Star........	.07
Rescue Eula.......	.08
West End Con.....	1.20
Atlanta...........	.05
Booth.............	.16
Comb. Frac.......	‡.02
Florence..........	.15
Jumbo Extension...	.12
Kewanas	.06
Nevada Hills......	.04
Nevada Packard...	.38
Round Mountain...	.20
Silver Pick........	.06
White Caps.......	.09

COLO. SPRINGS*	Dec. 17
Cresson Con.......	4.93¾
Doctor Jack Pot....	.04½
Elkton Con........	.06½
El Paso...........	.15
Gold Sovereign.....	‡.02
Golden Cycle......	1.75
Granite	.18
Isabella..........	.06¾
Mary McKinney...	.08⅝
Portland	.07
United Gold M....	.14½
Vindicator	.44

BOSTON EXCH.†	Dec. 17
Adventure.........	‡.60
Ahmeek...........	71
Algomah..........	‡.30
Allouez...........	‡46
Ariz. Com.........	13
Arnold............	‡.20
Bingham Mines....	‡10
Bonanza..........	.10
Butte-Balaklava...	.45
Calumet & Ariz....	65¼
Calumet & Hecla...	436
Centennial........	13½
Copper Range.....	44⅞
Daly West........	‡2⅞
Davis-Daly.......	5
East Butte........	9½
Franklin..........	4
Granby...........	‡79
Hancock..........	‡7
Hedley...........	‡12
Helvetia..........	‡.20
Indiana...........	.80
Isle Royale........	25
Keweenaw........	‡1
Lake..............	‡5½
La Salle..........	‡3
Mason Valley......	‡3½
Mass	4½
Mayflower........	‡3⅞
Michigan.........	‡3⅛
Mohawk..........	54½
New Arcadian.....	‡1⅛
New Idria........	‡13
North Butte......	12¾
North Lake.......	.75
Ojibway..........	‡1⅛
Old Dominion.....	35
Osceola..........	52
Quincy...........	63
St. Mary's M. L....	45
Santa Fe.........	.35
Seneca...........	15
Shannon.........	3½
Shattuck-Ariz.....	‡16½
So. Lake.........	‡1⅞
So. Utah.........	.11
Superior.........	7½
Superior & Bost...	3¼
Trinity...........	3
Tuolumne........	.80
U. S. Smelting....	47⅞
U. S. Smelting, pf..	46⅞
Utah Apex.......	3⅞
Utah Con........	8⅛
Utah Metal.......	1⅛
Victoria..........	2½
Winona..........	.96
Wolverine........	20
Wyandot.........	‡.50

N. Y. CURB†	Dec. 17
Big Ledge.........	1
Butte & N. Y......	‡.50
Butte Detroit......	.03
Caledonia.........	.24
Calumet & Jerome..	1/16
Can. Cop. Corpn...	2⅛
Carlisle...........	‡2
Cashboy..........	‡.09
Con. Ariz. Sm.....	‡1⅛
Con. Coppermines..	6⅜
Goldfield Con......	.28
Goldfield Merger...	.08½
Greenmonster......	‡1/16
Hecla Min.........	5 1/16
Howe Sound.......	4⅛
Jerome Verde......	‡.50
Louisiana.........	‡1/16
Magma...........	28
Marsh............	.04½
McKinley-Dar-Sa...	.47
Milford...........	‡.75
Mother Lode......	.34
Nixon Nevada.....	.37
Ohio Cop.........	.75
Rawley...........	‡2¼
Ray Hercules......	3¼
Richmond........	‡.56
Rochester Mines...	.30
St. Joseph Lead....	‡14
Standard S. L.....	⅛
Stewart..........	.17
Success..........	.10
Tonopah.........	‡3¼
Tonopah Ex......	1⅝
Tribullion........	‡⅛
Troy Arizona.....	‡.10
United Eastern....	4 1/16
United Verde Ext....	‡35½
United Zinc.......	‡⅛
Utica Mines......	‡.08

TORONTO*	Dec. 17
Adanac...........	.08
Bailey............	.04
Beaver Con.......	.35
Chambers Ferland..	.08
Coniagas.........	2.50
Hargraves........	02
Kerr Lake........	‡5.75
La Rose..........	31½
Lake Shore.......	90
Min. Corp of Can..	‡2.50
Nipissing.........	8.87½
Peterson Lake.....	.08
Temiskaming.....	.29
Wettlaufer-Lor....	03
Davidson.........	‡.65
Dome Exten......	24
Dome Lake.......	15
Hollinger.........	6.12½
McIntyre.........	1.62½
Newray..........	12½
Porcu. Crown.....	22
Teck-Hughes.....	25
Vipond..........	20
West Dome......	13

* Bid prices. † Closing prices. ‡ Last quotations

Engineering and Mining Journal

December 28, 1918

Volume 106 *Number 26*

PREPARATION OF COPPER ORE AT PUQUIOS, CHILE

The Importance of Particle-Size Reduction Before Sampling for Assay

By A. W. ALLEN

Efficient sampling of broken rock is impossible without previous consideration of two important factors—fineness and homogeneity. The superiority of a sample of an ore which has been ground to a comparatively fine mesh is obvious, especially when it is realized that the process of grinding almost invariably effects a more even distribution of the valuable metals throughout the mass. Assays of samples are used to calculate the metallic contents of ores and the result of metallurgical operations, and it is important to know which class of samples can be relied on to give more consistent and truthful results, and to represent, as nearly as possible, the average of the whole mass from which they are taken. A study of the question will indicate that uniform fineness has much to do with efficient work, and it is therefore reasonable to place more reliance on the sampling of ore that has been ground and mixed than on determinations made on that which is in an unhomogeneous condition and contains a proportion of material of large size and uncertain, though obviously variable, metal content. Residue samples usually give reliable results.

When a sample of ore is to be prepared for assay or chemical analysis, one of the most important precautions to be observed is that it be ground sufficiently fine to insure homogeneity. One or more weighed portions are taken for the test, and it is necessary that the results from duplicate or triplicate estimations should be in close agreement. By grinding the sample no appreciable alteration is made in the total metal or mineral content. The constituents are more evenly distributed than when found in nature, and this is effected by a general division and subdivision of the whole sample, accompanied, as it invariably is, by a commingling action which disseminates the valuable material more evenly through the mass.

The weighing of an assay ton or of a number of grams for estimation purposes is merely an elaboration of simple sampling. The charge resulting is representative of the larger sample, just as the latter is supposed to be representative of the tonnage of ore under consideration. Assaying would be merely a waste of time if regrinding were neglected and the charge for assay weighed without further reduction of the ore beyond the point needed to insure accurate weighing to an exact amount. With an unground sample, and other than under circumstances so exceptional that they are too rare to be taken into account, the selection of a representative charge would be impracticable. The fault would not be with the method of sampling, for, however the assayer wiggled the spatula, he could never be sure of obtaining an impartially representative proportion. The fault would be entirely with the manner of preparation of the ore—with a system which absolutely precluded efficient sampling.

Fine Grinding Essential in Assaying

Fine grinding is essential in assaying, and, if it be not practiced, there are inconsistencies in results that, by a process of elimination, could be proved to arise from no other cause. These inconsistencies are due to the fact that it is usually impossible to weigh two or more separate charges from unground and unmixed ore, of average physical characteristics and average metal content, that will give concordant results.

The facts stated are obvious and of considerable importance in metallurgical work. If the principle is applied to ordinary sampling, radical changes must be made in many installations before anything approaching satisfactory results can be obtained. Sampling of ore feed is often carried out on material so coarse that, unless the metal is evenly disseminated, no two samples, taken over the same period, will agree. If the procedure is to be at all logical, the material should be uniformly reduced to form a homogenous mixture; and the test of the representativeness of a sample would be to copy assay practice and see if two or more independent samples, taken over the same period of time, agree as to metal content. If there is an appreciable difference, not explicable by other reasons, the sampling should be postponed until the ore is further reduced in size, and mixed, and until agreement of assay results is obtained.

Bullion-Plus-Residue Method

Reasons for the adherence of so many engineers to the bullion-plus-residue method of calculating recovery percentage are often sought. No other phrase of metallurgical operations is more clearly definable; but, to judge from the entire lack of a uniform system in the presentation of metallurgical results in company reports, it is obvious that it is little understood. Assuming an acceptance of the logical differentation between the primary extraction of a product from an ore and final recovery in metallic form, it is easy to understand that an assay extraction refers to a figure calculated from assay differences only; whereas a recovery must necessarily be based on an actual known weight of metal.

It is impossible to compute, by a positive method such as direct weighing, the original metal content in a certain tonnage of ore. A calculation is, however, needed to furnish the complementary figure required in any metal-recovery estimation, and it may be effected by using either the assay of the head or tail sample. If the former is taken, then the entire calculation is often based on an error owing to the fact that it is impossible to obtain a representative sample by available means.

Head Sampling Often Unreliable

In a large number of mills I have found that head samples of unground ore, taken by a wide variety of methods, were invariably unreliable. I confirmed this conclusion in many instances by placing the sampling in the hands of different men during the same period. The results were so discordant that it was doubtful if the cost of assaying was justified. The fault did not lie with the samplers, or with the mechanical apparatus in use, but rested entirely with the system. The ore in these instances contained metal in variable quantity and unevenly distributed, and too little effort had been made to disseminate this throughout the mass by grinding and mixing.

An elaborate system of sampling has been adopted in some mills, but it has failed to merit general approval. In custom mills, however, where it is imperatively necessary to obtain as correct an estimate of the original content of the ore as possible, the expense of an ample installation may be justified. The head sample, if taken from an unground feed, is in most cases unreliable. It may average within fairly close limits if taken over a period, but, on the whole, it is not suitable as a basis for the estimation of the metallurgical result of a scheme of treatment.

I do not wish to imply that, because sampling of unground ore usually results only in an approximate estimation of metal content, no effort at improvement should be made. The daily assay result of samples of feed to a mill is an essential requirement, to serve as a guide in computing averages, if for no other purpose. The theoretical or assay extraction may be calculated from the amounts of metal found, by assay, to exist in head and tail samples; and the result is of value for comparison with the actual recovery of product. The one forms a check on the other, and inequalities between the two should lead to an investigation.

Residue Sample Usually Reliable

The residue sample is the most reliable that can be secured. Reasons for this are obvious, but they will bear assembling and repetition. The material has been finely ground and intimately mixed during the mechanical process of reduction and conveyance. The final product to be discharged from a metallurgical plant is usually of homogeneous composition, so that a sample taken by ordinary methods is truly representative of the whole bulk. If there be any question about the correctness of a tailing or residue sample, the material can usually be resampled without trouble. Residues are often dumped, so that the checking and rechecking of metal contained is feasible. Indeed, the sampling of the face of a residue dump is so simple that it should be periodically carried out to verify the results from ordinary sampling.

The occurrence of coarse particles of metal in an ore, such as may be found in the head samples of many mills, introduces a source of error, and is almost certain to lead to the taking of an unrepresentative sample and the recording of erratic results. Here again the sampling is not to blame, because it is usually not feasible to secure a good sample under such conditions. Even if obtainable by extraordinary means, a further source of error is introduced by the fact that assaying is complicated by the presence of coarse metal, and sundry precautions and additional estimations are necessary. These sources of error are not in evidence if the residue sample is taken for assay, as, if such an estimation is incorrect, the trouble is remediable, and the cause easy to determine. The result of a determination for metal in residue may therefore be relied upon in most cases.

When the product is recovered in a pure or almost pure state, a second figure is available that gives a true record of the actual recovery. Bullion is, or should be, in homogeneous form, and so is easily sampled. Hence the reliability of the final result. The actual weight of fine or pure metal is calculated by positive methods, and there can be little opposition to the view that this represents the final recovery or gain by the process.

Placer Mining in the Yukon

A paper by W. E. Cockfield, containing the result of explorations in the Yukon, is included in Part B of the Summary Report of the Canadian Geological Survey for 1917. The area covered comprises over 1000 square miles in the Sixty-mile and Ladue River valleys. Placer gold has been mined on some of the tributaries of Sixty-mile River since 1893, Miller and Glacier creeks being the most important of the producers, and, as little geological work had been done in that area, it was deemed advisable to map the Klondike rocks along their strike. Furthermore, the finding of tungsten having been reported in the gravels of Sixty-mile River, it was considered important, in view of the war demand for that metal, to determine the nature of its occurrence.

The Sixty-mile and Ladue River valleys lie well within the physiographic province known as the Yukon plateau, which extends from northern British Columbia, through Yukon and Alaska to Bering Sea. Its topography consists of a series of long branching ridges occupying the space between intersecting streams. The inter-stream areas well back from the valley walls are prevailingly flat-topped and stand at an average elevation of 4000 to 4800 ft. The main topographic feature of the region studied by Mr. Cockfield is the divide between the Ladue and the Sixty-mile drainage, which swings in the form of a semicircle from near White River around the head of the north fork, a distance of over 100 miles measured along the divide. From the main divide ridges extend along the tributary streams to both master valleys, becoming progressively lower as these are approached.

The geological formations include sedimentary, igneous, and metamorphic rocks, of which the latter are most widespread, forming a series to which the name Yukon group has been applied. These are probably all pre-Cambrian in age. In point of areal distribution, the next most important series of rocks comprises volcanics and sediments, ranging from Tertiary to Recent in age. Volcanics, which are referred to the Mesozoic, and small stocks of granite rocks, also of Mesozoic age, comprise the rest of the consolidated rocks of the district. Overlying the consolidated rock formations is a mantle of accumulations which includes gravels, sand, silt, clay, soil, muck, volcanic ash, and ground-ice. These cover the floors of the valleys to varying depths and extend over portions of the valley walls and upland.

Placer gold is the only mineral of economic value produced in the Sixty-mile district. Its distribution in the gravels of the Sixty-mile River and its tributaries is widespread, but thus far only a few creeks have been found rich enough to work. R. G. McConnell gives the total production up to 1901 as only $500,000. After the discovery of the Klondike gold fields the district was deserted for a time, but in 1900 prospectors and miners began to return. At the time of the investigation about 45 men were engaged in mining operations in the district. The only portion of Sixty-mile River on which active work was being carried on was a stretch from the mouth of Miller Creek to a point a short distance below the mouth of Big Gold Creek. In the past the main workings have been confined to the bench gravels, but at present the creek gravels are receiving more attention.

Large portions of the bench gravels remain and the creek gravels are comparatively untouched. There are many points at which it is known that these can be worked at a profit. On the Little Gold Creek three men were working on a pay streak 100 ft. or more wide, the gold content running between 5 and 9c. per square ft. At the Discovery claim on the upper portion of Matson Creek bench gravels were being worked with a return ranging from 18c. to $1 per ft. On the bench lying between Glacier and Big Gold creeks $500 was recovered from a patch of ground comprising 80 sq.ft. Much ground which is known to contain gold remains to be worked on the creeks, and a small but steady production is expected for some years. In view of the geological conditions, there is no reason why the gold belt should be confined to the creeks where discoveries have been made, and the rest of the valleys of the area be barren.

The widespread distribution of the metamorphic rocks of the Yukon group, and the fact that they are cut at many places by later granitic, andesitic, and other intrusions, should indicate favorable conditions for the occurrence of placer gold. Float gold is known at several points in Ladue valley, and although no deposits of economic importance have been discovered, it must be borne in mind that very little prospecting has been done there. The ground in the master valleys is deep and therefore discouraging to the prospector, but equally good pay may be obtained by working the tributary streams, where results are more easily obtained. There is reason to believe that the producing field will be much enlarged in the future. No deposits of tungsten were found in any of the gravels examined.

A Chinese Company has been formed of which part of the capital will be subscribed by the Chinese government, for working the iron mines near Hsuanwafu, between Peking and Kalgan, and building blast furnaces. It is reported that the Japanese will lend 20,000,000 yen to finance the enterprise.

Standardization of Mining Methods
VII—Prospecting and Development[*]

By CHARLES A. MITKE[†]

In this paper, the seventh of the series, the author emphasizes the value of coöperation and foresight. The relation of footage to costs is explained. Practical notes on drilling and shoveling are followed by an account of time studies of the various operations, and the value of such checks on the subsequent standardization of methods and improvement in general efficiency.

ONE of the most important branches of mining, and one which, on account of its magnitude, the variety of its operations and amount of money involved, offers a large field for the introduction of standard methods, is that of "prospecting and development work." "Prospecting" and "exploration" are terms applied to all work directed toward the finding of ore, whereas the various headings driven through an orebody, preparatory to mining, are usually characterized as "development work."

There are two distinct classes of mines: those whose ore reserves are defined by churn drilling before production begins, and those which prospect and develop their reserves in the usual course of mining. To the first belong the large porphyries; the second takes in practically all the higher-grade mines. These so-called porphyries have the advantage of having their ore blocked out for many years ahead, so that an accurate estimate of the tonnage can be made and the size of their reserves determined in advance, whereas the higher-grade mines have a much smaller ore reserve. In this latter division are mines with monthly productions ranging from 2,000,000 to 7,000,000 lb. of copper, which have been steady producers for many years, but have rarely reserves of ore for more than a few years at any one time. During 1916, approximately 70% of all the copper produced in the United States came from mines of this character, the remaining 30% being shipped from properties which had proved orebodies, previously explored by means of churn drilling.

One of the principal reasons why the higher-grade mines cannot follow the methods pursued by the porphyries, and prospect and develop large ore reserves at the outset, is that the nature of the ground is such that it will not stay open for any length of time without an excessive cost for repairs. Therefore, to keep pace with the continual depletion, and to maintain normal ore reserves, it is essential that their prospecting and exploration work be carried on simultaneously with the stoping.

The life of mines is a subject of vital importance to everyone connected with mining, and an interesting question arises as to what is the correct amount of prospecting that should be done. If the work is carried on too extensively it entails an excessive cost for repairs. On the other hand, if these operations are long postponed, the life of the mine is materially shortened. A precedent established by a number of companies is "to do sufficient prospecting to find one ton of ore for every ton extracted." To follow out this plan, prospecting and exploration work must be prosecuted continuously. Intensive prospecting should be carried on in the neighborhood of known orebodies, in order to make these ore-bearing areas as productive as possible. Favorable indications, faults, and small veins leading into the country rock should also be explored by means of intermediate drifts at the time of discovery, instead of postponing the work until some future date, when the records may have been lost, the incidents forgotten, and the cost of the work greatly increased, because of the necessity of reopening old workings.

In every case a golden mean should be sought, and a fixed ratio established between the amount of ore extracted and the amount of prospecting to be done. This fixed ratio should allow, in all instances, for sufficient ore to be developed in stopes to do selective mining, keep up the normal production, and maintain the required ore reserve. It should also provide for enough openings, carried just ahead of the average workings, to benefit the ventilation materially.

The exceptional conditions existing since 1914, attributable in the first instance to the outbreak of the war, secondly to labor difficulties, and finally to a decided shortage of labor, have caused operators to postpone, in a large measure, necessary prospecting work in a praiseworthy endeavor to maintain maximum production, and as a consequence, in many cases, ore reserves have become seriously depleted and a hazardous investment, both for the mine owner and the prospector. Though an occasional heading may penetrate an orebody, exposing enough ore to yield enormous returns on a comparatively small investment, thousands of feet of prospecting are done annually with practically negative results. One of the problems at present confronting the mining industry is how to make up for the large amount of prospecting which has necessarily had to be postponed during the last four years, so that normal ore reserves may be maintained in the future. To prosecute this work at a minimum cost it will be necessary to standardize all operations connected with it. At present, working forces are constantly being changed, vacancies generally being filled by men who require a considerable amount of training, as well as frequent supervision, before a fair day's work can be expected.

The employment of competent instructors to train the new men in the standard methods approved by the operating company will do much to alleviate the conditions created by this large labor turnover. Men who are best adapted for certain classes of work should be selected, complete equipment provided, and all unnecessary loss of time eliminated. This will make possible a larger amount of prospecting for the same expenditure, lower-grade material will then become of commercial value, and thus add to the reserves of the mine, and, ultimately, the cost per pound of copper will be lowered.

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[*] The seventh of the series of articles which began in the Nov. 9 issue of the *Journal*. Copyright 1918 McGraw-Hill Co., Inc.

[†] Mining engineer, Bisbee, Arizona.

The previous articles in this series describe the standardized methods which comprise the elements of prospecting and development work. Examples have been given of what may be gained by the use of instruction in training inexperienced men how to mine. The following illustrations will show what may be done by taking a number of trained and skilled miners and giving them further instructions as to the best methods of doing certain work, thereby increasing their value to the company.

CONCRETING A FIVE-COMPARTMENT MINE SHAFT

In preparing the work of concreting a shaft[1] the plans for clearing the old timbers, for moving forms and pouring the concrete were carefully made beforehand. The crew, working under the direction of a man thoroughly familiar with standard methods, was taught what was expected, and soon reduced the work to regular routine. Twelve men were employed, including the pipeman and foreman—two men to a compartment. They held the places originally assigned to them throughout the entire operations, and by constant application to the same task day after day became expert.

The estimated time for pouring five feet of concrete was ten hours. This was reduced to eight in a short time, and finally the work was done so expeditiously that it became a question of how to utilize the remainder of the shift. Before long it became possible frequently to concrete two sections in eight hours, and on one occasion three sections were put in within that time. Accurate records were kept, and it was found that the average time required to complete the work of putting in a 5-ft. section of concrete was 6 hr. 14 min., which represented a reduction in the total working time (eight hours) of 22.1%. During one month a record was made of 4 hr. 31 min., or 50.6% of an eight-hour shift.

These remarkable results were achieved by coöperation on the part of the men, and because they were trained in the beginning to plan ahead for their work and take all necessary tools and supplies with them when going on shift. Illustrations of this kind demonstrate the practicability of introducing standardized methods in other classes of mining, and indicate the great advantages to be gained thereby.

COST OF PROSPECTING AND DEVELOPMENT WORK

Prospecting and development work consists principally in sinking, drifting, and raising. Sinking is the most expensive and is therefore avoided wherever possible, deep shafts being put through in many cases by means of raises instead of by the more expensive process of sinking. Drifts are driven for horizontal prospecting, haulage, ventilation, and similar operations; raises, although used for like purposes, are vertical or inclined.

The amount of drifting and raising, or "prospecting and development work," as it is generally called, varies according to the stage of development the property has reached. In some instances as much as 30% of the total cost of mining is expended in prospect and development work, though in others it may be as low as 10%. In prospects which have not reached a producing stage, practically the whole expenditure goes into this class of work, and in the average producing mine it amounts to about 25% of the total mining cost. In extensive veins, where little prospecting is required, nearly all the headings are driven in ore, but in the majority of cases they are in waste, which is usually harder and therefore more expensive than mining in ore.

Some of the most important items in the cost of prospecting and development work are labor, timber, and explosives. Tables I and II, showing the amount of footage made during one month, give the proportionate expenditure for these items at one of the representative mines in Arizona.

TABLE I. DETAILED COSTS OF SEVEN DRIFTS UNDER VARYING CONDITIONS

	Cost per Foot				Ft per Shift
Example	Labor	Timber	Powder	Total	(a)
1	$4 47	$0 31	$1 81	$6 59	1 35
2	5 84	.50	1 45	7 79	1 03
3	4 89	.33	1 84	7 06	1 21
4	4 43	28	2 50	7 21	1 38
5	5 80	.75	2 04	8 59	1 02
6	5 43	54	1 96	7 93	1 08
7	4 14	11	2 00	6 25	1 47
Average,	$5 00	$0 40	$1 94	$7 34	1 22

Of the total expenditures, the labor cost was 68.12% of the total, timber amounted to 5.45, and powder to 26.43 per cent.

TABLE II. DETAILED COSTS OF SEVEN RAISES UNDER VARYING CONDITIONS

	Cost per Foot				Ft per Shift
Example	Labor	Timber	Powder	Total	(a)
1	$5 23	$1 02	$1 66	$7 91	1 12
2	5 96	3 20	68	9 84	1.02
3	5 10	1 88	1 49	8 47	1 16
4	7 25	2 46	1 37	11 08	.82
5	8 24	1 96	1.79	11 99	.72
6	6 90	2 07	1 66	10 63	80
7	4 18	1.55	98	6 71	1 42
Average,	$6 12	$2 02	$1 37	$9 51	0.99

(a) The footage per man shift denotes the entire work which has been done at the face, such as drilling, mucking, laying track, and other labor of the sort.

The standard custom in many mining districts dictates that the drilling of one round per shift (regardless of the amount of rock broken per round) shall constitute a day's work, even though it were possible for the miner to drill and blast two rounds in adjacent faces. Demands have frequently been made for two men on a machine, which if acceded to, would further increase the already high costs. When a machine weighing 150 lb. or more is used it is often considered best to put two men on it, but this would appear ridiculous with small machines, averaging 40 to 50 lb. In the majority of cases these small machines do the work equally well.

NECESSITY OF INCREASING FOOTAGE TO LOWER COSTS

To reduce the cost of prospecting and development it is necessary to increase the footage per man shift, just as in stoping the tonnage per man shift must be increased if the cost per ton is to be lowered. In other words, this means the drilling of deeper rounds, and the blasting and shoveling of more rock, in the same time and with practically the same number of men as were needed for the shorter round. To accomplish this it is absolutely necessary to have a complete equipment on hand for the driller, a regular program for the handling of the work, a type of round that will prove most effective, and a clean place to set up, which has been previously cleared by the mucker. In addition to these essential requisites, many other factors contribute to standardization underground, such as transportation, explosives, compressed air, and ventilation. These should all be given careful attention.

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[1] Sacramento shaft at the Copper Queen mine.

One of the most important considerations is the type of round to be drilled. The great problem is to "pull" as much ground as possible, consistent with the size and shape of the working face. The blasting of deeper rounds and the doing of more efficient work do not involve greater effort on the part of the miner than his usual day's work, in which a large part of his time is spent seeking tools and supplies, and only a small part in drilling and blasting. It does mean, however, the elimination of waste effort and the concentration of his energy along the most productive lines.

Stages in Drilling a Round of Holes and Shoveling

In general, the stages in drilling a round of holes, as practiced in many mines, are as follows: The foreman or shift boss comes into the face of a drift, raise or winze, and, after taking in the situation hastily, usually remarks to the miner: "Set up and drill a round of holes." He rarely tells him where to find the complete equipment. He may mention the place where a machine may be had, but never gives all the informaton necessary to drill the round. Consequently, the miner gets to work, and after finding the machine and column, brings both and makes the "set-up." Then he begins to search for the remainder of the equipment which was used by the preceding shift. He finds most of it in a reasonable time, but some things are generally missing —a few necessary wedges, a hose, wrench, wooden block, or some other minor part of the outfit.

The steel must next be obtained. In some mines racks are placed conveniently, but in others it is necessary to go a long distance to the shaft stations to get the steel. In a mine where a number of different kinds of machines are used, the miner often makes a mistake and brings the wrong size, which necessitates his returning for steel which will fit his machine. He then connects the hose and water lines and is ready to start drilling after one-quarter to one-third of the shift has been expended in preparations. After drilling for a few minutes, he finds it necessary to get oil for the machine. As no special oil cans are available, a bottle or ordinary tin can is used. Often the miner mixes car oil with machine oil so that the machine will not require frequent oiling. He next pours the oil, with the grit and dirt which has dropped into it, into the hose. Apart from the injury arising from the black oil and dirt entering the machine, the oil soon attacks the rubber in the hose, and small pieces break off from time to time and clog the air passages at the valve. This soon results in machine trouble.

Normal Procedure Needs Standardization

The type of round is of next importance. In approximately 90% of the rounds drilled in metal mines, the cut is put in the bottom of the drift. With the exception of the lower corners, this is the most difficult place in which the cut can possibly be put. The powder has no opportunity to break a deep round, on account of the unfavorable placing of the cut.

When the round is drilled the miner fills some paper bags with gritty material, or gets some clay to be used as stemming. He is now ready to go for his powder and load the holes. By this time the shift is so far gone that he usually finds only five or ten minutes left before tally. He hurries to get the powder into the holes, in almost any fashion, cramps and doubles the fuse, hastily forces in some stemming, spits the fuse, calls "Fire," and leaves the face. He then counts the shots and chalks up the number of missed holes.

The entire shift, normally for the purpose of placing and loading the holes in such a manner that the maximum amount of ground will be broken, may be rendered ineffective by hasty loading and firing; and this most particular stage of the operations is nearly always the most carelessly attended to and frequently results in missed holes and a short round, which means higher costs, to say nothing of increased danger to the men.

Drilling is usually done on one shift and shoveling on the next. After the drift has progressed far enough, track is laid, the ditch cut, and, if necessary, the drift is timbered. As a preparatory to shoveling, the turn sheets are frequently forgotten, and the rock is blasted direct on the ground. This makes it difficult to shovel from the rough bottom, causes delays, and, as a consequence, generally means that the entire round is not all removed by the end of the shift, leaving some near the face. When the machine men arrive, they will be delayed, and it will be necessary for them to shovel back from the face on account of their not having a clean set-up. If the turn sheets have been forgotten, the mucker may not have the proper kind of shovel, and so be handicapped in his work.

The Value of Time Studies

The following time studies are examples from a number made to obtain an accurate record of the distribution of the miners' time and to ascertain the proportion of the shift spent in actual drilling.

TIME STUDY—DRILLING HOLES 5 FT. DEEP IN HARD PORPHYRY

Distribution of Driller's Time	Minutes	Per Cent.
Walking to working place	5	1.0
Hunting blocks and putting up bar	50	10.3
Putting up clamp and machine	11	2.3
Building staging	3	0.6
Connecting hose	9	1.8
Adjusting clamp and arm of machine	17	3.5
Machine out of order, changing, and procuring new machine	118	24.3
Drilling	103½	21.3
Changing steel	36½	7.5
Oiling	7	1.4
Picking ground	1	0.2
Cleaning plugged steel	2	0.4
Talking	4	0.8
Lunch	35	7.2
Drawing out steel	2½	0.5
Moving machine for new holes	56½	11.6
Looking for tools	1	0.2
Tearing down machine and column	3	0.6
Cleaning out drift	2	0.4
Blowing out holes	4	0.8
Loading	11	2.3
Cutting fuses and spitting	3	0.6
Total	485	99.6

TIME STUDIES ON DIFFERENT GROUND

	A		B		C		D	
	Min.	Per Cent.	Min.	Per Cent.	Min.	Per Cent.	Min.	Per Cent.
Drilling	102.8	21.4	88.3	18.4	99.3	20.7	64.5	13.4
Loading	7.9	1.6	20.5	4.0	11.4	2.3	17.8	3.7
Cutting fuse and spitting	6.4	1.3	2.5	0.5	4.2	0.9	8.1	1.7
Setting up, oiling, hunting tools, changing position, lunch, etc.	362.9	75.7	368.7	77.1	365.1	76.1	389.6	81.2
Total	480.0	100.0	480.0	100.0	480.0	100.0	480.0	100.0

Note—*A* was drilled in very hard ground, consisting mostly of silica and pyrite; *B* in medium hard ground, principally limestone; *C* in oxidized limestone, and *D* in hard silicified limestone.

After averaging the figures recorded, it was found that only about 20% of the miner's time was spent in actual drilling, 3% in blasting, and the remaining 77% in searching for tools and supplies, or, in other words, "preparing and quitting."

STANDARDIZATION OF OPERATIONS

The studies show that by far the larger part of the miner's time is not spent in productive labor, even though his efforts are equivalent to the energy expended in a good day's work. The aim of standardization of drilling operations is to eliminate waste efforts so far as possible, and to make a large proportion of this 77% of the miner's time as productive as that spent in actual drilling.

When a drift is to be driven, the shift boss should look over and carefully examine the face during the preceding day. He should then instruct his tool "nipper" to assemble the entire equipment on the car designed for that purpose and take it to the working place before the miner comes on shift. He should also see that turn sheets are laid at the face. Then, when the miner arrives he finds everything ready. All that is necessary is to set up his machine, make air and water connections, and begin drilling.

By this time the shift boss makes his visit and inquires regarding the number of holes and type of round to be drilled. If the miner has previously received instruction in drilling other drifts in this particular mine, he will be able to satisfy the boss as to the kind of round he is preparing to drill; but if he is not familiar with the type which has become standard, the shift boss sends the drill instructor to him, who helps him in drilling a standard round. This should be the same under all circumstances, with the exception that in soft ground some of the holes around the edges of the drift are omitted, whereas in hard ground the number is increased. If a ditch is necessary, one of the lifters should be kept down. Great care should be exercised in having the drift kept on lines, and a uniform grade should be maintained wherever possible. It is also important that the air pressure be kept up, in order that the machines may do effective work.

If, in the course of drilling, the machine should get out of order, or the supply of steel run low, the miner may obtain a new machine and a fresh supply of steel from the tool house on the same level, where a surplus should always be on hand, so that he may not be delayed longer than is absolutely necessary. The old machine should be taken back to the tool house and checked in before the new machine is taken out. This provides for a perpetual inventory of all such equipment. The man in charge of the tool house, who is also the powder man, sends the machine to the repair shop, either on surface or underground, as the case may be.

All machines require oiling from time to time during the shift, and a can filled with proper machine oil should be included in the equipment on the tool car. The injurious effects of constant oiling through the air hose should be explained to the miner, and he should be instructed to pour the oil into the receptacles designed for that purpose.

Having drilled the round, the miner disconnects the air and water lines, tears down the machine, loads the outfit on the tool car and pushes it back into a siding, where it should remain if he is to drill in the same face the next day. On the following shift, the contents of the car should be checked over by the tool "nipper," who exchanges dull steel for sharp, refills the oil can, looks over the equipment and sees that everything is complete. The ventilating pipe near the face should next be removed, and the miner should see that sufficient turn sheets have been properly laid.

THE USE OF EXPLOSIVES

The miner then clears the holes with his blow pipe, takes his powder and fuse sacks, and goes to the powder magazine, where he is supplied with the number of sticks of powder and capped fuses for which the order he has previously obtained from the shift boss calls. The powder man also gives him a supply of stemming to be used in tamping the holes. He places all these things in the sacks provided for the purpose, and then returns to the face and starts loading, being careful to use a wooden tamping stick, and to slit the paper covers on the sticks of powder (except in the case of wet holes), so that in forcing it in he will eliminate all air spaces. Having placed the powder and primer in the holes, he fills the remainder of the space with stemming to within about 6 in. of the collar, and thoroughly tamps it, taking care, however, not to damage the fuse. When ready to spit the fuse, he calls another miner to his assistance and lights the fuses, igniting them *in the order in which they should be fired*, which is usually the cuts first, then the side holes, back holes, and, finally, the lifters. Having done this, he leaves the face and waits at a safe distance to count the shots, seeing that no one enters the working place. The number of missed holes is then chalked on the blackboards placed for that purpose for the information of the next shift.

It usually takes the miner the entire shift to drill, load, and fire a 6- or 7-ft. round in a drift 5½ ft. wide by 8 ft. high, in average ground. With the use of the standard round, described in a previous article, this depth of ground has been blasted consistently for periods of 15 consecutive days. In smaller drifts, such as 4 x 6 ft., it is not practicable to use as deep rounds as in the large drifts, and consequently it will not take the miner a full shift to drill a small round under average conditions. Consequently, wherever possible, two working faces, near each other, should be chosen. The miner in this case, having drilled a round in one face, can tear down and set up in another; and it would be entirely possible for him to drill, if not two whole rounds, at least a round and a half. In this event he would, of course, leave the loading and firing of the first round until near the end of the shift.

CLEARING THE FACE AND TIMBERING

The mucker, when coming on shift, should get his complete equipment from the tool house on the level where he is to work. After completing his shift, if he is to continue working in this particular place, this equipment should be left in the drift until he comes on shift again. When the tool "nipper" makes his rounds, he should look over the mucker's outfit at the time he inspects the miner's tool car, and replace the dull picks with sharp ones and make other necessary adjustments. It is the mucker's duty before going off shift to see that the turn sheets are laid near the face. His work should be planned beforehand by the shift boss, who arranges for cars, the transportation and destination of the waste, and does everything possible to facilitate the work, so that when the driller comes on shift the next morning he has a clean place in which to set up and drill.

Mine cars should be light and easily handled, and the track carried as near the face as possible in order to avoid unnecessary shoveling. Tracks, ties and rails should be standardized as far as practicable.

If the drift requires timbering, it should not be arched; but, generally, three back holes are needed to square it up so that timbers can be put in without extra plugging. The timber man as a rule is not put in the drift until the face has progressed 30 or 40 ft., but sometimes it is necessary that the timber be kept up close to the face. In general, the timber man should get his timbers at the timber station on the level and take them to the drift in question. He usually has a helper to assist him in setting them up; and, as they are all of standard size for this character of drift, they require no cutting underground.

DETAILS OF RAISE DRILLING

The operations connected with the drilling of raises may be standardized along lines similar to those described in driving drifts. The miner should find his equipment waiting for him; and, soon after taking the machine and necessary parts up the raise, should be ready to begin work. The shift boss should outline the work and see that the driller is prepared to put in the standard round for raises. If necessary, the drill instructor should be sent to his assistance. When rounds have been drilled, loaded, and fired, and the rock has been drawn down the raise far enough to be out of the way, the back of the raise being about 12 ft. above the floor, it is necessary to put in a set of timbers. In timbering, the principle of putting in standard sets should be followed, carrying up a standard raise with chute, manway, and timber compartment as far as practicable.

These standardized operations apply equally well to stoping, inasmuch as stoping operations are usually, in the broad sense of the word, a combination of both drifting and raising, followed by timbering, with or without waste filling.

Provision should be made for good ventilation in all drifts, raises and stopes; and, where necessary, blowers with ventilating pipe should be installed to keep a supply of fresh air at the working face.

The night-shift bosses should come early enough to consult with those on the day shift, so that they may plan the work intelligently before the men arrive; and when going off shift should leave a complete record of what has been done during the night, in order that the day bosses, when they come on shift, may continue the work without delay.

THE IMPORTANCE OF COÖPERATIVE EFFORT

A continuous repetition of the above operations forms the basis of prospect and development work; but, that it may proceed smoothly and without serious interruption, many other matters should receive consideration. The personal equation is one which should not be overlooked. The attitude of the shift bosses and foremen should be such that they can maintain discipline, but at the same time have the full coöperation of the men. It is impossible to produce the best results unless harmonious relations exist.

The shift boss should make a study of each man to learn the particular class of work for which he is best adapted. One man may be especially fitted for raising; another may do better at drifting, timbering, or some other detail in mining. It is sometimes necessary to change a new man around until he has been finally placed in the right job; but frequently mistakes are committed by bosses who make a practice of changing men around constantly, thereby preventing their making the showing possible were they permitted to become thoroughly familiar with one particular working place.

THE LABOR TURNOVER PROBLEM

One of the economic wastes in mining is in hiring and discharging men—a problem which has not, as yet, been satisfactorily solved. An endeavor is being made at several camps to eliminate this expense by having a central employment office. In case a man does not make good in the division in which he is first placed, he is sent back to the employment office, where he obtains a transfer and is tried out under another foreman. This practice is continued until he either finds the work for which he is suited or is discharged as incompetent to hold a job. In the majority of camps, however, though the hiring is done by the central employment office, the discharging is left entirely to the individual judgment of the bosses. With this system the bosses should, and in many cases do, receive specific instructions to discharge a man only for absolute inefficiency or for conduct contrary to company rules.

Experiments in various forms have been tried out in order to provide an incentive for additional footage over and above that made on day's pay by the average miner. One plan was the contract system; whereby a man was paid so much per foot, regardless of the total footage. Another was the bonus, which guaranteed a day's pay to every man, and at the same time compensated him for any additional footage made over and above the average.

TIME STUDIES LEAD TO MUTUALLY ADVANTAGEOUS RESULTS

To arrive at something which might be considered a basis for an equitable bonus system, time studies were made in drilling the standard round, to determain what would constitute a fair day's work. By this is meant not the maximum amount of work produced by the exceptional driller, but that which can be produced by the average man using standard methods.

The purpose of time studies is to furnish the necessary information upon which a day's work may be planned and an efficient system built up, and it is not intended to speed up the men or to induce them to work any harder. As may be seen from the few time studies given in this paper, the miner who puts in a round of holes by drilling 20% of the time, and spends the remainder in obtaining tools and supplies, would not work any harder if he should put in 40% of the time drilling, complete two rounds, and have all equipment and accessories brought to him.

In the minds of the men, unfortunately, the idea of time studies is so closely associated with "speeding up the work" that they are inclined to look upon them with suspicion, and much good which might be attained is therefore lost. This prejudice on the part of the miners to stop-watches and time studies has some foundation, because many of those who have made time studies have been novices at the work themselves, and the bosses, not understandng the principle underlying these studies, proceeded to order the men around and speed them up. This has greatly retarded the work which might have been accomplished by these methods.

One of the principles adopted by the National Industrial Conference Board for the period of the war was that "maximum production should be maintained, and anything which interferes with it or tends artificially to increase the cost of production is discouraged."

This is well stated. Only by the use of time studies and cost sheets is it possible to arrive at the various weaknesses in underground mining systems. Until these weaknesses have been discovered and eliminated, it is impossible to operate with the highest degree of efficiency, which means maximum production; and until definite figures for a fair day's work have been ascertained, no satisfactory bonus system can be evolved.

After the deficiencies in the different underground systems have been fully brought to light, and a definite program has been outlined for the miner, it will be far better for him personally, as well as for the company, to make a good showing; for in this way the cost of mining will be lowered, more low-grade ore will be made commercial, and the life of the mines thereby increased. The company will be in a position to pay a substantial bonus to the man who has gone through a course to make his average day's work an achievement in which every move has been made to count.

Burma Corporation, Ltd.

The annual meeting of the Burma Corporation, Ltd., controlling Burma Mines, Ltd., through the ownership of 721,813 shares out of 724,577 issued, was held on Nov. 18, 1918, and at it the report for the year ended Dec. 31, 1917, was presented. Profits of the Mines for the year were £144,108, against £58,155 for the previous year. The entire amount was then advanced to Burma Mines, Ltd., to meet capital expenditures. The Corporation had other income from interest and transfer fees of £37,314 and general expenses of £22,898, carrying forward a profit of £181,423 for the year. The Corporation therefore shows on its balance sheet "shares and interests in and advances to subsidiary and connected companies" (at cost) amounting to £1,277,339 and current assets of £118,092. On the other side are current liabilities of £226,683; 6% debentures, £14,410; 963,749 shares (907,514 full paid at £1), £953,439; premium on shares, £3,108, and a profit-and-loss balance of £197,791.

No such summary, however, sufficiently indicates the wide activities of Burma Mines, Ltd. The most interesting point, possibly, is the decision to erect a zinc-distilling and sulphuric-acid plant in India, with the aid of the Indian government. The terms under which that government will advance £200,000 at 5½% are roughly as follows: A new mining lease will be given running for 30 years and providing royalties of from 2½ to 30% of the value of the ore at the shaft-collar. The interest is to run during construction, and the loan is to be on a first mortgage on the new plant, secured by collateral by the Burma Corporation, Ltd., to be repaid after 10 years in five annual instalments. The company is to enter into no arrangement tending to any monopoly in the products of its new works, and, while any of the loan is outstanding, the Indian government may purchase its own requirements at prices as low as those given to any purchaser.

Shipments from the mine amounted to 78,750 tons of ore in 1917, against 47,588 in 1916, and 2819 tons of washed slag and 210 tons of barytes were sent to the smelting plant in 1917, against 18,492 tons of slag in 1916. Refined lead production increased from 11,088 tons in 1916 to 16,957 in 1917, and silver from 105,603 oz. in 1916 to 1,525,844 oz. in 1917. (For the first half of the current year production was 10,387 tons of lead and 1,128,310 oz. of fine silver, showing a further increase in production.) At the close of 1917, ore reserves were estimated at 4,138,000 tons, assaying 24.6 oz. Ag, 27.2% Pb, and 18.9% Zn, against 3,644,000 tons of practically the same tenor at the end of 1916. (As of June 30, 1918, ore reserves were estimated at 4,299,888 tons.)

In the Bawdwin mines 6735 ft. of development work was completed in 1917, as compared with 8216 ft. in 1916. Geological studies point to the Shan lode and the Chinaman orebody as being the same, separated by the Yunnan fault. The ore is classified as follows: Lead-zinc ore, 4,033,000 tons, 24.7 oz. Ag, 27.4% Pb, 19.1% Zn, 0.4% Cu; copper ore, 105,000 tons, 21.0 oz. Ag, 19.9% Pb, 8.8% Zn, 8.9% Cu. In computing ore reserves a minimum figure of 20% lead plus zinc is assumed, although experiments indicate that much ore below these limits may prove profitable. Rill stoping is now practiced where feasible; elsewhere the square-set method is used.

Laurence Addicks has been retained as consulting metallurgical engineer, and the milling process has been fully reported on by him.

Registering Engineers in Service

The professional division of the U. S. Employment Service is endeavoring to assist experienced technical ment of the Army and Navy to find places in reconstruction work. Officers and men released from active service are being registered with the division, and placed in touch with those employers who can best make use of their services. The record of each man is carefully investigated before registration is permitted. Communications should be addressed: Professional Division, U. S. Employment Service, 16 East 42d St., New York, N. Y.

Barnes-King Development Co.

The quarterly report of the Barnes-King Development Co., covering the months of July, August and September, 1918, shows that 5580 tons of ore from the North Moccasin property was milled, 3449 tons from the Piegan-Gloster property, and 5924 tons from the Shannon property. Grade of ore treated and metallurgical recoveries are not given. Favorable developments are reported as continuing in the Shannon mine. The total earnings for the period amounted to $73,556.86, indicating a net profit of $55,703.77. Dividends amounted to $40,000.

Australian Transport Facilities

BY ROBERT SLESSOR

In the Commonwealth of Australia the question of efficient transportation is of national importance. Unfortunately, interstate jealousies and other inexplicably petty hindrances have retarded progress in this direction. Insular policies in railway engineering resulted in the adoption of no less than three distinct gages on the different state railway systems. Our contributor discusses sea and land transportation and its effect on the Australian mining industry; forecasts the greater size of future cargo ships, and points out that increased port facilities will be necessary. Now that Australia has entered the ranks of the steel-producing countries of the world, an additional incentive for development is at hand.

PRODUCTION and realization costs of Australian base metals are greatly influenced by domestic transport conditions. The long Australian coastline provides facilities for numerous ports, whence, with proper handling and railway equipment, goods could be cheaply shipped. A glance at a complete Australian railway map shows that only in Queensland has any systematic attempt been made to develop coastal ports and the country behind them. Considering the coast line from Cooktown, in North Queensland, to Geraldton, in West Australia—along about 5000 miles of the most inhabited parts of the commonwealth—there are only about 25 ports with railway connections, apart from the five state capitals. Of these, Queensland has 15. The sixth state, Tasmania, being a small island, is well served with numerous ports, each connected with railways.

RAILWAY GAGE DIFFERENCES COMPLICATE TRANSPORTATION PROBLEMS

Intercolonial communication is cheaper by sea than by land, even with the present abnormal sea freights; and this is attributable to the break of rail gages. The only long navigable waterways are the River Murray and its tributaries. These waterways, not being locked, are navigable only for small boats during flood time.

The subject of the breaks of gage in Australian railways has been written threadbare. Owing to state jealousies before federation, a mixture of broad (5 ft. 3 in.), standard (4 ft. 8½ in.) and narrow (3 ft. 6 in.) lines has resulted, that renders intercolonial transport slow and expensive. Whether a system of privately owned railways, instead of all state lines, would have resulted in better communications is now too late to discuss. The commonwealth railway policy is to gradually obtain lines of standard gage from east to west and north to south. The recently completed line from Port Augusta to Kalgoorlie is of standard gage and the idea is to eventually connect Brisbane with Perth by a standard line.

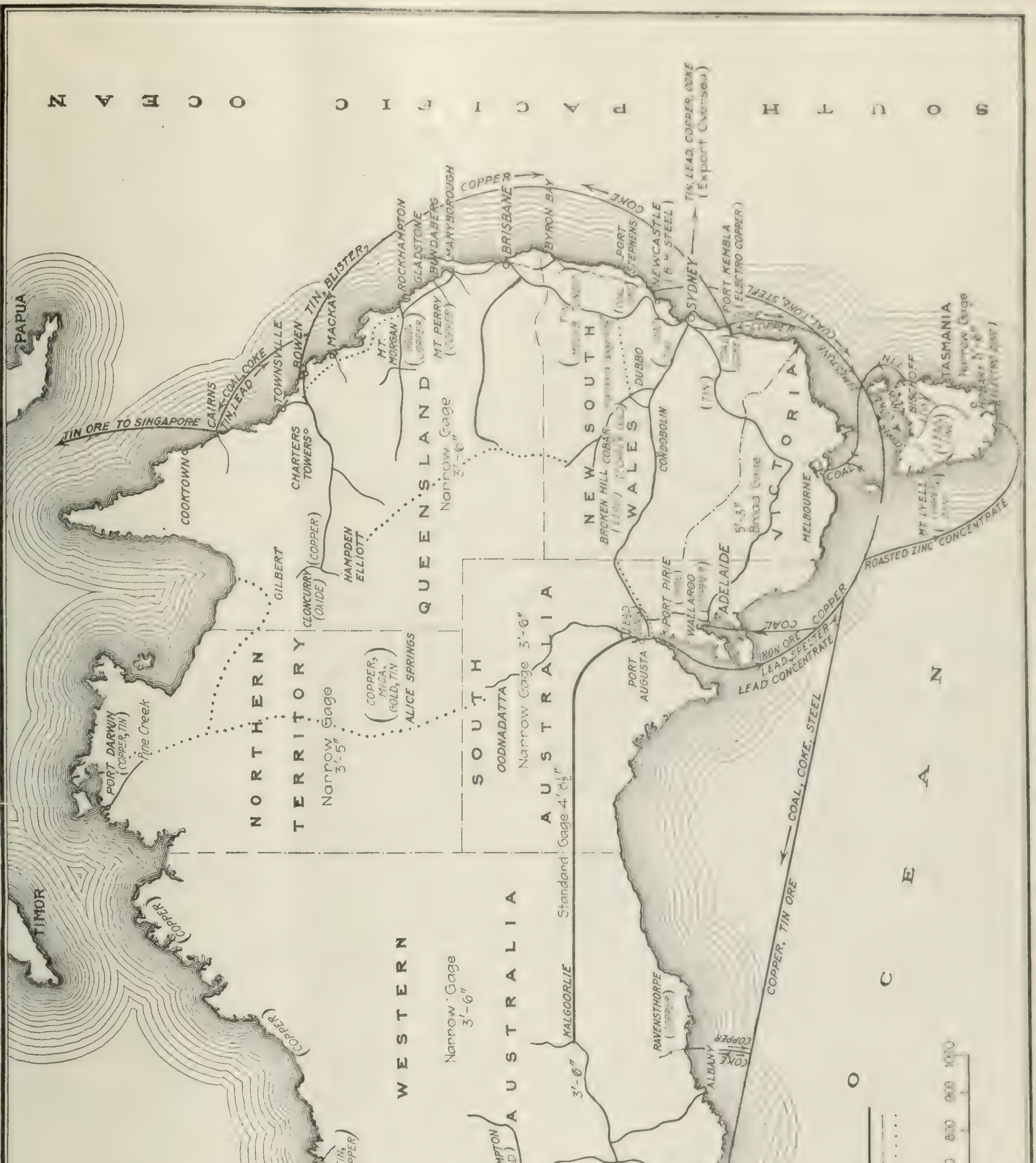
The Brisbane-Wallangarra-Werris Creek-Dubbo-Condobolin - Broken Hill - Port Augusta - Kalgoorlie - Perth route is incomplete, so far as construction is concerned, by 1000 miles. Of this, however, a distance of about 650 miles is traversed by narrow-gage lines which only need alteration to conform them to the standard. Meanwhile, a route is proposed from Brisbane, via Richmond Gap, to join with the New South Wales north-coast line, and so via Condobolin, to Broken Hill and Port Augusta. This would necessitate only about 200 miles of narrow-gage alteration between Broken Hill and Port Augusta and the building of about 200 miles of standard-gage track. The line from Condobolin to Broken Hill is constructed for 120 miles, and this connection must be made in order that goods may be sent from Sydney to Broken Hill by rail.

BROKEN HILL SUPPLY FREQUENTLY TRANSSHIPPED

The present route for the necessary coal supplies to Broken Hill is by sea from New South Wales to Port Pirie, and thence by narrow-gage rail to the Hill. Trouble with the coal lumpers at Pirie has resulted in partial suspension of operations at the Broken Hill mines. The completion of the Condobolin-Broken Hill line would make it possible to send coal from Lithgow or Newcastle to the Hill, and to bring back lead and zinc concentrates. The pre-war cost of shipping these to Sydney and Newcastle via Pirie was about 20s. per ton and, with the probable shortage of ships after the war, it may be cheaper and quicker to send these ores by rail. The chief mineral products to be transported annually are: Coal, 8,500,000 tons; coke, 450,000 tons; lead concentrate, 200,000 tons; zinc concentrate, 450,000 tons; iron ores, 250,000 tons; copper ores and blister, 60,000 tons; tin, molybdenite, tungsten and other minerals, somewhat less than 5000 tons. Besides these, timber, machinery, fluxes and other materials are required by the base-metal mines and works. Of a total of about 10,000,000 tons to be moved in connection with the mineral industries, approximately 4,000,000 goes by sea, and the remainder by rail. With a post-war continuance of shortage of ships, the outlook for cheaper transport is not bright. More ports should be opened by building interior railways, and these must be constructed on a broader and more scientific plan, and selfish interests must be disregarded.

STANDARDIZATION OF RAILWAYS IMPERATIVE

The railway problem, of course, is of greater importance in Australia for the pastoral and agricultural industries than for the mineral industries. The question has been ably discussed in papers on the commonwealth railway policy, published by the Victorian Institute of Civil Engineers. The internal transport problem is also bound up with that of overseas imports and exports. During the next decade it is likely that oversea ships will be exceptionally large and of very deep draft. They will probably stop at only one or two suitable ports, and tranship to a number of smaller boats running to the other ports. Only a few ports in Australia can take vessels of exceptionally deep draft. These are Gladstone, Port Stephens, Hobart, and Albany. None possess facilities for quick handling of cargo such as are found in European and American ports.



MAP ILLUSTRATING MAIN LINES OF MINERAL TRANSPORT IN AUSTRALIA

Operations at the base-metal mines are restricted by high transport costs on imports of coke and coal, and on exports of lead and copper. Cloncurry, North Queensland, being the most remote region from present coke-making centers, may be taken as an example. This district is today the largest copper region in the country, and the one that gives the most promise of future development. Coke costs about £5 per ton there, yielding, on burning, from 12 to 18% ash, and the average price at the ovens, in 1917, was 25s. It therefore costs 75s. to carry one ton of coke from Bulli, New South Wales, to Cloncurry, North Queensland, about 2000 miles by rail and sea; and this cost is in addition to the loss arising from high wastage due to several handlings. Coke in 1913 averaged 14s. per ton at the ovens, whereas coal was 6s. 8d. per ton, in 1913, and 16s. per ton, in 1917, at pit (1917 report of the New South Wales Mines Department).

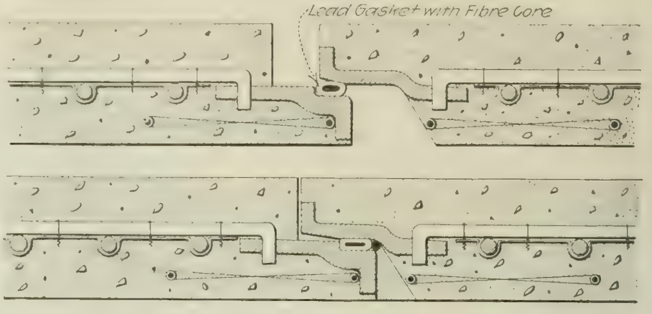
The future of the Cloncurry mines would seem to be bound up largely with the successful use of wet mills, and leaching in large central plants, together with production of fire-refined copper at suitable places, such as at Bowen. The selection of improved methods can well be left in the hands of those now at the head of the base-metal mines. At Lyell, Mount Morgan, and Wallaroo, increased attention is being given to milling, flotation, and leaching at the plants already at work, in anticipation of utilizing the low-grade ores, whereas Broken Hill and Port Pirie still lead in milling and smelting the lead ores.

Now that Australian steel works can provide excellent material, the state and federal government can cheapen land and sea transport by building more railways and ships. The cheapening of coke and coal, and the improvement of labor efficiency, are the harder problems.

Joint for Concrete Pressure Pipe*

The need of steel and iron for war operations has attracted attention to the varied uses of concrete. Reinforced-concrete pipe is now used for water lines in which it is necessary to provide for considerable pressure. Variations in temperature demand proper provision for contraction and expansion.

The Lock Joint Pipe Co., of East Orange, N. J., has developed a joint for reinforced-concrete pressure pipe, details of which are shown in the accompanying illustrations. The bell and spigot ends of the pipe have cast-iron annular rings, previously faced to a true circle on those parts which come in contact with a lead gasket used to seal the joint. This gasket consists of a thin round lead pipe into which has been drawn a fiber core compressed by the act of drawing. The pipe gasket is then flattened by passing through suitable rolls turned into a circle, and soldered to the exact diameter required. The gasket is placed in the bell end of the pipe just previous to the insertion of the spigot end of the adjoining pipe, as shown in the upper of the sketches. As this spigot is pressed home, it compresses the gasket until the latter occupies the shape and position shown in the lower sketch. In this way, one side of the gasket is forced against the square shoulder and into a partly dovetailed space, thereby producing a greater thickness of gasket at this point than at the other edge nearest the outside joint. This extra thickness prevents the gasket from being withdrawn from its seat when the pipe contracts as a result of a drop in temperature.



JOINT FOR REINFORCED-CONCRETE PRESSURE PIPE

This system has been tested to 110 lb. hydraulic pressure per sq.in., the pipe joint opened as would be the case if the pipe contracted, the pipe deflected as much as 7°—all changes while under pressure—without developing leakage.

Negligence Imputable to Employer

By A. L. H. Street*

In the process of rewinding the cable of a mining hoist on the drum, a hoistman loosened the clutch band which acted as a brake. After the cable was rewound, the clutch band was not tightened by him, nor by the hoistman who came on duty with the succeeding crew. Plaintiff's husband was a member of the second crew, and when the second hoistman undertook to lower him and other miners in a bucket, the cable unwound so rapidly that the men were placed in peril, owing to improper adjustment of the clutch band. Realizing the imminence of peril, plaintiff's husband grasped a beam in the shaft, from which he fell to the bottom, and was killed. The other men were saved through a stopping of the cable before the bucket reached bottom.

Plaintiff sued the employing mining company for damages, and recovered judgment before the United States District Court for the District of Idaho. Affirming this judgment the United States Circuit Court of Appeals, Ninth Circuit, holds that the jury was warranted in finding that decedent was not guilty of contributory negligence in attempting to escape from the peril to which he was exposed, and that negligent failure of the hoistmen to have the clutch band in proper condition before the men were lowered in the bucket must be attributed to the employer, who rested under a non-delegable legal duty to provide reasonable safe appliances where the safety of his employees was involved (Witkouski *vs.* Consolidated Interstate-Callahan Mining Co., *249 Federal Reporter, 833*).

The Enormous Strength of Ferro-Concrete has been frequently demonstrated during the war. Steel cupolas have often been blown to pieces by means of high explosive shells, whereas ferro-concrete has escaped serious damage. In one part of Northern France a reservoir 80 ft. long by 40 ft. wide and 12 ft. deep and supported on slender pillars was subjected to gunfire. The columns were blown away and the reservoir fell to the ground, escaping injury except for a few holes and cracks.

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*Excerpt from "Concrete in Architecture and Engineering."

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Taxation of Land and Underlying Deposits

BY CHESLA C. SHERLOCK*

LAND is the most common basis for taxation, and it has long been recognized that the ordinary taxation of the surface carried with it the taxation of the entire property, extending to a vague point somewhere near the center of the earth.

Modern mining practices have injected complications into this theory. It is not infrequently found that the owner of the surface is one person and the owner of the mineral deposits under the surface another. The owner of the surface may be a farmer and have no interest in the deposits of mineral that lie beneath the surface. He may have conveyed all this interest to another person.

Naturally, in such a situation, the contention would be raised by the owner of the surface that it was unfair for him to have to pay taxes on the mineral interests owned by another. Furthermore, the mineral interest might greatly increase the assessable value of the tract. Was it fair to allow the owner of the mineral to escape payment of taxes, and to require the owner of the surface to be assessed in proportion to the value of the material under the surface which did not belong to him?

The courts readily realized that the old theoretical division of land, by vertical planes, was unjust in such cases. In many instances it worked a substantial loss on the taxing power, because of the inability of the taxing authority to assess and tax the mineral matter separately and independently.

The courts had previously held that two persons might, at the same time, be the owners of real property in the same division of land, in conformity with the governmental description; that it was possible for the owner of the surface to sell, grant, and convey the mineral deposits under the surface to another, and that such a conveyance would vest an estate in the purchaser of such mineral deposits.

Having reached this conclusion, it was not illogical for the courts to hold that it was possible to divide land horizontally as well as vertically—that one person might own the surface and another the minerals under the ground; and that each estate was subject to taxation (Northern P. R. Co. *vs.* Mjeld (1913), *48 Mont. 287, 137 Pac. 386*).

It is a well-settled rule of law that the fee in the mineral may be severed from the fee in the surface, by properly executed instrument, and that when this has been accomplished the separated interests may be assessed and taxed to each owner as real property.

In this connection the following cases may be referred to as authority: Re Major, *134 Ill. 19, 24 N. E. 973;* Sholl Bros. *vs.* People, *194 Ill. 24, 61 N. E. 1122;* Stuart *vs.* Com., *94 Ky. 595, 23 S. W. 367;* Smith *vs.* N. Y., *68 N. Y. 552;* Logan *vs.* Washington Co., *29 Penn. 373;* Sanderson *vs.* Scranton, *105 Penn. 469;* Waterman *vs.* Davis, *66 Vt. 83, 28 Atl. 664;* Low *vs.* County Court, *27 W. Va. 785.*

The real difficulty does not seem to be present in a clear-cut case where the mineral in the estate has been absolutely granted to another, but arises in determining whether a separate estate has been created in the mineral, or only a lease made, and the absolute estate in the mineral retained by the owner of the surface.

Where the instrument conveying the right to the minerals in the land is construed as a mere lease, which does not dissever the fee in the mineral from the fee in the soil or surface, it may, by reason of local statute, be taxed as personal property, but it cannot be taxed as real property. Such was the decision in a case where the instrument was construed to be a mere lease and not a conveyance of the mineral *in situ* (Jones *vs.* Wood, *9 Ohio C. C. 560;* also *54 Ohio St. 627, 47 N. E. 1119*).

In a Vermont case, an instrument giving a person the right to enter upon land, and open and test slate rocks, and, if suitable material were found, to manufacture roofing slate therefrom until the rock was exhausted—such party agreeing to pay a specified rent, and the owner of the land reserving all that is not needed for working the quarry—was held to be a lease creating no interest in land which is taxable to the lessee as such (Hughes *vs.* Vail, *57 Vt. 41*).

In a Federal case it was held that the conveyance of a fractional undivided interest of oil, gas, and other minerals under a tract does not sever the ownership of the minerals *in situ* from the title to the soil, and is, therefore, not subject to separate assessment as real estate (Barnes *vs.* Bee, *138 Fed. 476*).

The manner in which the severance of the fee in the mineral from the fee in the surface is accomplished is immaterial. It may be either by deed or by lease. This view was not always entertained by the courts, however, and it was formerly thought necessary to have the severance by deed only.

In a Kentucky case, the court said: "It is contended, however, that the oil *in situ*, being a part of the realty, cannot be severed therefrom except by deed. It is admitted that the leases held by the appellees are of the usual kind. They give to appellees the right to drill and operate for oil and gas for a definite term of years; and in case oil or gas is found in paying quantities, to continue said operations so long as same is found in quantities that pay. . . . Why, then, say that a deed is necessary to sever the oil from the realty, when the lease accomplishes the same result? During the continuance of the lease the ownership of the oil or gas is vested in the lessee; and, as the lease continues so long as oil or gas may be found in paying quantities, does not the lessor part with his title to the oil *in situ* for all practical purposes? We therefore conclude that the form of contract is immaterial, and that it makes no difference whether the oil or gas privileges be conveyed by deed or lease, so long as the effect of the instrument is to vest in the lessee all property rights to the oil or gas that may be found in paying quantities on the leased premises" (Wolfe County *vs.* Beckett, *105 S. W. 447*).

There is no question that interests of this nature are taxable, but the dispute arises as to whether they are taxable as land or as personal property. Said one court:

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"The owner may convey any part of real estate. He may convey some particular deposit or stratum, and retain the surface; or he may convey a part or all of the mineral strata or deposits, and retain the surface. Such strata or deposits are land." It follows that, if they are land, they are taxable as land.

Where the right to the minerals is granted for a fixed term, there seems to be no issue so long as the interest granted is land, whether the grant be by deed or lease. Said one court: "The minerals and the surface interests may, by separate conveyance, become separate pieces of real estate, and held by different persons; each estate may be separately seized and sold by execution; and each may be defeated by the statute of limitations as any other real estate. The mineral estate when severed by conveyance, being separate real estate, may be taxed as other real estate" (Kincaid *vs.* McGowan, *88 Ky. 91, 13 L. R. A. 289*).

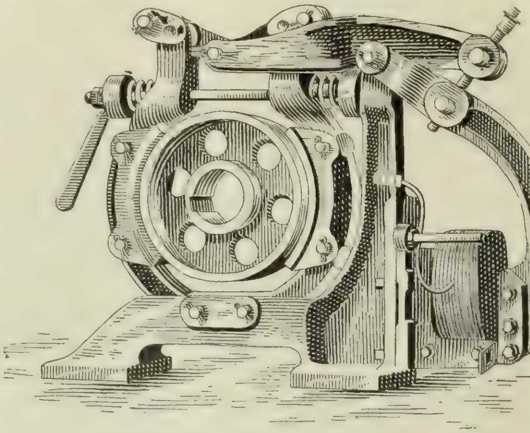
In a Minnesota case, the question arose as to what land was included in the description used in the tax proceedings. Said Justice Vanderburgh: "The title of each party being of record, it will not be presumed that the separate property of the different parties is embraced under one general description in tax proceedings, if the same may be applied and limited to the land of one, and not to that of the other. The description, when applied to the subject matter . . . is susceptible of the construction claimed for it by the defendant. An opposite construction would be misleading . . . and ought not therefore to be upheld."

The effect of this is not to include the mineral rights; and a judgment against the surface owner, under a tax proceedings, cannot be held to have included therein the land of the owner of the fee in the mineral. As one court said: "It is nevertheless true that the land of one person should not pay the taxes that ought properly to be paid by the land of another. The judgment in the tax proceedings does not affect the mineral estate of plaintiff, because that estate was not described in the proceedings" (Washburn *vs.* Gregory Co., *125* Minn. *491, 147* N. W. *706, 1914*).

New Design of Magnetic Brakes

The principle of the type of magnet which has been successfully incorporated in the design of magnetic controllers by the Westinghouse Electric and Manufacturing Co., of East Pittsburgh, Penn., has been employed by the company in a new design of magnetic brakes, just developed for use with mill, crane, and hoist motors. The use of a clapper-type magnet eliminates all movable parts within the coil, and the consequent wear, sticking, or damage to insulation.

The new brake is markedly quick in operation. It responds by an almost instantaneous release when the power is applied. This is attributable to the design of the operating magnet, which gives high initial pull and a small distance of travel (¼ to 1 in.). When voltage is impressed on the motor, the magnet is energized and the armature lever overcomes the pressure of the compression springs through a toggle, and releases the brake-shoe grip on the brake wheel. While the magnet remains energized the brake wheel is allowed to rotate freely. As soon as the current is shut off from the motor, the brake magnet releases, and the compression springs force the shoes against the brake wheel and bring the motor quickly and smoothly to rest without shock or jar. The compression exerted by the springs can be easily adjusted so that any holding or retarding torque, up to the full capacity of the brake, can be obtained for equal braking effort for both directions of rotation. Simple means for making adjustment for shoe wear are provided.



WESTINGHOUSE MAGNETIC BRAKE

In case adjustments for shoe wear should be neglected, a safety feature has been introduced which assures that the magnet will not release the grip on the brake wheel. This insures proper brake operation and the elimination of accidents due to the slippage of the brake wheel. The simplicity and accessibility of the few parts of the brake are shown in the illustration.

British Iron and Steel Prices Regulated

The Minister of Munitions in Great Britain is fixing export prices of pig iron applicable to all exports while existing maximum prices for home delivery remain in force, Consul General Skinner cabled from London on Dec. 3. New maximum prices are also being fixed for steel for delivery in the United Kingdom from Feb. 1. The ministry stated that though the government was practically sole purchaser of iron and steel products, prices were stabilized by paying direct to makers a subsidy representing increased costs due to war conditions. As the government no longer is sole purchaser, it is desirable to place the industry on an economic basis, but because the immediate withdrawal of all subsidies would seriously prejudice the resumption of ordinary commercial work, the government has decided to remove them in two stages. Subsidies applicable to steel making will be removed Jan. 31; those applicable to pig iron will continue to Apr. 30. It is not intended that government subsidies should be used to enable exports to be made at less than full cost, and therefore the government will levy as drawback on exported iron and steel the difference between home and export prices.

Flake graphite was produced almost exclusively in Ceylon up till 1913, and the output averaged from 30,000 to 40,000 tons annually. Madagascar started in competition in 1907 with a production of 8 tons, which was increased by 1911 to 1246 tons, by 1913 to 6313 tons, and by 1916 to 25,489 tons. The Madagascar deposit is found distributed throughout an extensive crystalline schist formation covering an immense area, and the graphite reserves are said to be enormous.

The Elimination of Gelatinous Silica in the Hydrometallurgy of Zinc*

It is well known that in the hydrometallurgical treatment of zinc ores the presence of gelatinous silica, at certain stages of the process, interferes seriously with the efficiency of operations. Such troubles have been experienced at a number of metallurgical plants; and the following description of a new modification in treatment, invented by F. Laist, the manager of the Washoe reduction works of the Anaconda Copper Mining Co., outlines an interesting method of improving results by the elimination of this undesirable product. The last word, however, has not been said in this connection, and it is understood that further improvements in the process have been made since the filing of the patent applications.

A DESCRIPTION of procedure embodying the new Laist modified method of zinc recovery, whereby difficulties in treatment, arising from the presence of gelatinous silica, are overcome, and an increased yield of metal is obtained, follows:

Concentrates containing, for example, about 33% zinc, 8% lead, 20% iron and 6% insoluble matter, the last comprising about 4.5% silica and 1.5% alumina, are roasted in multiple hearth furnaces to oxidize the sulphides into oxides and sulphates. The roasted product, or calcine, is then leached with a solution containing 8 to 9% of sulphuric acid, this solution in a repetition of the process being the depleted electrolyte from the cells in which the zinc is electrolytically precipitated.

Usually, approximately five tons of leaching solution is used per ton of calcine. The resulting solution is then neutralized or nearly neutralized with calcine, and thereafter a small proportion of limestone is customarily added. The effect of this limestone addition is to establish a slightly alkaline condition in the liquor, and thereby to precipitate in gelatinous form any silica which has been dissolved during the acid treatment. Practically, it is necessary to effect complete precipitation of the silica at this point, as it will otherwise separate during later operating stages and occasion much trouble. The precipitation of silica may be rendered even more complete by adding to the pulp, after the limestone addition, a small amount of zinc dust. This reagent, either in the presence or the absence of copper salts, is effective for precipitating residual traces of dissolved silica. In the presence of copper salts the cement copper is, of course, the active reagent.

The above-described operations of neutralizing the liquid and precipitating the silica are conveniently performed in Pachuca tanks with thorough stirring. At this point the solution should carry at least 80% of the zinc content of the original calcine. The contents of the Pachuca tanks are now discharged into Dorr thickeners, and the thickened product, with the precipitated matter, passes to the filters. The filtrate, together with the overflow from the Dorr thickeners, is a zinc solution usually containing small amounts of copper and cadmium. These metals are precipitated by zinc in dust or other suitable form, and the solution is clarified by settling or filtration and passed to the electrolytic cells. The entering electrolyte is a neutral solution containing about 8% of zinc in the form of sulphate; the depleted electrolyte flowing from the electrolytic cells contains about 2% of zinc as sulphate, with about 8 to 9% of sulphuric acid, and is returned to the leaching tanks, as mentioned above. Lead anodes may be used, and the current conditions are preferably those which have become standard in this operation.

In the practice of the above-outlined process a filter cake is obtained which comprises the insoluble matter from the ore and the precipitated gelatinous silica. This is in the form of a wet cake, ordinarily containing 42 to 45% of moisture, which is, of course, a rich zinc-sulphate solution. It is impossible to wash the cake free from zinc with an amount of water within practicable limits, and the losses at this point may attain 15% of the zinc content of the ore.

Efforts have been made to reduce this loss by removing the leach liquor from the residue before neutralizing and while still containing about 0.5% of acid. The acid pulp was passed through thickeners and filters, and yielded a dry, sandy cake, containing only about 20% of moisture, and readily washed. However, the subsequent treatment of the acid solution with calcine, limestone, and zinc dust yielded an unworkable precipitate of gelatinous silica, this precipitate being slimy, slow-settling, and producing a cake containing up to 80% of moisture. The necessity of precipitating the gelatinous silica in presence of the sandy ore residue was therefore established.

According to the present invention, the mechanical difficulties due to the precipitation of gelatinous silica, as well as the excessive losses of zinc occasioned thereby, are avoided by proceeding substantially as follows:

The silica is precipitated in presence of the ore pulp, preferably in the manner first described above, that is, by successive additions of calcine, limestone, and zinc dust, if required, the latter either with or without copper salts. The subsequent operations of thickening and filtration are easily carried out in apparatus of standard type, but yield, as above stated, a filter cake of high moisture content.

This filter cake, which may be termed the "primary filter cake," and which need not be washed, is discharged from the press and dried or gently calcined at a temperature sufficiently high to effect dehydration of the silica, as well as the hydroxides of aluminum and iron, a temperature of about 150° C. being suitable. These compounds are thereby rendered insoluble in water or dilute acids, and are also converted into a granular condition which lends itself readily to filtration, the zinc remaining soluble. The dried residue is now leached with a sufficient quantity of acidified solution, so that, after the leaching is completed, a small excess of acid may remain. An 8% solution of sulphuric acid is suitable for this purpose.

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*Abstracted from specifications of Letters Patent Nos. 1,281,031 and 1,281,032, U. S. Patent Office.

The pulp is now settled or thickened and washed. The washing is readily accomplished in the filter, and the residue, termed the "secondary filter cake" is sandy or granular. The filtrate from the secondary filters, with the overflow from the secondary settling tanks, is acid, and is returned to the primary leaching tanks, being introduced, preferably, just before the final neutralization with calcine or limestone. This modification is illustrated diagrammatically in Fig. 1, shown herewith.

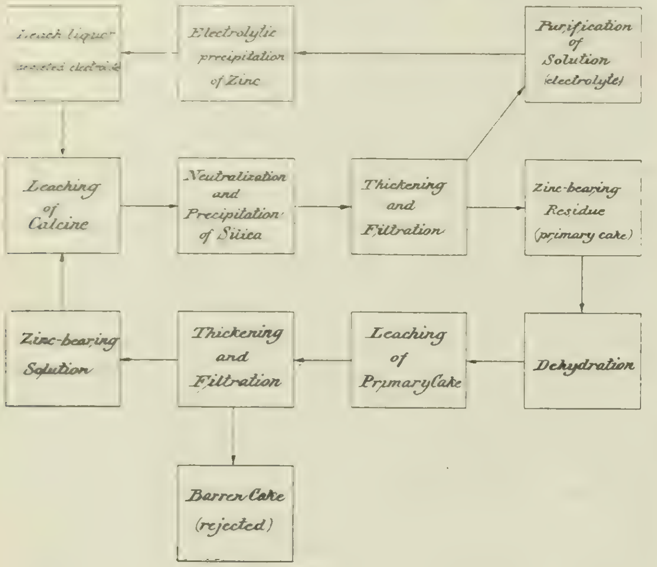
Leach liquor
(depleted electrolyte)
Electrolytic precipitation of Zinc
Purification of Solution (electrolyte)
Leaching of Calcine
Neutralization and Precipitation of Silica
Thickening and Filtration
Zinc-bearing Residue (primary cake)
Zinc-bearing Solution
Thickening and Filtration
Leaching of Primary Cake
Dehydration
Barren Cake (rejected)

Fig. 1

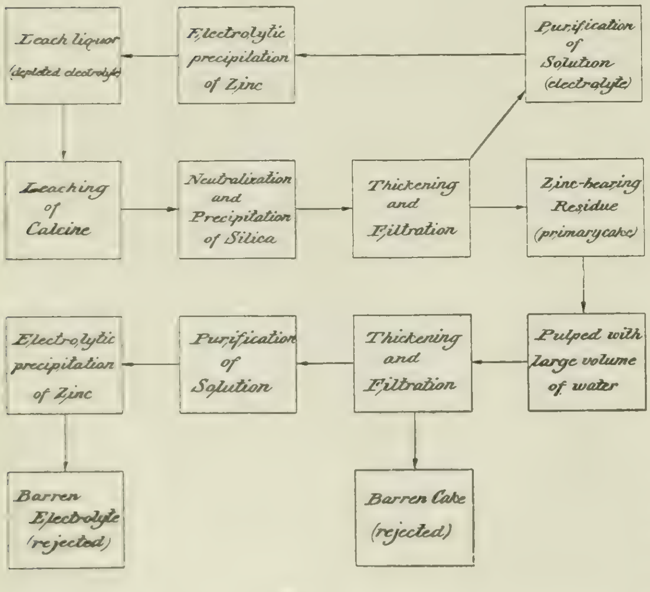
Leach liquor (depleted electrolyte)
Electrolytic precipitation of Zinc
Purification of Solution (electrolyte)
Leaching of Calcine
Neutralization and Precipitation of Silica
Thickening and Filtration
Zinc-bearing Residue (primary cake)
Electrolytic precipitation of Zinc
Purification of Solution
Thickening and Filtration
Pulped with large volume of water
Barren Electrolyte (rejected)
Barren Cake (rejected)

Fig. 2

THE LAIST MODIFICATION OF ZINC-ORE TREATMENT

In an alternative method, as shown in Fig. 2, the solution from the filter, with the overflow from the Dorr thickeners, is a zinc solution usually containing small amounts of copper and cadmium. These metals are precipitated by zinc in dust or other suitable form, the solution clarified by settling or filtration and passed to the electrolytic cells. The entering electrolyte is a neutral solution containing about 8% of zinc in the form of sulphate. The depleted electrolyte flowing from the electrolytic cells contains about 2% of zinc as sulphate, together with about 8 to 9% of sulphuric acid, and is returned to the leaching tanks as mentioned above. Lead anodes may be used, and the current conditions are preferably those which have now become standard in this operation.

The above-described process also produces a filter cake, which comprises the insoluble matter from the ore and the precipitated gelatinous silica, the preferred method for the recovery of the zinc comprising purification by treatment with zinc in dust or other suitable form, clarification by settling or filtration, or both, and electrolysis with insoluble anodes, as, for example, lead. It has been found practicable, even with this dilute solution, to recover economically 75% or upward of the zinc content by electrolytic precipitation. The spent electrolyte may either be discarded or worked up by any appropriate method for its residual zinc content.

Concrete Road Construction*

Successful concrete road construction requires, first, proper preparation of a foundation of sub-grade. This usually calls for compacting the soil where the concrete is to be laid, and draining the roadbed so that water will not remain under the concrete slab. Concrete is placed on the foundation in one layer or, sometimes, two layers or courses. A one-course concrete road consists of a relatively rich concrete mixture throughout. A two-course concrete road consists of a somewhat leaner mixture for a base, with a richer top or wearing course, applied before the concrete in the base has begun to harden.

Sometimes reinforcement in the form of wire fabric or steel rods is imbedded in the concrete. This assists to prevent slabs from cracking and aids in keeping cracks which do form from opening to any appreciable extent. High-wearing quality of the concrete results from using properly graded, clean, hard sand and crushed rock or pebbles. These must be combined with portland cement in definite proportions, mixed in a power-operated batch mixer with an amount of water to produce a stiff, plastic consistence, then placed on the sub-grade and struck off with a templet or strikeboard, so shaped that the surface of the pavement will have the desired crown. After rolling with a light metal roller, to compress and remove excess water used in mixing, the concrete is finished by seesawing a belt to and fro and along the pavement, leaving a true, even, gritty, dense surface. When hardened sufficiently to prevent pitting or marking, the surface is sprinkled with water, then covered with two inches or more of moist sand or earth, which is kept wet by sprinkling for from ten days to two weeks to prevent the concrete from drying out too rapidly. Under no circumstances should a concrete road be put in use until it is 14 days old, and in cool weather a longer time must be allowed.

Serbian Copper Mines.—The copper mines of Maidan-Pek, in Serbia, which belong to a French company, have recently been exploited by the Austrians, who about midsummer were contemplating an increase in the scale of operations. Recent events in Serbia may have caused a modification of those plans.

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*Abstracted from a bulletin published by the Portland Cement Association.

Central Station Power for Mines*

By A. Tancig†

It may surprise many to know that 30% of the fuel burned in the ordinary mine boiler plant is wasted absolutely. Not only is there a waste of fuel, but there is also considerable other expense incidental to a mine steam plant that can and should be eliminated. In making comparisons between the mine power plant and that of a central station power plant, one fundamental should not be lost sight of, and that is to remember that it is the miner's business to mine ore, whereas the business of the central station power plant is to generate and sell power. Obviously the economical way to conduct both propositions is for each one to follow its own particular line. There is no secret or mystery as to why a central station can sell power for less than it can be generated at the mine. It is merely the natural result of a small trained organization, operating an efficient plant which carries the greatest possible average load.

In a general way, conditions about the average mine boiler plant are as follows: Two or more horizontal return tubular boilers, the kind our grand-dads used, are set in a brick setting that leaks more or less air, usually more. The probability is that the grates are stationary in a hand-fired furnace, and that the breaching dampers have not been used for ages. One look at the feed pumps indicates, by the groaning and kicking, that at least 15% of the plant steam is being used there. The prevailing idea seems to be to let any old contraption feed the boilers, pumping against a 300-ft. head for every hour in the day, and every day in the year. Off in a dark corner is the plant goat, which we are pleased to call the feed-water heater. It gets no attention, but is supposed to perform wonders. Let a recording thermometer diagnose its case for 24 hours, and one will wonder where the heater got its name. The sizzling sound that has been going on all this time is from a few leaks that we intend to fix on Sunday.

The real plant losses, however, are due to the low average load. If it were possible to hoist continuously, all of the day's production would be on surface in about three hours. The tramming would take a little longer, and the rest of the time the plant would be just burning coal. Of course, if there is a pumping load the plant is doing some good, but not enough to warrant its operation, if it be a large one.

While on the subject of wastes and losses it is important to mention the ever-present "chain gang"—a sort of foreign legion, composed of a few good men, ball players, bandsmen, and boomers who perform some good work and are more or less necessary around a mine steam pump. Just the same, I should hate to be around when the efficiency expert makes his report on the false moves, starts, and time losses of the "chain gang." The so-called mine-heating systems come in for their share of the blame for wasted fuel. To justify their maintenance they are called exhaust steam heating systems, but it is an exhaust steam that makes it necessary to carry from 3 to 7 lb. back pressure on the rest of the plant, to say nothing about the vacuum pump which uses its share of live steam. In this Minnesota climate, a heating system is a necessity, but, as such, it should be given the same thought and care, both in planning and operation, that would be given to any other important part of the plant. Too often, in order to please the boss, or for some other reason, a makeshift affair is installed, and is a constant source of trouble. A whole volume could be written on that economic crime of the Mesabi Range entitled "A Mine-Heating System." The main objection to the mine steam plant is that the conditions are not favorable to the plant because the load it carries is too light for the expense involved.

The following are some of the advantages obtained by the use of the central station plant: The individual mine does not need a boiler plant, and this means from $10,000 to $20,000 saved on initial installations; the labor problem is simplified, as no firemen, coal wheelers, engineers, or pipemen are required; the power bill will be much smaller than the coal bill would have been; considerable is saved in waste, oils, packings and other items too numerous to mention, but the saving of which nevertheless helps to make the cost sheet more or less attractive; and the appearance of the surface layout will be improved.

Why are not the central stations selling more power to the mines? There are several reasons. Demand for power precedes the supply. But the most important reason is that the boss is from Missouri and he has to be shown. When you talk power to him, talk to him in dollars and cents, because he is paid to make a decent return on invested capital, and every fraction of a cent that can be saved will look good to him. Once prove to him that his $20,000 boiler plant is a liability, and he will be the first one to say, "Sell it for junk."

Sooner or later the fact must be recognized that mining is not altogether the capitalist's necessity, but that it is our opportunity to show that we see in mining a competitive business, a business that must be made to pay from A to Z. The profit in mining is not all made from the ore in the mine; the ton of iron ore carries quite a burden as it is without laying the blame for wasted fuel, labor, and investment on its shoulders.

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*Excerpt from a paper presented at a meeting of the Engineers' Club of Northern Minnesota, Mar. 12, 1918.

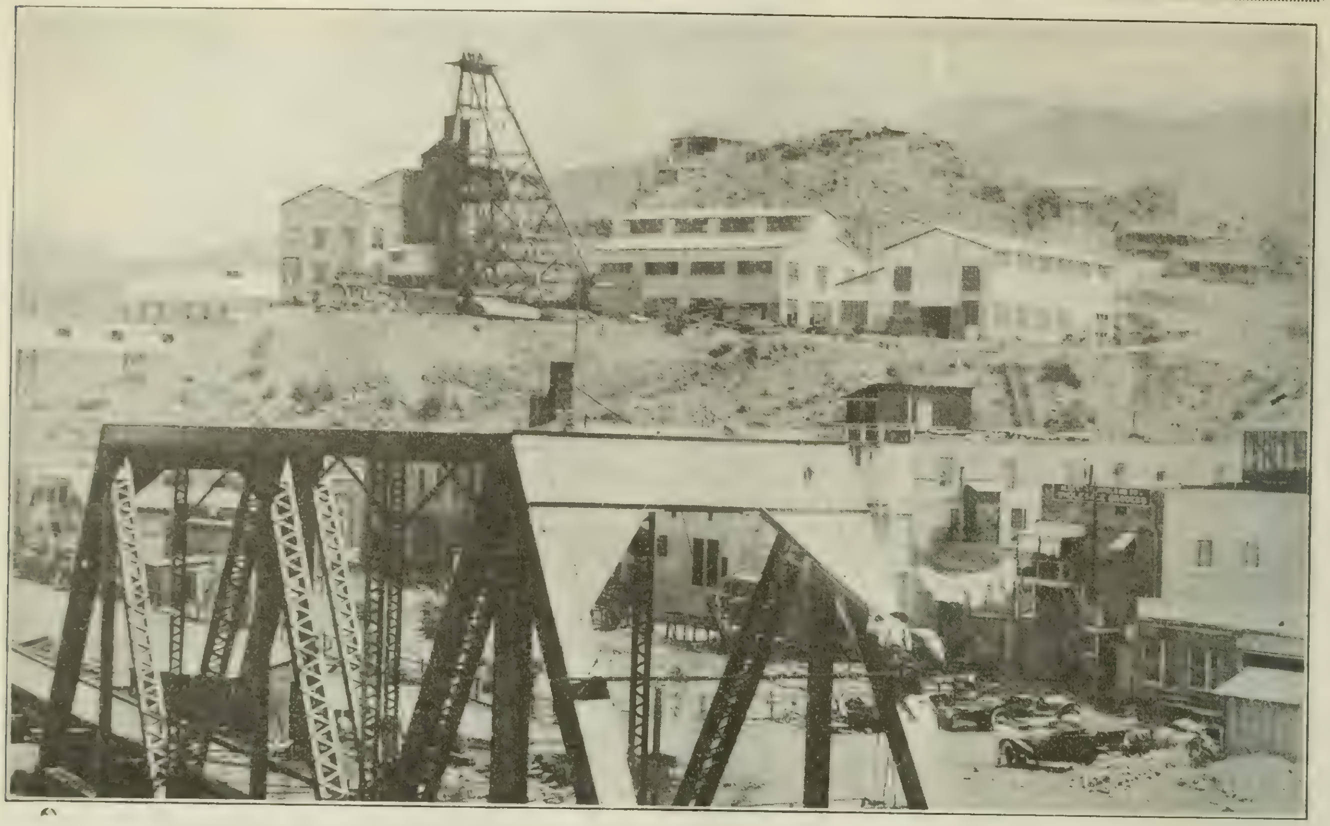
†Mechanical engineer, Shenango Furnace Co., Chisholm, Minnesota.

John Scott Legacy Medal Awarded

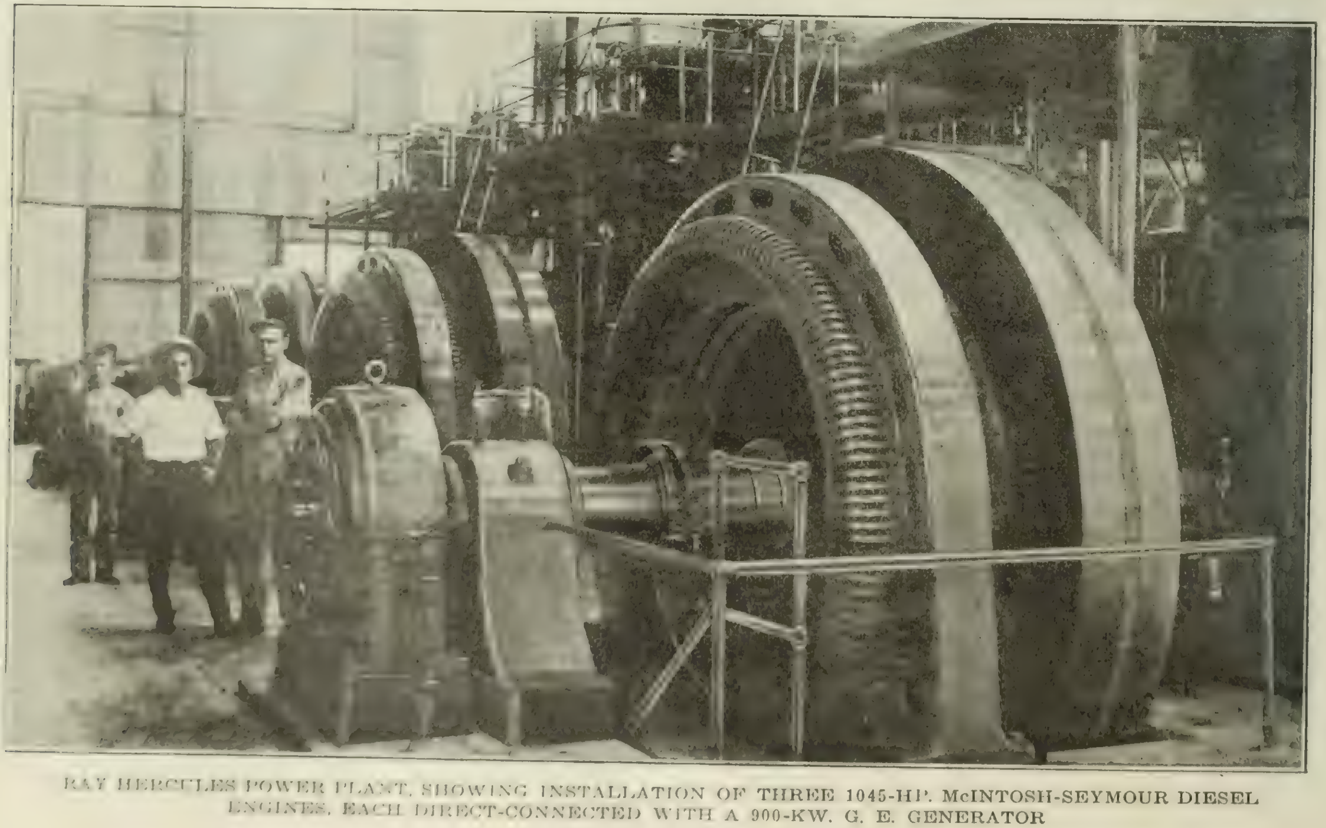
Acting on the recommendation of the Franklin Institute, the city of Philadelphia recently awarded the John Scott Legacy medal and premium to Frank P. Fahy, of New York, for the Fahy permeameter. The fact that measurements taken by the permeameter may be used to obtain information concerning the previous heat or mechanical treatment of magnetic materials makes its use of great importance in industrial plants.

The fifth session of the prospectors' short course held annually at the Mackay School of Mines, Reno, Nev., will open Jan. 6 and continue until Feb. 1, 1919. The course is designed to aid the prospectors of Nevada, but is open to residents of other states as well. No charges are made for the course except a $5 fee to cover the cost of supplies. Textbooks are not required, though certain books useful to the course are recommended.

Ray Hercules Copper Company



HEADFRAME AND SURFACE PLANT AT THE RAY HERCULES MINE, RAY, ARIZONA



RAY HERCULES POWER PLANT, SHOWING INSTALLATION OF THREE 1045-HP. McINTOSH-SEYMOUR DIESEL ENGINES, EACH DIRECT-CONNECTED WITH A 900-KW. G. E. GENERATOR

MILL OF RAY HERCULES COPPER CO. AT HERCULES, ARIZONA

The mill building is 137 ft. x 87 ft., with a 90- x 30-ft. filter plant. A 2500-ton ore bin is served by a standard-gage railroad spur from the tracks of the Ray and Gila Valley R.R. Three 16-in. conveyors, with automatic weighers, deliver the ore to three 500-ton Marcy mills. Other equipment includes three 6-ft. Hardinge mills, 15 Overstrom tables, 42 Callow flotation cells, 9 Dorr classifiers and 3 Oliver filters. The present capacity is 1500 tons per day of ore averaging 1.77% copper. The mill site comprises 1500 acres, including an attractive town site, already well improved, and a dumping ground which will accommodate at least 100,000,000 tons of tailings. Water supply from the Gila River is abundant.

At the mine, the headframe is 110 ft. high. The shaft, which is to be a total depth of 930 ft., is three-compartment, and is provided with two 5-ton, self-dumping, Kimberly skips, for which double-deck cages may be substituted. The main hoist is a double-drum Nordberg, capable of handling 300 tons an hour. Coarse-crushing plant has two No. 8 Gates, Type K, gyratory crushers and two heavy Traylor rolls.

Construction and development work was in the hands of C. E. Addams, now in charge of Arizona Council of Defense work. He has been succeeded in the Ray Hercules management by A. A. Wren. The construction engineers were Bradley, Bruff & Labarthe, and the consulting metallurgist was J. M. Callow.

INTERIOR OF RAY HERCULES MILL AT HERCULES, ARIZ., SHOWING ONE OF THE THREE MARCY MILLS, EACH OF 500 TONS' DAILY CAPACITY

Price Readjustment*

BY B. M. ANDERSON, JR.

Liquidation of war conditions as promptly as is consistent with the fulfillment of our purpose in the war is highly to be desired, so that business may return to a basis of peace and the realization of legitimate profits. It is the aim in the following discussion of price control to aid business men to a clearer view of conditions resulting from the return of peace. The contention is presented that the business changes involved in this transitional period should be allowed to follow their normal and natural course, and that they should not be subjected to artificial influences.

PRICE FIXING in this country has served its purpose and should be abandoned at the earliest possible date. It was a temporary subversion of principles of free enterprise that only the war emergency justified. But, like press censorship and other necessary measures incompatible with the genius of American institutions, it should be abolished. A medicine in war, it would prove a poison in peace. There may remain, for a few months, good reasons for a continuance of price fixing in specially scarce foods, as normal food conditions must await new harvests in Europe. But permanent price fixing is no more to be desired than is a permanent standing army of four million men.

A NEW KIND OF PRICE FIXING

Particularly unsound is the form of price fixing for which a demand has arisen in some quarters—a demand for nothing less than price fixing designed to keep prices up against the inevitable drop that will come with the return to conditions of peace. The notion that prices should be kept up is based on the fallacy that a fall in prices is undesirable. The fact is that a drop in prices to stable levels is exactly what is desired. Such stable levels are prerequisite to satisfactory business conditions.

Price fixing is only one of several plans suggested by those who are apprehensive as to the effects of falling prices on business. It has been proposed to prevent the fall in prices: (a) By price fixing; (b) by a continuance of heavy loans by the United States Government to our Allies, to be used for *reconstruction purposes;* and (c) by an organized policy of liberal lending on the part of American banks.

FALL IN PRICES DESIRABLE

Two comments are in order. In the first place, these policies, though they might for a time retard the fall in prices, could not prevent it. In the second place, it is better by far to have prices go down in the natural course, get through with it, and then undertake long-time plans on a sound price basis.

The efficacy of the measures suggested for preventing a fall in prices is essentially limited. Price fixing, for example, has not been devised for holding prices *up*, but for holding them *down*. We have devised no machinery for holding prices up except in the case of wheat, where the purpose was to make the maximum price also a minimum price, and where the Government has created the Grain Corporation with a "revolving fund" of $150,000,000 which may be used in purchasing wheat if the market price should fall below the minimum guarantee. But, in general, our price-fixing mechanism has been adjusted to hold prices down, and the procedure has been essentially this: As we have limited prices, we have restricted consumption, rationing out the supplies. We have said to producers: "Produce all you possibly can," but we have said to consumers, "You may buy at such and such price, but you may only buy so much," and to some consumers we have said, "You may not buy at all." The Government organization concerned with handling this problem has been worked out with a view to studying the needs of consumers, and to rationing the supplies in accordance with public policy.

It would, of course, be possible to reverse the procedure, and to make the present maximum prices minimum prices. But in that case we should have also to reverse our instructions to producers and consumers. We should then say to consumers, "Buy all you possibly can," but we should have to say to producers, "Although you may sell at such and such a price, you must restrict production and limit output. If you sell at a high price you can only sell such an such amounts."

ARTIFICIAL PRICE LEVELS

This procedure is, indeed, not unfamiliar in the history of American business. We have had pools and combinations in the past, which, by restricting output, have sought to maintain prices. But such pools have not usually been successful. The temptation to expand the market by breaking the pool agreement and cutting prices has always been a great one. Moreover, such arrangements are clearly contrary to public policy. Whatever else we may seek to do in the present emergency, we must do nothing which would tend to lessen output. The world is impoverished, goods and supplies of all kinds are short, and every effort should be bent toward increasing supplies.

We need not give serious consideration to the idea that a mere legal *fiat*, naming a price at which men shall buy and sell, would be efficacious. Price fixing, to the extent that it has been successful during the war, has been successful only by virtue of a control and rationing out of the supplies. Price fixing as a permanent policy is indefensible in any case. The magnificent loyalty of the American business man, and the heavy pressure of public opinion under the stimulus of the war, have made business men submit to it as a temporary measure. But it would do great harm if long continued.

Though it is desirable that our Government should continue to make necessary loans to our Allies to enable them to meet war-time problems, and though it may be desirable that loans to our Allies, even for reconstruction purposes, should be made directly by the Government, it is neither desirable that such loans be made in large volume, to be spent on reconstruction materials at present prices, nor probable that they will be. A factory, built at present prices of building materials and machinery, would be handicapped in competition with a factory built a little later, when building materials and machinery have gone down. A French business man, making a fixed investment which is to bring in returns during a 20- to 25-year period, would not be enthusiastic about using credits, even if unlimited credits were offered him by his government, on the present level of prices. He will feel it wiser to wait till prices fall; and the quicker prices fall, the sooner will he begin his operations.

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*From a pamphlet issued by the National Bank of Commerce, New York.

Reconstruction and Bank Credit

The world has been forced to reckless buying by the emergencies of the war, and whatever was necessary for carrying on the war, the governments have bought. Civilization itself was at stake, and we did not stop to apply accounting methods. But "reconstruction" is in large degree a *business* matter, to be carried out by private enterprise, even though aided by government credit. Only a government can afford to make expenditures that will not pay—and governments cannot do it indefinitely. We may expect heavy buying of foodstuffs and things necessary for the life and health of the peoples of Europe to continue, but the buying of materials to be used in construction, manufacturing, railroading or other similar operations may be expected to proceed on a hand-to-mouth basis until prices have dropped sufficiently to induce business men to feel that a fairly stable level has been reached.

As much may be said for the notion that an organized policy of liberal lending on the part of American banks would prevent a decline in prices. The process of transition from war organization of industry to peace organization of industry will require the making of a great many loans that would not otherwise be required, and bank credit must be provided to put the transition through. But efforts by banks to control the expansions and contractions of credit are much more likely to be successful when directed toward contraction than when directed toward expansion. Business men do not borrow and pay interest at the banks for amusement, and bankers do not make loans unless they see good prospects for the enterprises to be undertaken by the loans. American business men are not likely to be enthusiastic in borrowing and paying interest to support a falling market, nor would American banks be performing a useful public service in encouraging them to do so.

Much of the consumption demand of the American people, repressed by war-time prices, will be effective as prices go lower. The past unsatisfied demand for food and day-by-day luxuries, for much clothing and many other things, is water which has gone under the mill. It will never affect future prices. But part of that past demand for clothing remains. And there is doubtless a large volume of deferred demand for household furnishings, pianos, automobiles, and other luxuries, which only awaits lower prices to become effective. With the cessation, moreover, of the current production of steel, copper, and other basic raw materials, now so largely devoted to war purposes, and with the release of large numbers of laborers now engaged in war work, a substantial amount of the most urgent construction work will begin, and with the decline in wages and prices of supplies we may expect a great volume of construction work to be undertaken promptly, keeping laborers and plants actively employed.

Falling Prices Stimulate Demand

Nothing in the argument above put forth justifies the suggestion that a period of slack industry must intervene. A tremendous volume of unsatisfied demand is waiting for both labor and goods at lower prices. There is, in fact, a scale of demand prices both for labor and for goods at which supplies will be taken off the market as they come. A given manufacturer will take on 10 more men if he can get them at a slight reduction of wages. If he can get them at a lower wage, he will take on 20. If he can get them at a still lower wage, he will take on 25. With copper and steel at present prices, he will buy only moderate amounts; but with each drop in prices of these commodities, he will increase the amounts which he is ready to purchase. As prices drop, the more urgent demands will be satisfied first, and then, as prices drop still further, less urgent demands will be satisfied. When levels that are expected to be reasonably stable are reached, a great volume of demand will take up all supplies that come into the market. No arbitrary action should be taken to hasten this process, but none should be taken to impede it.

Stabilization of Public Expenditures

In the interests of active business, it is desirable that this relatively stable level should be speedily reached, and it is undesirable that palliative methods should be used unless actual unemployment appears. It should, however, be made definitely known that large-scale plans for expenditures of the Federal Government, the states, and the municipalities are in readiness, in case unemployment should appear. But it is just as important that governments should curtail expenditure in times when prices are abnormally high and labor is working overtime, as that governments should increase their expenditure in times of unemployment. This use of government expenditure as a balance wheel does not mean that wasteful or useless work should be undertaken, merely to make jobs. It means, rather, that there is a great deal of necessary public work which can be done almost as well at one time as at another, and that the various grades of government should make orderly plans looking ahead through a 10-year cycle, so that they can take advantage of periods of relative depression, with a double gain—lower prices to the governments, and the prevention of unemployment.

The tension of the last two and a half years, with scarcity and high prices of labor and supplies, has led to the interruption of many public works, and has prevented many new ones from starting. *When* prices drop—as they must—and *if* unemployment on a substantial scale should appear—as it may—then the various grades of the government should be prepared to take up the slack by useful public works.

American business need not be unduly apprehensive of the effects of falling prices and some slackening of business activity upon profits. Profits are, after all, a differential—what is left over after meeting costs. A general decline in prices means a general decline in costs. Moreover, with the forced draft under which American industry has been working for the last two or three years, there has necessarily come, in increasing degree, waste and inefficiency. Labor has been working overtime at high wages. It has been shifting rapidly from employment to employment—perhaps as great a factor in inefficiency as could be found. In some cases, it has not been amenable to shop discipline, and the employer has been largely helpless in the face of loafing and inefficiency. In other cases, protracted overtime work has lessened energy and efficiency. In some cases, laborers have lacked interest in the work in hand through the fact that they were constantly considering alternative employments. For these and other reasons, the labor force had become less efficient than it is in normal times. Wholly apart from a decline in wages, therefore, labor costs per unit of output will decline, and it will not be necessary to reduce wages as fast as prices fall in order to break even on labor costs.

Employers, moreover, driven by the pressure of new contracts, and harassed by the multiplicity of details in new undertakings, have not been able to make use of their customary efficiency in bringing about economical production, and the large profits of the war period in many industries seemed to remove the necessity for the elimination of wastes.

With some relaxation of the tension under which both employers and laborers have been working, and with an increasing appreciation of the importance of economies and efficiency in production, we may expect wages to decline less rapidly than prices—especially desirable in view of the fact that food prices are unlikely to decline greatly for some months.

SUMMARY

Artificial control of business and prices should be dispensed with as rapidly as possible. At the earliest possible date, the business man should be free to make his plans and contracts with reference to accounting prinples rather than under Government direction. Neither price fixing nor a forced expansion of credits can prevent the fall in prices which the return to peace conditions inevitably involves, nor would they be desirable if they could. If prices could be artificially sustained, it would merely mean a period of hesitation and increasing strain. As they decline naturally, however, we shall see the emergence of successive strata of demand which have been submerged by war-time prices, and the transition to peace-time price levels will be relatively painless. This will be particularly true because current stocks of goods are light, and because the relaxation of the forced draft under which production has been proceeding will make possible large economies and increasing efficiency which will make it unnecessary for either profits or wages to fall as rapidly as prices fall.

There remains, however, a large sphere for Governmental action by ordinary commercial methods in the expansion of public expenditure of various kinds, as prices go lower and if unemployment should appear.

Reconstruction Recommendations

Among the resolutions finally passed at the Reconstruction Conference of the Chamber of Commerce recently held at Atlantic City were the following:

CANCELLATION OF WAR CONTRACTS

It is in the public interest that all war orders placed by any contracting agency of the Government, and accepted in good faith, whether formally and regularly executed or not, should, upon cancellation by such contracting agency, be promptly and equitably adjusted and satisfied as if every formality had been observed; and when so adjusted the amount ascertained to be due by the Government should be promptly paid, to the end that these funds may be utilized by the industries of the country to speed their transition from a war to a peace basis.

If it should be ascertained that legislation is necessary or desirable to accomplish this end, Congress should forthwith enact such legislation.

Officials dealing with questions of adjustment on account of war orders must necessarily be familiar with all the conditions affecting the orders. It will greatly promote expedition and the interests of both the Government and private enterprise for the officials who made the contracts to remain in the Government service to participate in the readjustment.

SURPLUS GOVERNMENT SUPPLIES

Under date of Nov. 29, 1918, the Secretary of War issued a public statement, in which he said: "To prevent too violent dislocation of industry from the standpoint of both employee and employer, accumulations by the War Department of either raw material or finished products will be distributed when and where liquidation of such supplies will least interfere with the return of industry to normal conditions." Such action would seem to insure the stability of the industries affected, which fully appreciate this liberal position.

Therefore, the War Service Committees of American Industries hereby tender to the War Department their services on behalf of their respective industries for the purpose of advising with and assisting the War Department in the disposition of such materials.

INDUSTRIAL COÖPERATION

The war has demonstrated that through industrial coöperation great economies may be achieved, waste eliminated, and efficiency increased. The nation should not forget, but rather should capitalize, these lessons by adapting effective war practices to peace conditions through permitting reasonable coöperation between units of industry under appropriate Federal supervision. It is in the public interest that reasonable trade agreements should be entered into, but the failure of the Government either clearly to define the dividing line between those agreements which are, and those which are not, in unreasonable restraint of commerce, or to provide an agency to speak for it on application of those proposing to enter into such agreement, in effect restricts wholesome coöperation and deprives both industry and the general public of its benefits. The conditions incident to the period of readjustment render it imperative that all obstacles to reasonable coöperation be immediately removed through appropriate legislation.

REMOVAL OF RESTRICTIONS ON INDUSTRY

It is in the public interest that all war regulations of industry should be revoked, and all war restrictions on industry be removed, as speedily as practicable, save in the case of such industries as are engaged in the production, preparation or distribution of foods, feeds, and fuel, and such last-named group of industries should be freed from war regulations and restrictions as early as consistent with the welfare of this nation and of the Allies.

Meso-Thorium as a Radium Substitute

The increasing demand for radium in medical work, but more particularly for the manufacture of luminous paint, indicates the importance of finding radium substitutes. Radium luminous paint was used in the war for many purposes, notably on the dials of aëroplane instruments, so that they could be read at night. The paint is permanently luminous in the dark and contains from 0.1 to 0.25 mg. of radium to 1 gram of zinc sulphide. A luminous watch face requires from 10c. to 20c. worth of radium.

An excellent substitute for radium, for certain purposes, is meso-thorium, which is a radioactive element found in monazite sand and other thorium minerals. When first extracted it is not in a satisfactory condition for the manufacture of luminous paint; it must be allowed to "ripen" for several months, or even for a year, before it can be used. During this time the alpha radiation which is required for luminous paint becomes sufficiently strong. On the other hand, the beta and gamma radiation of meso-thorium grows rapidly, and it can be used for medical purposes within a few days after preparation.

Radium has a long life, half of it decaying in approximately 1600 years. Meso-thorium, on the other hand, has a short life, five or six years being its useful life for luminous-paint purposes. The price in the past has varied from 40 to 60% of that of radium, the comparison being on products of equal activity. For medical purposes, therefore, it cannot compete with radium as long as there is plenty of the latter; for luminous paint, when used on objects which have a short life, it is an excellent substitute for radium, and should be the means of saving radium for medical purposes. Undoubtedly it was used, during the war, by the Germans. Some of the first luminous watch dials in this country probably contained meso-thorium imported from Europe.

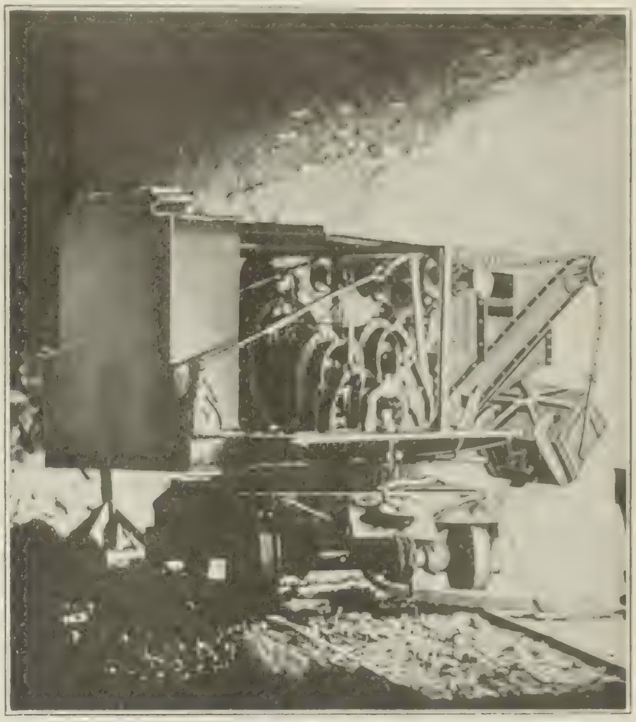
Until recently no meso-thorium was recovered in the United States, although large quantities of monazite sand are treated annually for the manufacture of incandescent gas mantels, a condition that represented an important mineral waste. Soon after the United States entered the war, the Bureau of Mines made a coöperative agreement with the Welsbach Co., of Gloucester, N. J., for the study of methods of extraction and recovery of meso-thorium. The work was carried on at the Rocky Mountain station of the Bureau of Mines, at Golden, Colo., under the direction of Dr. R. B. Moore, superintendent of the station, Dr. Herman Schlundt being assigned to the detailed work on the problem. Successful methods of extraction and recovery have been worked out and added to the regular metallurgical processes of the Welsbach company, so that meso-thorium is now one of the regular products made by that company. The next largest producers of thorium salts in the country about the same time became interested in the recovery of meso-thorium and worked out its own methods. Consequently at present meso-thorium is recovered from practically all the monazite sand treated in the United States.

Incorrect press reports of the announcement made by Dr. Moore at the September meeting of the A. I. M. E. at Colorado Springs were responsible for some serious misstatements of fact. The Bureau of Mines has never claimed the discovery of meso-thorium, as this element was first identified and described by Hahn in 1905.

Electric Shovels in Underground Mines

Electric shovels in underground mining are in many ways desirable, and several of them have been employed to good advantage in iron, coal, zinc, limestone, and salt mines, where their performance has proved them to be highly productive and economical factors in this class of excavation. Experience has shown that electricity is an ideal power for underground mining shovels, for it is economical, safe, and need be used only while the machine is actually digging.

An accompanying illustration shows a Thew electric shovel, built by the Thew Automatic Shovel Co., of Lorain, Ohio, and its construction embraces many of the desirable points that are required of an underground mining shovel. This type is a radical variation of the standard, full-circle swinging steam shovel, and is an abridgment, or a "pocket edition," of the larger shovels, but possesses a pronounced difference in construction and working features that adapt it to advantageous and profitable use under conditions inseparable from underground operations. The shovel has, in concentrated form, all the rugged strength and dependable digging ability of the bigger models, but its compactness does not complicate the control, for the mechanism is easily operated by one man.



THEW ELECTRIC SHOVEL IN UNDERGROUND MINE

Adapting the construction of the shovel to underground mining consisted in minimizing its over-all dimensions, for it was necessary to consider restricted operating room and narrow entries and passageways, as well as the shaft through which the shovel must be taken into the mine. The shovel is so built that it may be quickly dismantled to pass through restricted areas and be speedily erected for the succeeding operation. As an example of the "knock-down" ability of the Thew shovel, it is stated that a recent installation could be so disassembled as to be taken through a 3-ft. 6-in. x 3-ft. 8-in. shaft.

Conditions often make it inadvisable, impossible, or too expensive to place a track for stopping cars in a definite position. This underground shovel, rotating through a complete circle, has the advantage of being able to work in any direction, to load cars easily and quickly, at the side of or behind the shovel, and the result is increased production and reduced overhead expense. The motor is of the single, constant-speed type, with friction control. Hoisting, crowding, swinging, and propelling movements are controlled direct from the motor.

One of these shovels operating in a New York iron mine is equipped with a 20-hp. motor, and consumed the following power in loading five consecutive cars of ore: Car No. 1, 16.04 hp.; No. 2, 20.75; No. 3, 16.25; No. 4, 17.00; No. 5, 14.25 hp., or an average of 16.86 hp. for the five cars. Operating costs of this shovel during four months of 1917 and five months of 1918 averaged 16.6c. per ton. An average of 4141 tons per month was loaded at a total cost of $685.72, of which $13.59 was the cost of the power. These costs include all expense involved in actually loading the ore, tramming it 300 ft. to the main haulage way, and moving the shovel to different levels and working places. The ore was loaded into three-ton gable-bottom cars. Under identical conditions the per-ton loading cost by hand labor was 30c., the saving effected by the shovel being in this case 13.4c. per ton. At a Western zinc mine a similar shovel loaded 125 cars in 5¾ hours at a cost of less than 9c. per ton, including tramming, which figure shows a marked reduction in cost of handling material and hauling it to the shaft by hand, from 16c. and 18c. per ton, or a direct saving of 45 to 50 per cent.

Cathode-Sheet Loop Punching

By M. A. Mosher*

The loops by which a cathode starting sheet is suspended from its rod in an electrolytic tank have for a long time been fastened by an automatic punching machine, which cut through the loop and sheet with an H-shaped die, and then turned the flaps of metal back, one above and one below, leaving a rectangular hole, as shown in Fig. 1. However, with even the most careful work, 15 to 20% of the punchings pulled out before the cathode was in operation, and these loops had either to be attached by hand or run through the machine again, causing delay, expense, and waste of material.

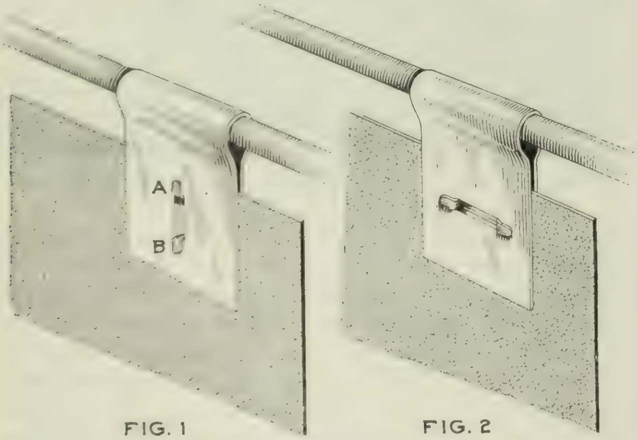


FIG. 1 FIG. 2

LOOPS ON CATHODE STARTING SHEETS

The reason for the failure of this style of punching can be understood by noting that the downward pull due to the weight of the suspended sheet, especially when it is being handled roughly by the workmen, puts the entire strain on the flap *A* (Fig. 1), and flap *B* is thus of no help and continually tends to pull out.

Frequent careful adjusting of the machines brought no improvement, so, as an experiment, the dies were turned through an angle of 90°, making a horizontal punch, as shown in Fig. 2, with the flaps bent back to the right and left, instead of one above and one below. This proved to be the solution of the problem, as the strain, taken equally and sidewise by the two flaps, is so greatly decreased that a failure of the punching occurs only rarely.

Daniel Murgue*

On Oct. 9, 1918, Daniel Murgue, the eminent authority upon mine ventilation, died at Lyons, France. From his graduation at the age of 21 from the School of Mines at St. Etienne, until his death, he devoted his engineering energies to the mines of France, especially those in the coal regions. Immediately after the war of 1870 he began the task which was to bring him fame, and in 1876 he propounded his theory on mine ventilation. Previous to his work, this subject had been a source of complete discord among engineers. Murgue established rapid methods for gaging strength of air current in mines, and invented a machine for the continuous registration of these strengths, and many other ingenious pieces of apparatus. He developed laws which have become classic in the art, and applied his theory of ventilation to the circulation of air in mines by ventilators, and established mathematical formulæ for determining the quantity of air necessary.

Murgue introduced into the problem of ventilation the important principle of the "equivalent orifice" of a mine or section in square meters, that is, an orifice such that the same pressure would force through it, during the same time, the same volume of air as through the mine. Murgue also actually determined the "equivalent orifice" for a great number of mines and combined the results in tables which have been of the greatest service.

He was well liked among his associates, as his long tenure of important engineering-society offices testifies. He was for 16 years president of the Society Amicale of Engineers of St. Etienne, and an officer or member of almost all the other mining societies of France. He contributed at the proceedings of these organizations many papers in his chosen field, which are of great value to the mining world. Murgue can rightfully be called the father of the study and application of systematic mine ventilation.

Davis-Daly Copper Co.

The quarterly report of the Davis-Daly Copper Co. for the period ended Sept. 30, 1918, indicates that 17,697 tons of ore was shipped, which produced 2,071,886 lb. of copper and 101,705 oz. silver. Total receipts amounted to $412,443.92, and disbursements were $301,978.17. Mention is made of the fact that no improvement is apparent in the labor situation, and it is contended that the low efficiency of the mine workers is a contributory cause to the high cost of operations.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

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*[illegible] Rector St., Perth Amboy, New Jersey.

*Abstract of translation of article appearing in Oct. 20, 1918, number of *Texte de l'Echo des Mines et de la Metallurgie.*

Why Minerals Float

BY GEO. J. YOUNG

A suggestive discussion of some principles controlling the flotation of sulphide minerals. The writer puts forward the hypothesis that conditions favoring flocculation are necessary before flotation can take place. Adherence of oil films is explained as being due to chemical action.

THERE has been much discussion of the principles affecting the flotation of heavy minerals, and many attempts have been made to explain the phenomenon, but apparently without a satisfactory outcome. The present article is offered as a contribution to the discussion, in the hope that further expression of opinion and experience along somewhat different lines than have been customary will result.

A mineral froth floats because it displaces a greater weight of water than its own weight. Under what conditions is such a froth formed? The question can best be answered by a specific case. Suspend 50 gm. of finely crushed galena in 5000 c.c. of water rendered alkaline with 25 gm. caustic soda, and maintain it in suspension by vigorous agitation in one part of the vessel. Now add some flotation agent. No froth, except under conditions to be stated afterward, will form. Gradually acidify the solution. As soon as acidity is reached a froth will appear and rise to the surface in the quieter portions of the vessel (an experimental flotation machine).

What is the explanation? Consider a suspension of galena particles in distilled water in a glass tube, and, without agitation, gradually add sulphuric acid until the solution is acid. No oil is present. As soon as the solution is acid the particles of galena flocculate and form larger particles, which fall rapidly. Flocculation of suspensions by the addition of an electrolyte is a common phenomenon. In the first experiment described agitation and oil failed to produce a froth, but as soon as an electrolyte was added a froth appeared. Evidently the flocculation of a suspension is as necessary as the use of a flotation agent.

USE OF ELECTRODE

The first experiment was repeated with all of the conditions the same except that sulphuric acid was not added and an electrode connected to a water pipe was suspended in the spitzkasten portion of the flotation machine. A froth formed. The explanation is not difficult. The electrode caused the discharge of the charged particles in the suspension. In other words, the presence of the electrode facilitated the flocculation of the particles of the suspension. I venture the hypothesis that before a froth can be formed it is necessary to have conditions present that will permit of the flocculation of the mineral particles. The floccules can trap and hold the globules of air with sufficient tenacity to cause the froth to form. It will be asked at once that, if this is true, why would not the fine particles (gangue) also flocculate and also trap air and rise to the surface. In other words, why should there be any differentiation between particles of a different nature in a suspension. To satisfy this it is necessary for me to invent a term—the degree of the intensity of flocculation. The hypothesis must be further extended by stating that the intensity of flocculation varies with different minerals. Minerals like galena are wetted by certain oils (flotation agents). Whether this is an example of simple adherence of an oil film or the slight adsorption of the oil is an open question. The fact remains that an oily film does form on some minerals and not on others.

What is the difference between the flocculation of oiled galena particles and oil-free galena particles? The oiled particles of galena would adhere and form a more tenacious floccule than the unoiled. It is probable that the intensity of flocculation is increased by the presence of oiled particles in the suspension, and this would affect the galena particles. The oily floccule of galena particles may be expected to more readily entrap the air globules than a floccule composed of unoiled particles. There is sufficient movement of the solution to break up the floccules of gangue minerals, but evidently not enough to interfere with the floccules of galena.

Here is an explanation, perhaps not complete, of the differentiation between particles of different substances in a suspension when subjected to the action of a flotation machine. It should be further remarked that where gangue and mineral particles are together the froth is never free from a certain amount of admixed gangue minerals. This would indicate that some of the gangue floccules are not broken up, and therefore act like the galena floccules.

FROTH PRODUCTION

An additional fact must now be added. Bancroft states that a froth cannot be produced with a pure liquid and air. A third substance in colloidal solution in the liquid in question is necessary. He defines a froth as an emulsion of air in liquid. Thus, to obtain a suspension of fine air globules in a liquid, it is essential to add a substance which goes into colloidal suspension in the liquid. Bancroft adds that ore flotation requires a froth of air in oil. This air emulsion possesses the distinct advantage of distributing minute air bubbles and thin films of oil throughout the pulp, where they can come in contact with the particles of heavy mineral. Without further discussion of this phase, or of the question that might be raised as to other conditions, the presence of an electrolyte or its equivalent, which might influence the formation of the froth, it can be stated that a froth of air in the liquid is highly advantageous and necessary for flotation.

In the Elmore vacuum apparatus the mineral particles were thoroughly mixed with oil and then drawn into a vacuum chamber. The vacuum under which the pulp was maintained caused the air in solution to be liberated in fine bubbles throughout the pulp, and these bubbles were of great assistance in forming and in lifting the froth to the discharge lip of the vacuum chamber. There is thus only a difference in method between the formation of a froth as Bancroft describes it and its formation in the Elmore system. The results are similar.

Why does oil stick to a sulphide mineral and not to a gangue mineral such as quartz? Sulphide minerals are oxidizable substances, and may be expected to sensibly occlude (adsorb) oxygen. Oil is an oxidizable substance, and when brought in contact with a sulphide particle which has already a thin film of oxygen in its pores and on its surface it may be expected to adhere. Wetting a mineral particle with oil is only another way of indicating that obscure chemical reactions supply the force which causes the oil and the particle to adhere. The same explanation applies to the adherence of air to the oily particle.

In flotation experiments upon cinnabar I have encountered considerable difficulty in thoroughly wetting the crushed cinnabar with water. There was a distinct tendency of the cinnabar particles to adhere and form clots. Even without the addition of a flotation agent, some of the cinnabar would rise and form a thin layer on the surface of the water in the spitzkasten. This was probably due to the strong occlusion (adsorption) of oxygen. The fact is significant in indicating that the degree of occlusion (adsorption) varies with different minerals.

Summary of Conditions

Summarized, the hypothesis advanced is that the formation of a froth is due to conditions which permit flocculation, to the occlusion (adsorption) of oxygen by both the mineral particles and the oily particles, and to the presence of an oily substance in which there is a colloidal suspension. A fine state of subdivision and thorough contact are essential for the completeness of a chemical reaction. In flotation, the mineral particles are finely divided and thoroughly mixed with air and a flotation agent. Agitation plays the important part of subdividing the air and oil and bringing them in contact with the mineral particles.

Flocculation may be brought about by the use of suitable electrolytes, by heat, or by the discharge of the charged particles in the suspension. Occlusion (adsorption) cannot be controlled, but undoubtedly is more active in the presence of a fine degree of subdivision of the sulphide particles and vigorous agitation. Air is in great excess, whereas the amount of the flotation agent is usually limited. The flotation agent which I have stated to be necessary, and which probably is in the majority of cases, can be controlled both as to quantity and kind.

In a series of experiments that were conducted by some of my former students, and which were made upon portions of pure minerals, finely divided, all of the flotation agents tried did not react equally well. There was some difference, but not as great a difference as might have been expected. Though the experiments were not completed, enough data were accumulated to enable me to form the opinion that the kind of flotation agent was of secondary importance compared to the attainment of the proper physical conditions. The quantity is important from a theoretical point of view, for, if the statement that oil is oxidizable be accepted, a relatively large quantity present in the agitation chamber will reduce the quantity of oxygen and interfere with the occlusion of oxygen by the sulphide particles. Excess of oil may operate to produce a mineral oil and air froth that will be less tenacious than one in which the oil is smaller in quantity.

The hypothesis advanced and the observations and opinions stated were derived from different sets of experiments made at different times, and therefore lack the conclusiveness of systematic work.

Salvage From the Battlefields

Iron and steel merchants are showing keen interest in the intentions of the British government with regard to the distribution of the huge dumps of steel scrap, consisting of broken shells and the metal parts of transport and railway wagons, which have been gathered on the battlefields of France and Belgium, says the *Ironmonger*. Some of this material is now being used by the French steel works, but their consumption represents only a small proportion of the whole, and the bulk of the material must be disposed of in Great Britain. During the present year quantities have been loaded into wagons, ferried across the English Channel and conveyed to Swansea. It has been suggested that the intimate knowledge of the scrap trade gained by the Ministry of Munitions will enable that department to sell the material economically directly to users without employing an intermediate agency, but the merchants express confidence that their services will be found indispensable in disposing of the material to the best advantage. In the meantime it is announced that a Ministry of Supply is to be set up, and that, pending its formation, the Ministry of Munitions will undertake the work of disposing of all government property.

Mining in Greece in 1917

The important mineral products of Greece are magnesite, marble, and emery, says *Commerce Reports*. Most of the magnesite mines of the country are on the island of Euboea. The production of magnesite during the last four years has been as follows: 117,430 metric tons in 1914, 133,858 tons in 1915, 176,363 tons in 1916, and 99,518 tons in 1917. Only the larger mines whose output was sold to the Allied governments were able to continue operations, as the smaller properties were unable to secure tonnage for export and supplies for operating their mines. The large mines were given every facility by the Allied governments for obtaining explosives, railway materials, oil, greases, food, and other necessities unobtainable by mines not running under this management.

The mining of emery is a monopoly of the Greek government. The only mines in operation are on the island of Naxos. Exports in 1916 were 19,950 metric tons, but in 1917 they amounted to only 17,000 metric tons, shipped entirely to Marseilles. Marble production has been almost completely stopped on account of transport difficulties.

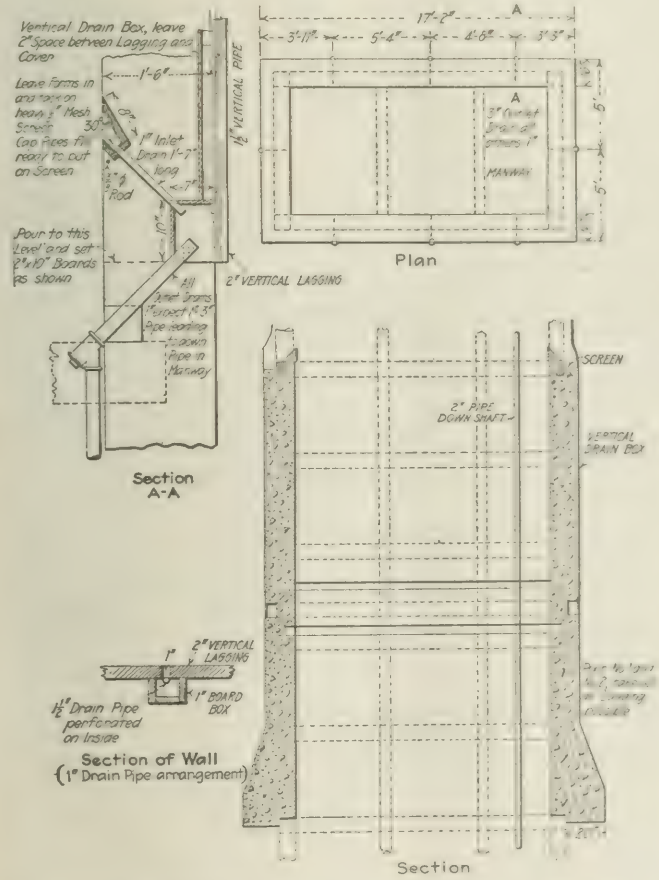
Bottoms of Mine Cars may be cleaned by means of a drill of the jack-hammer type, fitted with a flat or wedge-shaped bit. The operator manipulates the machine with a short "scooping" motion to loosen the material, which is afterward removed with a short-handled shovel.

Details of Practical Mining

A Concrete Water-Seal Ring for Shaft

BY G. G. WALD*

An effective method of sealing off water in a shaft where the inflow is confined to a restricted, well-defined area was evolved at the main shaft of the Arizona Hercules Copper Co. at Ray, Arizona. In instances where the water-bearing strata is extensive, the only method of waterproofing a shaft is to concrete it completely, but at the Arizona Hercules practically all of the water came in on a flat dacite-conglomerate contact 220 ft. from the collar of the shaft, and it was possible completely to seal off this water by lining 30 ft. of the shaft with concrete.


Vertical Drain Box, leave 2" Space between Lagging and Cover
Leave Forms in and tack on heavy ⅛" Mesh Screen
Cap Pipes fit ready to put on Screen
30°
1'-6"
8"
1" Inlet Drain 1'-7" long
7"
⅜" ϕ Rod
10"
1½" VERTICAL PIPE
Pour to this Level and set 2"x10" Boards as shown
All Inlet Drains 1" except No. 3" Pipe leading to down Pipe in Manway
2" VERTICAL LAGGING
Section A-A
17'-2"
A
3'-11"
5'-4"
4'-6"
3'-3"
5'
5'
A
3" Outlet Drain
Manway
Plan
SCREEN
2" PIPE DOWN SHAFT
VERTICAL DRAIN BOX
1"
2" VERTICAL LAGGING
1" BOARD BOX
1½" Drain Pipe perforated on Inside
Section of Wall (1" Drain Pipe arrangement)
Section

WATER COLLAR AT ARIZONA HERCULES SHAFT

The Arizona Hercules shaft is 900 ft. deep, 14 ft. 2 in. x 7 ft. inside in the clear, and consists of two hoist compartments 4 ft. 10 in. x 7 ft. and a 3-ft. 6-in. x 7-ft. manway. A station and a pocket are cut at the 475 level. It was desired to line a heavy section of the shaft (from 395 ft. to 555 ft. from the collar) with concrete, and, to improve the working conditions below, the water flow at a point 220 ft. from the collar, 15,000 gal. per 24 hours, was first sealed off. In this operation, 30 ft. of the shaft was lined with concrete, a distance 12 ft. below and 18 ft. above the water-bearing contact. The concrete mix was six sacks of cement to one cubic yard of creek gravel, and 40 lb. of hydrated lime per cubic yard were added for waterproofing and for the purpose of making the concrete flow easily through the troughs. The concrete was mixed on surface in a one-yard Ransome mixer and so placed as to discharge directly into a 6-in. pipe hung in the southeast corner of the west hoist compartment. At the working level the concrete was caught in a bucket 2 ft. 6 in. high and 20 in. in diameter. The bottom of the bucket was set 6½ ft. above the top of the pour to be made, and from the bucket the concrete was run into the form by means of launders, made of 1-in. plank.

The shaft sets were not removed, and the 2-in. form-planks were nailed to the inside face of the shaft timbers after they had been dressed or bushed to conform to plumb. The concrete was reinforced with ⅝-in. square twisted bars, having 1-ft. horizontal centers, and ⅜-in. round iron having 2-ft. vertical centers. The concrete walls are 18 in. thick, except for the bottom wall, which is 2 ft. thick, and averaged 2.75 cu.yd. per linear foot of shaft over the 30 ft. poured.

The men worked on a three-shift basis, one jigger boss and four timbermen on each shift. The average time taken to make a 5-ft. pour of concrete after the forms were ready was three hours. Work was started 12 ft. below the contact, and all the lagging entirely removed from two sets. The ground was solid conglomerate, and a hitch was cut at a point 2 ft. behind the timbers at the bottom, to insure cutting off and holding back the water, and was then tapered to 1 ft. back of the timber and to 5 ft. above the bottom. The first pour of 5 ft. was then made, lagging was removed from the third set, and the second pour of concrete completed, and so on to the top.

Had the water been simply sealed off, it would no doubt have found its way over or under the concrete. The following method was therefore adopted to collect and drain the water down a pipe to the sump: The top of the second section or pour brought the lining 1 ft. below the dacite-conglomerate contact, and a 3-in. outlet pipe was set in the concrete on a 45° slope, with its upper end projecting above the concrete near the back of the wall and its lower end projecting into the shaft in the center of the end of the manway compartment. Seven 1-in. pipes were placed similarly, one in the center of each compartment and in the center of each end of the shaft, and capped so that they would be used only in case the 3-in. pipe clogged. A 6-in. square recess was allowed all around the shaft so that if it becomes necessary to use the 1-in. emergency drain pipes, the gathering pipe can be strung outside of the shaft clearance. Above the second section, vertical back lagging was placed around the shaft with the face of the lagging 18 in. back of the inside face of the shaft timbers. This lagging was put in tight and caulked so that no grouting could get through and a free space would be left for the water to circulate behind the lagging.

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*Mining engineer, Hanington & Wald, Contractors, Ray, Ariz.

A 2-in. space was left between the laggings at the center of each compartment and the center of each end. Opposite each space a perforated pipe was carried up vertically to the top of the concrete collar and set in a 3 x 4-in. box of 1-in. plank to collect the water and carry it to the 7 x 8-in. gathering box of 2-in. plank. This latter was placed completely around the shaft and against the back lagging, covering the open ends of the pipes that were set during the second pouring. To catch any water that might run down the face of the concrete, a niche was left all around the face of the shaft, and from this eight 1-in. pipes carried such water down to the inner gathering box. The water collar, which was designed and constructed by Hanington & Wald, contractors, of Phœnix, Ariz., has been successful, as the 3-in. drain pipe is carrying all the water, and the shaft is dry.

Station Box for Dull Tools

By C. T. Rice

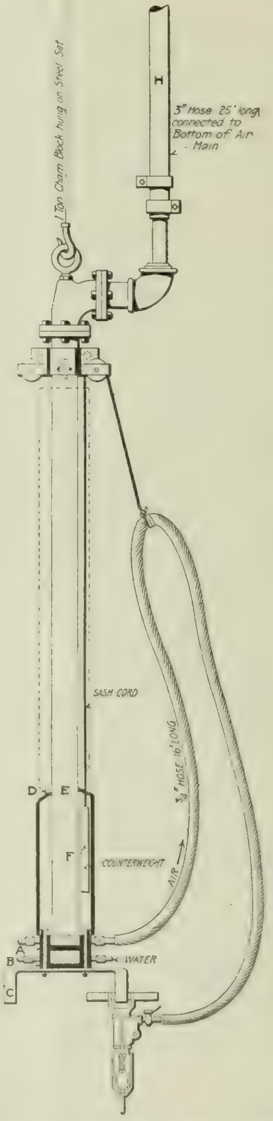
Dull tools are much more likely to go on top at the end of the day if there is some regular place for them to be left at the station as the men go off shift. At the Hecla mine, Burke, Idaho, a small portable box is used that may easily be slid over to the shaft on the turn sheet to facilitate loading by the station tenders. This is divided into two compartments, one for saws and the other for dull axes and picaroons. The box is kept in such a position in the station that it can be seen easily from the shaft by the cagemen.

Shaft Sinking at the Seneca Mine

In the *Journal* of Sept. 28 appeared a short article on the sinking of the Seneca shaft at Mohawk, Mich., which mentioned the use of a header as a part of the drilling apparatus used. It is interesting to note that a similar header was utilized in sinking the Woodbury shaft, at the Newport mine, Ironwood, Mich., in 1915. J. M. Broan, who was in charge of the shaft sinking at the Newport, is the superintendent at the Seneca, and it was through him that the information for Mr. Featherly's article was obained.

An accompanying sketch shows the general arrangement of the header at the Woodbury shaft, concerning which Mr. Broan writes[1] as follows:

"The drilling equipment in sinking is somewhat different from that used in ordinary practice in that a header is used to distribute air to the machines. The sketch shows a single machine hanging in position when not in use. The casting *A* is of 9-in. diameter, bored out in the center, and has a bolt circle of a standard 4-in. flange. Eight holes, evenly spaced, are drilled in the sides and tapped for ¾-in. nipples, to which the machine-hose connections are made. *B* is a duplicate of *A*, except that the holes for the nipples are of different size. There are seven ½-in. and one 1-in. connections, the latter being an inlet for the water and the others for water discharges to the drills, to be used only with water-tube type jack-hammers. The hooks or hangers *C* are made of ⅜ x 2-in. strap iron. *A*, *B*, and *C* are held together by four ¾-in bolts passing through the 4-in. flange at the bottom of the 4-in. air pipe *E*. The ell at the top is made with a lug cast on it to accommodate the 1-in. I-bolt by means of which the header is suspended. *D* is a 9-in. pipe and serves as a casing to inclose the counterweight *F*, which holds the slack hose out of the way while drilling is being done.


1 Ton Chain Block hung on Steel Set
H
3" Hose 25' long connected to Bottom of Air Main
SASH CORD
¾" HOSE 16' LONG
AIR
D
E
F
COUNTERWEIGHT
A
B
WATER
C

GENERAL ARRANGEMENT OF DRILL HEADER USED IN SHAFT SINKING

"Two headers are used and each accommodates seven jack-hammers and one blowpipe. When not in use, the apparatus is hung to one side in the headframe and can be easily lowered by means of a sling beneath the bucket. In service it is handled by means of a small chain-block fastened to the bottom shaft set and brought to any desired height, the adjustment being allowed by means of a 3-in. air hose *H*, which connects to the air main."

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[1] Vol. 20, *Proceedings* of the Lake Superior Mining Institute.

The Twenty-seventh Engineers

The 27th Engineers went over in sections, first A Co., then B and C, and finally D, E and F. Co. A naturally got first into the activities, and its men will receive two gold chevrons, while the men of the other companies will get one. Toward the end of the campaign the entire regiment was together and did splendid work, particularly in the last offensive, as is evidenced by the following letter from the Chief Engineer of the First Army:

> HEADQUARTERS, FIRST ARMY.
> OFFICE OF CHIEF ENGINEER.
>
> 23 November, 1918.
>
> From the Chief Engineer, First Army,
> To Commanding Officer, 27th Engineers.
> Subject: Services Rendered During Offensives.
>
> 1. I desire to express my appreciation to you, and, through you, to your regiment, of the excellent service rendered by the officers and men of the 27th Engineers during the Meuse-Argonne offensive, beginning Sept. 26, and continuing until the conclusion of the armistice on Nov. 12th.
>
> 2. At the time when the building of bridges was of paramount importance to the advance of the Army and its supply, the men of your command met every demand made upon them, and by their energy and ability contributed in no small degree to the success of the First Army.
>
> 3. A copy of this is being sent to the Chief of Staff, First Army.
>
> 4. Please publish this letter to all the officers and men of your command at the earliest opportunity.
>
> GEORGE R. SPAULDING,
> Colonel, Engineers, U. S. A.
> Chief Engineer, First Army.

After four months of nearly continuous campaigning, most of the time in pup tents and under more or less continuous shellfire, working day and night in all kinds of weather, particularly the wet and cold kinds, the boys are now entitled to a rest and some good feeds. Colonel Perry saw to it that they had a treat on Thanksgiving, with the aid of the Comfort Fund; and provisions were made for another treat on Christmas. After that they will soon be on their way home, if present plans are maintained.

HOW THE COMFORT FUND STANDS

Previously acknowledged	$18,492.77
C. M. Eye	10.00
C. A. Burdick	5.00
Mining and Metals Section, National Safety Council	125.00
John Herman	10.00
Lane Pearl	5.00
W. L. Gibson	5.00
C. M. Fenton	10.00
Charles Le Vasseur, monthly	5.00
B. N. Jackson	10.00
H. A. Johann	10.00
Mrs. A. B. Emery, Messina, Transvaal	10.50
A. C. Stoddard	5.00
Robert E. Tally	25.00
Nelson P. Hulst	20.00
Lawrence Addicks	20.00
R. R. Boyd	25.00
E. R. Varela	5.00
W. J. Olcott	25.00
J. E. Clennell	10.00
C. M. Eye (monthly)	10.00
A. H. Hoffman	10.00
Francis Drake	25.00
Employees of Sociedad Minera Backus y Johnston del Perú	176.29
Charles Le Vasseur (monthly)	5.00
F. Wartenweiler	10.00
Walter Douglas	100.00
Robert E. Dye	10.00
R. T. Hancock	3.00
Total	$19,182.56

Friends are urged to make an effort to carry the Comfort Fund to its goal.

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers. Because of the work involved in administering the Comfort Fund, contributions are acknowledged only by publication in the *Journal.*

Control of Influenza

A meeting of the New York Section of the Mining and Metallurgical Society was held on Dec. 16, at which the subject of influenza was discussed, with particular reference to its nature and control in mining camps, in many of which the ravages of the disease have materially affected production. The chairman of the section, Sidney H. Ball, in his opening remarks, drew attention to the unusual experience of the two large South African diamond mines. At the De Beers mine, where there are normally about 12,000 employees, about 4000 have died from the after-effects of the disease. At the Premier mine drastic preventive measures were undertaken before the disease had made any headway, with the result that there was practically no loss of life.

Dr. Charles F. Collins, of New York, called attention to the history of the disease. From the early part of the sixteenth century up to 1870 the records show that about ninety influenza epidemics have been described. Some were sporadic, though others swept rapidly over the entire world; some were of short duration, and others lasted for several months. Many fatalities have accompanied the outbreaks, but in all cases, so far as records show, deaths have not been directly due to influenza, but to other diseases that immediately follow and attack those who are already much weakened and thoroughly poisoned by the influenza.

There are so many varieties of the symptoms that accompany influenza that it is an open question as to whether all the epidemics have originated from the same germ. It always starts with infection of the mucous membranes of the nose or throat, spreads more or less to all the other mucous membranes of the body, and, in the milder forms, the patients always present practically the same symptons.

Dr. Collins pointed out that, although a large number of the fatalities have been due to pneumonia, this complication differed from the pneumonia that seems to be always more or less prevalent. The pneumonia following the influenza develops at a single spot and creeps gradually over one or both lungs. In the recovery phase it recedes in the same manner, instead of enveloping the whole of the lung tissue at once, and clearing gradually but equally from the entire lung.

Dr. William H. Park, of the Research Laboratory of the New York Board of Health, opened his remarks by making a rather surprising statement to his audience, namely that he and his associates did not know the germ that caused influenza. On several occasions since 1890 scientists have thought that they identified the germ, and have followed it on its course for a time through the disease, only to find it missing later, though the disease traveled on in unabated virulence. During the present epidemic a germ was identified in the Eastern states, but it was almost lacking in the Middle West. Several vaccines have been tried, and the records from their use have been most encouraging; but other records upon the same material show no favorable results. There is a fair consensus of opinion among bacteriologists that they neither know the germ nor how to destroy it, but they do believe that they know how to prevent its spread, and that is by isolation, avoidance of contact, the protection of a healthy person from any and all excretions which may come from the nose, mouth, or eyes of the patient. Five thousand marines isolated near San Francisco, in an island in the bay, have not had influenza. It develops slower in sparsely settled localities, and properly made masks have undoubtedly protected their wearers in many cases. All are in agreement as to the necessity for taking to one's bed as soon as there is the least evidence of the disease, and staying there until all danger is past.

Dr. Charles E. Baldwin, of Derby, Conn., spoke of a solution of lime and creosote that he had been using for several months both for influenza in its incipient form and for pneumonia, where that disease had already developed. Dr. Baldwin claimed that the solution is not an immunizer, but kills the influenza and pneumonia germs when they are present. This idea has been adopted at Cripple Creek, Victor, and Colorado Springs, where six physicians have been using the solution, apparently with good results. The remedy has also been sent to the Anaconda physicians at Butte, Mont., but they have not yet reported the result.

Mining Congress To Enlarge Work

The American Mining Congress held its annual meeting of members in New York on Dec. 10. Representatives from several other states were present. The discussions upon the questions propounded in the questionnaire recently sent out developed many angles as to the post-war conditions affecting costs and treatment of the wage problem. These discussions led into a final consideration of a plan for enlarging the work of the Mining Congress upon the basis of divisional organizations, with specialized men in charge of the grand divisions, under following general headings: "Copper"; "Iron and Ferrous Minerals"; "Gold and Precious Metals"; "Oil and Gas"; "Non-Metalliferous Minerals"; "Coal"; "Base Metals"; "Transportation"; and "Industrial Relations and Welfare." The background of the enlarged work was the Bureau of Mining Economics, with such subdivisions as "Educational Publicity" and "Statistics."

The plan submitted by Secretary Callbreath met with general approval, with the understanding that the "Industrial Relations Division" devote most of its energy to educational work and general welfare of employees.

The following resolution was presented by Bulkeley Wells, and adopted by unaminous vote:

> That the American Mining Congress accept, as a general program of reorganization and development, the plans submitted by the secretary, the actual adoption of these plans to be effected only in the discretion and by order of the directors and only as the assured income of the congress will cover the increased expenses so to be incurred.

A special committee consisting of Messrs. Wells, Howard, and Crosby reported in favor of financing the enlarged work upon the basis of a production tax of 10c. for each $1000 in values produced. The secretary was instructed to enter into contracts with producers for a permanent service through the Bureau of Mining Economics, upon the above basis, a minimum of $60 and a maximum of $6000 per year being fixed for such service. The president was authorized to appoint committees representing each division of production, to proceed with the organization.

The nominating committee, Messrs. Barnett, of Colorado; Payne, of New York, and McCutcheon, of Pennsylvania, nominated the following directors: John C. Howard, Salt Lake City, Utah; Bulkeley Wells, Denver, Colo; Harry L. Day, Wallace, Idaho; E. L. Doheny, Los Angeles, Calif.; and E. P. Mathewson, New York. The report was adopted. The "hold-over" directors are: Walter Douglas, New York; M. S. Kemmerer, New York; George H. Crosby, Duluth; W. J. Richards, Pottsville, Penn., Samuel A. Taylor, Pittsburgh, Penn.; L. A. Friedman, Lovelock, Nev.; Carl Scholz, Chicago, Ill.; and Charles S. Keith, Kansas City, Missouri.

The board of directors elected the following officers: President, Bulkeley Wells, Colorado; first vice-president, Harry L. Day, Idaho; second vice-president, M. S. Kemmerer, New York; third vice-president, George H. Crosby, Minnesota; secretary, James F. Callbreath, Washington, D. C.

Pulverized Fuel in Blast Furnaces

A company has been formed under the title of the Garred-Cavers Corporation, with offices at 43 Exchange Place, New York, to introduce the use of pulverized fuel in blast furnaces. The company has acquired the patents of the Garred and Cavers processes and has made arrangements for the use of the same at the blast furnace plant of the Tennessee Copper Co., Copperhill, Tenn., and at the smeltery of the International Nickel Co. of Canada, Ltd., Copper Cliff, Ontario.

A large amount of experimental and development work has already been done, with encouraging results, both from an operating and economic point of view, and the enginers and metallurgists interested in blast-furnace practice will fully appreciate the many advantages that will accrue if this system, which utilizes cheap pulverized fuel in place of coke, is generally adopted.

U. A. Garred was formerly chief engineer at the Washoe smeltery of the Anaconda Copper Mining Co., and was later engaged at the Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Australia. More recently he was chief engineer at the Nichols Copper Co.'s smeltery, at Laurel Hill, L. I., and is now devoting his time to the problems connected with the use of pulverized fuel in metallurgical furnaces.

Marketing Government Property

Benedict Crowell, Assistant Secretary of War and Director of Munitions, has been requested by the President to assume responsibility for the proper disposition of all property acquired by the War Department since Apr. 6, 1917. Mr. Crowell has appointed C. W. Hare, Assistant Director of Munitions, to have general supervision of this work, and Brig. Gen. C. C. Jamieson has been appointed Director of Sales in direct charge of an organization to be perfected for the disposal of surplus property.

The policies and procedures upon which sales will be made are being formulated by the Director of Munitions, the Assistant Director of Munitions, and the Director of Sales. It is the intention of the Director of Munitions to so market Government property as to interfere as little as possible with business conditions, and to this end the Assistant Director of Munitions and the

Director of Sales will, as occasions may require, confer with committees representing the industries affected.

Any information in connection with the various problems involved will be furnished by either the Assistant Director of Munitions or the Director of Sales at their offices in the Munitions Building, Nineteenth and B Streets, Washington, D. C.

Monthly Copper Production for 1918

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE COPPER PRODUCTION, 1918

	August	September	October	November
Alaska shipments	4,245,557	4,216,816	4,142,744	6,607,216
Arizona:				
Arizona Copper	4,300,000	4,330,000	4,060,000	4,000,000
Cons. Ariz. Smelting	1,250,000	1,200,000	1,200,000	7,500,000
Inspiration	9,000,000	7,800,000	8,125,000	992,271
Magma	900,000	747,805	949,455	....
Miami	5,374,198	5,012,865	4,945,178	4,382,170
New Cornelia (a)	2,838,000	2,468,000	2,390,000	2,272,000
Old Dominion	2,064,500	2,292,000	2,373,000	2,101,000
Ray	6,625,000	7,250,000	7,490,000	7,020,000
Shannon	708,000	722,000	800,000	684,000
Shattuck Arizona	682,861	686,844	744,069	583,655
United Verde Extension	4,627,260	4,623,300	4,702,500	....
Other Arizona	26,363,078	25,002,934	26,604,700	....
California:				
Mammoth	1,320,000	1,140,000	910,000	1,140,000
Michigan:				
Calumet & Hecla	10,718,520	10,341,468	11,929,929	10,499,711
Other Lake Superior (b)	7,000,000	7,000,000	7,000,000	....
Montana:				
Anaconda	24,900,000	21,800,000	23,450,000	22,600,000
East Butte	1,714,358	2,134,700	1,823,000	2,100,000
Nevada:				
Mason Valley	1,032,702	1,682,340	1,086,200	1,073,400
Nevada Cons	6,500,000	6,670,415	6,700,000	6,601,000
New Mexico:				
Chino	5,065,818	7,936,000	7,063,000	6,464,285
Utah:				
Utah Copper	19,920,947	17,785,000	19,000,000	16,500,000
Eastern smelters (b)	1,750,000	1,750,000	1,750,000	....
Total reported	148,900,799	144,592,487	149,238,775	....
Others, estimated	16,650,000	13,400,000	4,100,000	....
Total United States	165,550,799	157,992,487	153,338,775	....
Imports: Ore and concentrates, etc	18,546,115	10,828,810	10,112,365	....
Imports in blister, etc	42,519,271	37,570,650	33,884,114	....
Grand total	226,616,185	206,391,947	197,335,254	....
British Columbia:				
Canada Copper Corpn	159,821	142,466	191,433	....
Granby Cons	2,820,207	3,371,535	2,549,474	2,147,405
Mexico:				
Boleo	....	1,764,000	1,873,760	....
Cananea	5,000,000	4,900,000	4,300,000	5,100,000
Phelps Dodge, Mexican properties	4,063,322	4,308,845	3,791,602	3,551,418
Other Foreign:				
Braden	6,690,000	6,020,000	(c)	(c) ....
Cerro de Pasco	5,786,000	6,150,000	5,836,000	5,398,000
Chile	8,496,000	7,346,000	8,548,000	9,854,000
Katanga	4,894,200	4,887,598	3,306,900	551,250
Backus & Johnston	2,052,091	2,435,442	....	....

(a) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery, which is included under "Other Arizona." (b) Estimated. (c) Not reported.

The production of the United States by months since the beginning of the year is as follows:

	Pounds
January	165,431,568
February	160,011,364
March	185,525,168
April	163,207,096
May	181,070,350
June	166,723,599
July	159,329,031
August	165,550,799
September	157,992,487
October	153,338,775

The item "Alaska shipments" gives the official figure of the U. S. Department of Commerce. Kennecott production from its Alaskan mines for August and September was 5,280,000, and 5,508,000 lb., respectively. Beginning with the month of October, the Kennecott Copper Corporation discontinued reporting the output of its Alaska mines and the Braden mines separately. In October its copper production from both sources was 13,286,000 lb., and in November, 12,146,000 pounds.

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Canada Copper, Granby, Cananea, Braden, Cerro de Pasco and Chile. As a matter of record, however, the individual figures are given after the total. We also report the production of the Boleo and Katanga companies, whose copper does not come to the United States.

The Tin Situation

G. N. Armsby, chief in charge of tin, of the War Industries Board, authorized the publication of the following letter dated Dec. 18 and addressed by him to John Hughes, chairman of the sub-committee on pig tin, of the American Iron and Steel Institute:

> Referring to my letter of Dec. 2, fixing the price, terms, and conditions under which this tin is to be distributed to consumers, dealers, and jobbers, the total quantity allocated is approximately 10,000 gross tons, and the estimated overhead cost from f.o.b. port of shipment, either Singapore or Sydney, to f.o.b. delivery point in United States, including ocean freight, marine and war risk insurance, interest, railroad freight, storage, weighing, and all other charges, will be covered by the provisional prices announced in Circular Letter No. 8 of American Iron and Steel Institute, dated Dec. 3, 1918, namely, 72½c. per lb. ex dock or store port of New York or Chicago, or f.o.b. delivery points at Chicago and points east, seller's option, or 71½c. per lb. ex dock or store Pacific Coast ports, seller's option.
>
> In my letter of Dec. 2, 1918, which was published in your Circular Letter No. 8, above referred to, the United States Steel Products Co. was authorized to make sales at the above prices for shipment during the months of December, 1918, and January, 1919. After due consideration, the War Industries Board has decided to extend the period, during which the base prices will be maintained, beyond Jan. 31, 1919, until such time as all of this tin has been distributed.
>
> The War Industries Board has further decided that, when the importation and distribution of this tin shall have been completed, and all charges and costs accruing thereon shall have been finally and definitely ascertained, the actual net price per pound be determined and proper refund be made on the cost basis by the United States Steel Products Co. to each buyer to whom said company has made a sale.
>
> Careful consideration is being given to the needs of American consumers with respect to further importation of pig tin from the various producing centers, and when the proper time comes, a formal announcement will be made as to when and under what conditions import licenses will be granted permitting importations to be made.

Mr. Hughes has made the following statement to the trade: "Sales of tin made by the United States Steel Products Co. will be adjusted after final distribution, as soon as the cost price has been ascertained and determined under Government authority."

Tomboy Gold Mines Co., Ltd.

At the annual meeting of the Tomboy Gold Mines Co., Ltd., held recently in London, the report of the directors and the statement of accounts were approved and adopted. The operations for the year show a net profit of £57,364 6s 6d. Shortage of labor is given as the principal reason for the fact that development work was not carried out on so extensive a scale as it otherwise might have been. During the year experiments were made on a practical scale to indicate the suitability of the oil flotation process as a method of treatment for the ore. The results showed that a net saving of at least $1 per ton can be made. The question of the necessary plant has been deferred until conditions warrant the expenditure involved.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Reopening French Mines of Interest

Much valuable technological information will be available to mining engineers who have an opportunity to watch the reclamation of the French mines. As the mines were systematically destroyed by opening their workings to underground quicksands and water and by the blasting of shaft linings, it is certain that some very unusual methods must be employed to save them. The hope is expressed that competent observers will follow the restoration of these mines, so that the industry generally may take advantage of the practices developed.

War-Mineral Producers Convene

Producers of war minerals who wish to obtain Government relief held a convention in Washington Dec. 16 and 17 under the auspices of the American Mining Congress. As a result of the deliberations it is probable that a resolution will be introduced in Congress, authorizing the Secretary of the Interior to determine the measure of damage suffered in each case and liquidate these amounts from the appropriation authorized by the War-Minerals Act.

A committee from the convention called on the Secretary of the Interior, while the sessions were in progress, to inquire as to his policy in administering the War-Minerals Act. Secretary Lane admitted that he possibly has the technical right under that law to undertake to adjust the situation as to some of the war minerals, but as there is doubt whether such action would come within the intention of Congress, he declined positively to act without specific authorization from the President or from Congress.

The producers at the convention summed up their reasons for asking relief as follows:

> By reason of urgent appeals made by representatives of the U. S. Government, many persons throughout the United States have expended varied sums of money in producing and in preparation for the production of the minerals specified in the War-Minerals Act, and will lose much or all of their investments unless the legislative intent of the act shall be carried out. This will result principally because of the fact that competitive material from foreign nations can and is being delivered to American users at prices much below the cost of the American product.
>
> The persons so induced to undertake production were led to make such expenditure upon the representation that legislation was being considered by the Congress of the United States, and its early enactment expected, and that provision would be made to reimburse such expenditures.
>
> The War-Minerals Act authorized the President "to develop and operate such mine or deposit" with the funds thereby appropriated. By reason of individual investment, ample supplies of nearly all the specific minerals have been developed in the United States, the expense thereof having been borne by individuals who now find themselves suffering financial losses because the markets have been supplied by heavy importation from cheap-labor countries, while the fund provided by the act for such purpose remains intact.

There were 55 delegates present at the convention. Twenty-two states were represented. It was estimated that 1000 employers and 20,000 employees are affected to a greater or less extent by the present situation in war minerals.

The meetings were attended by a number of senators and representatives. Senator Henderson, chairman of the Senate Committee on Mines and Mining, and Representative Foster, chairman of the corresponding committee in the House, assured those assembled that Congress would give sympathetic attention to their petition, and each pledged himself to take up the matter in committee as soon as definite proposals were available.

Sulphuric-Acid Capacity Estimated

A report on the present sulphuric-acid capacity of plants in the United States and on the requirements for 1919 has been made to the Chemical Alliance by Arthur E. Wells, who is one of the sulphuric-acid specialists of the War Industries Board. The report reads as follows:

> On Jan. 1 of this year, the total manufacturing capacity of the country for acid was 427,000 tons per month (basis 100% H_2SO_4), or 8,200,000 tons per year (basis 50° Bé), of which 29% was at contact acid plants.
>
> On Nov. 1 of this year, the total manufacturing capacity of the country was 500,000 tons per month (basis 100% H_2SO_4), or 9,600,000 tons per year (basis 50° Bé). Of this total capacity 40% was at contact acid plants.
>
> This capacity was divided among (1) Government, (2) explosives companies, (3) all others, including commercial manufacturers and byproduct manufacturers, as follows:

SULPHURIC ACID MANUFACTURING CAPACITY OF UNITED STATES

	Expressed as Tons per Month 100% H_2SO_4	Expressed as Tons per Year 50° Bé
(1) At Government plants.......	54,000	1,040,000
(2) At plants of explosives manufacturers	58,000	1,120,000
(3) All others	388,000	7,440,000
Totals	500,000	9,600,000

The total capacity east of the Mississippi River, and also including the plant at Argentine, Kan., and the plants in Louisiana and Arkansas, is 454,000 tons per month as 100% H_2SO_4. The report continues:

> If it be assumed that the Government plants and the contact plants, which were built by the explosives companies primarily to supply acid for munitions explosives, are not operated in 1919, or, if operated at all, that the production will be utilized only for munitions, and thus will not be placed on the market, there remains a total capacity to be considered in the eastern part of the United States amounting to 365,000 tons per month (basis 100% H_2SO_4), or 7,000,000 tons per year (basis 50° Bé).
>
> During the first nine months of 1918 the actual rate of production was only about 90% of the rated maximum capacity, although many plants were operating much above the rate capacities. Therefore, it is fair to conclude that the probable maximum output from these plants for 1919 cannot be greater than 90% of the rated capacity, or, in other words, the maximum output could be only about 328,000 tons per month (basis 100% H_2SO_4) or 6,300,000 tons per year (basis 50° Bé).

Copper Prices Expire Jan. 1

The War Industries Board announced on Dec. 20 that price regulation of the copper industry by the Government would end on Jan. 1, when the board will go out of existence. The price has been fixed by agreement at 26c. The board expressed the opinion that the great need for copper, including that needed for reconstruction work abroad, will create a demand equal at least to normal times.

After a meeting of the price-fixing committee with the copper industry, held on the same day, a statement was issued which reads in part:

> The chairman called attention to the fact that among the vital war needs of the Government copper ranked second only to steel, and wished to place on record the Government's appreciation of the patriotic spirit in which the copper producers had accepted maximum prices suggested by the price-fixing committee, and the industry's unceasing efforts to produce the abnormally large quantity of copper required to supply the war needs of ourselves and those associated with us in the war.
>
> The industry through its spokesman testified to the courtesy and consideration it has always received at the hands of the price-fixing committee, and to the fact that the fixing of maximum prices by the Government had developed, at the numerous meetings, a vast amount of information which had been most helpful in stabilizing and standardizing the industry.

Copper Ore Import Rules Changed

Regulations covering the importation of copper ore and copper concentrates have been modified, according to an announcement by the War Trade Board. These commodities will hereafter be admitted as follows:

1. Copper ore originating in and coming from Korea, Newfoundland, the West Indies, France, England, the West Coast of South America, Cuba, Canada, and Mexico, irrespective of the content of copper.
2. Copper ore originating in and coming from Spain only when containing more than 2% of copper.
3. Copper concentrates from Cuba, Canada, and Mexico, irrespective of the copper content.
4. Copper concentrates from any non-enemy country, other than Cuba, Canada, and Mexico, only when containing 50% copper or over.

There is no restriction upon the importation of copper matte or blister copper.

Tin Import Negotiations Described

In his report to Congress, the chief of the Bureau of Foreign and Domestic Commerce comments as follows on tin imports:

> At the beginning of the fiscal year the commercial adviser of the British Embassy in Washington was informed of our desire to make some arrangement with his government under which sufficient quantities of British-controlled tin to supply the requirements of our trade would be released monthly and distributed in this country through the American Iron and Steel Institute, under the guidance and control of the Department of Commerce. A plan to control the use and distribution of all British tin imported into this country was prepared and approved by the solicitor. Before it could be approved by the department, the executive order creating the Exports Council and vesting in that body the control of foreign trade was signed by the President. In the meantime, Commercial Attaché Williams, in London, with the assistance of Mr. Sheldon, representing our Food Administration there, continued to represent the interest of our consumers, both as a whole and in individual cases, before the British rubber and tin exports committee. Finally, in October, the War Trade Board, successor to the Exports Council, received authority of law to control imports, and in November regulations for controlling this importation, as well as the distribution of tin in this country, after being agreed upon by the War Trade Board, the Food Administration, and a representative of the bureau, were promulgated by the War Trade Board.
>
> From this time the actual tin negotiations with Great Britain were conducted for our Government by the War Trade Board, Great Britain finally agreeing to allocate to us a certain amount of British tin each month. It was also agreed that all shipments of Straits and Australian tin should henceforth come to us via the Pacific instead of via London.
>
> In February the War Industries Board assumed control over the importation and distribution of pig tin, and, with the assistance of the Bureau of Standards, took up the question of greater economy in the use of tin, a subject to which this bureau had already given attention, with gratifying but not sufficiently universal results. Our commercial attaché in London has remained in charge of the London end of our negotiations respecting this commodity.

Navy's Purchase of Non-Ferrous Metals

Total purchase of the non-ferrous metals for the requirements for the Navy, during the fiscal year ended June 30, 1918, are given as follows in the annual report of Rear Admiral McGowan, head of the Bureau of Supplies and Accounts:

PURCHASES OF NON-FERROUS METALS BY THE U. S. NAVY IN YEAR ENDED JUNE 30, 1918

Commodity	Quantity (in Pounds)	Value
Copper	[illegible]	[illegible]
Lead	[illegible]	[illegible]
Tin	[illegible]	[illegible]
Antimony	222,098	[illegible]
Monel metal	[illegible]	[illegible]
Steel wire rope	[illegible]	[illegible]
Nickel	[illegible]	[illegible]
Zinc	[illegible]	[illegible]
Aluminum	[illegible]	[illegible]
Portland cement	[illegible] (a)	[illegible]
Copper products	[illegible]	[illegible]
Brass products	[illegible]	[illegible]
		[illegible]

(a) = Barrels.

Geological Survey's Part in War

In the course of his report to Congress, submitted Dec. 17, George Otis Smith, the director of the U. S. Geological Survey, says:

> Every activity of the Geological Survey that could possibly contribute to the prosecution of the war has been so directed. . . . The increase in the Survey's representation in the Army from 61 men who had held appointments of the Secretary at the beginning of the year to 322 at the end, necessarily involved a serious reduction in the man-power available for other contributions to war work.
>
> The field search for new occurrences of war minerals, the prompt examination of newly reported deposits, and the field estimates of the reserves thus made available have constituted a large part of the duties of the geologists of the Survey. In the effort to meet the urgent demand for essential minerals, the Survey geologists have visited not only the mining districts of the United States but also deposits of potash and nitrate and chrome and manganese in Central and South America and in the West Indies.
>
> The geologic work connected with the mineral fuels has been concentrated on the search for oil pools to stimulate increased production. Close coöperation with the Fuel Administration has made all the geologic data obtained quickly available for use in directing new drilling.

Navy Got the Tin

Under the caption "We Got the Tin," Rear Admiral McGowan, in his annual report to Congress, tells of the commandeering of tin supplies in storage at New York. He says:

> In the fall of 1917, 27,000 lb. of tin was urgently needed. The tin market was jumping out of bounds. Several dealers were called upon without result. The Collector of Customs at the Port of New York was called by long distance telephone. He advised that a ship was in with a cargo of 250 tons consigned to three companies. The 13 tons required by the Navy was apportioned among those three companies, and the tin was paid for at 64c. per lb., the approximate value before the market began to rise. With this beginning, arrangements were gradually made to restrain all tin warehoused in New York found to meet Navy specifications. Through the Commandant at New York, approximately 2000 tons was placed under seal. This action prompted a dealer to place at the Navy's disposal 700 tons additional, which was contracted for at 64c. per lb., the market price at that time being 80c. per lb. Complaints with regard to procedure were adjusted by the subcommittee on pig tin of the American Iron and Steel Institute. The following statement appeared in a letter from the chairman of the subcommittee and was subsequently incorporated in the report of the House Investigation Committee on Conduct and Administration of Naval Affairs: "The action of the Navy in commandeering tin which was hoarded in the possession of importers and dealers, and thereby held from the market when an acute shortage prevailed, was commendable."

Editorials

The Situation in the Metals

THE more fully are details revealed respecting governmental positions in copper, lead, zinc, and tin, the more serious does the position of those metals appear to be. In each case the stocks on hand are greater than anyone engaged in production and commerce ventured to estimate, and the officials to whom were available the statistics of the invisible stocks, especially of tin, apparently paid no great attention to them, or did not know what they meant.

In copper, American producers were estimated about a month ago to have approximately 800,000,000 lb. of crude copper in stock and in transit, and the quantity must have been increased during December. Australia has about 50,000,000 lb., and Japan must have a large supply. It has become known within a few days that the British government has 62,000,000 lb. of refined and the American Government between 75,000,000 and 100,000,000 lb. How much is held by the French government and by manufacturers everywhere? How much has been, or will be, salvaged from the battlefields and from sunken ships that will be raised?

The surplus of copper has not resulted from any great increase in production in 1918. On the contrary, the indications are rather strong that the statistics of the world's production in 1918, for which preliminary figures will be available in a few days, will show a considerable decrease from 1917.

In lead we find a similar situation. Large stocks exist in America and Great Britain, the British government reporting 49,000 long tons of its own, while supplies have backed up in Australia.

The British government has reported holding 18,769 long tons of common spelter and 6544 tons of high grade. Stocks in the hands of American producers are about 35,000 tons, a decrease from the figure of Oct. 1, but there is reason to surmise that the invisible supply in this country is large. Stocks of zinc ore are superfluous in the Joplin district and in Australia.

American consumers of tin are supposed to have had about 20,000 tons of tin on hand in November, and 10,000 tons bought in the Orient by the United States Steel Products Co. is on the way hither. This would provide for the normal consumption of this country for about six months, irrespective of the production from Bolivian ore by American smelters, who will soon be turning out nearly 2000 tons per month. In Great Britain the stocks of tin are also reported to be large.

With this situation there is no reason for surprise respecting the failure of buyers to appear in want of metals at recent prices. Nor that lead broke to offerings at 6c. when free market was declared last Saturday. Nor that on the London Metal Exchange quotations for copper opened at about 20c. Nor that tin declined in London to about 57c. Nor that high-grade zinc here has been unsalable on offerings at 9c. The rise in lead in London to £40 on Nov. 26, which quotation has since then been maintained, was manifestly an arbitrary matter, for American and Mexican producers could, and would, have undersold that price sharply if they had been able to arrange with the steamship companies for carriage of the metal, which they could not do.

The talk that there has been about maintaining prices, large orders in prospect, etc., has been a sort of camouflage of a disagreeable situation. The matter that has been most in the minds of the producers has been the orderly liquidation of governmental stocks. In the early days following the armistice some of them resented the cancellation of orders and in an obtuse way thought that they were accomplishing something helpful when they obtained rescindment of cancellations and could continue to put metal into the hands of the Government. It was soon seen, however, that the accumulation and holding of large stocks by the Government would be a menace to the market, and the present thought, economically sound, is to see that such stocks are distributed as soon as possible, with the minimum of disturbance. The plans that are being urged are based on the idea of a regular disposition spread over a period of a year, say, the distribution to be managed *pro rata* by the producers in connection with the sale of their new product.

It will be best to defer discussion of the conditions that have produced the present situation until the statistics of production in 1918, and other statistics, are available. It looks, however, as if the world's output of tin will show only a small increase, if any, as compared with 1917, while the totals for copper and lead are all but certain to show a decrease. Zinc will surely show a decrease. Thus, the producing of these metals was not overdone. On the other hand, the curtailment of "non-essential consumption" was probably carried too far.

What About Mexico?

NOW that the first act of the great drama in Europe approaches its end, and the second act, the readjustment of international affairs, looms large on the horizon, we hope that one scene of that act will be laid in Mexico. No scene can be of greater interest to those interested in foreign commerce, and particularly to miners, than one in which Americans and Mexicans take the leading parts.

We do not speak solely for the miners but for Americans and Mexicans and for all commercial interests. The United States is large and contains ample undeveloped resources to occupy the energy of all of our people for years to come. The same may be said of Mexico, but we are learning, as every European nation has learned, and as Mexico will some day learn, that no country is so large and so self-contained that it may remain forever isolated and have no business relations with foreign countries. We have learned that we can give and receive benefits through intercourse with all portions of the globe, and that the cultivation of this intercourse will redound to the great advantage of all participants.

More than once it has been correctly stated that commerce follows the flag, but the flag follows the prospector; or, in other words, where conditions are such that mining indutries may be advantageously conducted by foreign capital, other commercial undertakings follow, and the participating countries are mutually benefited.

Through internal disorders in Mexico her mining industries have been ruined, and with their destruction the state has fallen into a deplorable condition morally, financially, and commercially.

"Let Mexico do her own housecleaning," was the answer for several years to those who knew Mexico and asked for help from the American people; but the American people are finally waking up to a realization of the opportunities and duties lying just across the Rio Grande, and we anticipate that when the more important work on the other side of the Atlantic is finished appeals from Mexico will not fall on deaf ears. Measures will then be taken that will lead to a better mutual understanding, a stabilizing of the government, and a reign of order throughout the country.

This can be done, and at no great effort on our part, if done in the right way; for there is a right and a wrong way of doing these things. We read of the suggestion of making Mexico a military camp of the United States; we see her officials cartooned and held up to ridicule, her people deprecatingly spoken of and contemptuously treated; and these things all go to make up the wrong way.

The atrocious treatment that has been meted out to foreigners in the oil fields is unpardonable, but this was not inflicted by those who ought to be in power in Mexico and whom we should like to see there. Banditry as it has been practiced throughout the country, at times as the acts of pseudo or self-appointed officials, and at times as pure deviltry, challenges comparison with the brutality of the lowest type of savagery. The confiscation of property through taxation or decrees has been inexcusable and unwarranted, and merely shows the incompetency of those who, by physical force, are in authority. Mexican officials have done enough to irritate us, have done enough to call for condemnation and ridicule; but when we adopt this kind of criticism, and include all Mexicans in our censure, we go too far, for we speak of the mass of the people, who are no more to blame for conditions than as though they were not living there.

The educated, the intelligent, Mexican knows the treatment that Americans have been receiving; he regrets it deeply, though powerless to prevent it, and he feels it keenly when he is blamed for that condition which renders this treatment possible. By far the largest percentage of the Mexican people, her uneducated class, her peons, are mere children, easily controlled and easily lead. These, too, would be our friends if they could, and must not be classed with the trouble-making officials.

Our policy toward Mexico should be helpful criticism, frank, straightforward advice, clear and explicit. The educated Mexican will appreciate and not resent it. It is safe to say that a great many of them desire it. The official with power and authority, but lacking ability to use either, will understand it, and may have the good judgment to make use of it. If not, then our advice should take a more positive form, insistence upon order and good government, to originate within, if possible, but from without if she cannot do it herself. We would all gladly see Mexico solve her own problems if she can, but eight years of misrule must be discouraging to her unhappy people. They certainly have been so to us. We are ready to help her if she would ask, but we have had no hint that this would be acceptable. Only one course appears to be open: that we take the initiative and help her whether those in authority wish it or not. If we do not, European nations will, and they may not do it with so gentle a hand as will her next-door neighbors.

The existence of satisfactory relations between Mexico and the United States will depend upon mutual respect. We can certainly have no respect for an authority, a government, that permits of banditry such as has existed in the oil fields for several months, where robberies are committed by men wearing the uniform of the government and carrying government rifles. We can have little respect for a government that confiscates or destroys enterprise by taxing it to death, and issuing decrees as often and as variable as the winds of heaven.

Nor can any class in Mexico have much respect for Americans, when recalling the advice that was sent to our nationals from the States—"At any sign of disorder you should leave the country."

Upon a later occasion a timorous statesman gave like advice to American citizens. He advised them to stay off the high seas when other peoples were at war. The majority of Americans thought otherwise, and when a few of them were mistreated, two million of our boys went many thousand miles to demonstrate that the rights of a few American citizens must not be tampered with.

We do not threaten Mexico with two million soldiers, but merely point out to her that the viewpoint of the American public has changed somewhat within the last few years. We have come to that point when, in the event of a few well-behaved citizens being disturbed, Uncle Sam does not hesitate to go to considerable trouble and expense to see that their rights are preserved.

President Wilson has already set forth the attitude of the United States in a note which he recently sent Carranza. He said:

> The United States cannot acquiesce in any procedure ostensibly or nominally in the form of taxation or the exercise of eminent domain but really resulting in the confiscation of private property and arbitrary deprivation of vested rights. In the absence of the establishment of any procedure looking to the prevention of spoliation of American citizens, and in the absence of any assurance, were such procedure established, that it would not uphold in defiance of international law and justice the arbitrary confiscations of Mexican authorities, it becomes the function of the Government of the United States most earnestly and respectfully to call the attention of the Mexican government to the necessity which may arise to impel it to protect the property of its citizens in Mexico divested or injuriously affected by the decree above cited.

Mexico will respect us and our Government for taking this attitude. When she learns that what we ask her to do is for her own good more than ours, her respect will increase, and when those in authority have had the strength and good judgment to act wisely and well, we will have an equal respect for Mexico.

Standardization of Mining Methods

IN THIS issue we publish the last one of a series of notable papers on mining practices. Mr. Mitke's papers are good. They cover many important details of mining that do not receive the attention they deserve. Out of many small economies there appears the resultant of a large economy. Mr. Mitke strikes at two important points of a general nature. One is the desirability for the intensive study of the smaller features of mining practice by the engineer. Experimentation is a part of this study. The second, and equally important, point is the training of the miners.

The success of modern quantity production in manufacturing lies in the segregation of processes into sequential steps and the training of each group of workers until they are able to execute their part thoroughly and quickly. Necessarily, the coöperation of the worker must be secured.

In mining operations there are similarities in principle to manufacturing methods, although there is the important difference that the work is distributed and cannot be concentrated, as is done in well-organized factories. The effect of this is to throw a considerable amount of initiative upon the miner or group of miners. Unrestrained or untrained initiative results in waste and therefore uneconomical labor. Efficient supervision and direction by foremen and shift bosses go a long way toward remedying this state of affairs, and together with sufficient training of the workers to enable them to catch the objectives of the system, will produce results exceeding the expectations of the most sanguine.

BY THE WAY

The immediate death of "Dora" is unanimously demanded by British business men, according to reports from the American Chamber of Commerce in London. "Dora," the Defense of the Realm Act, is evidently unpopular. Only a few restrictions are approved by business men generally, except that men engaged on what they believe to be "key" industries are much interested in developments in the government's plans for protecting them.

Rumors were abroad regarding cuts in copper prices, remarked the *Evening Post*, but among the principal copper people it is asserted that the price is still held stiffly at 26c. per lb. What is the use in cutting prices, they ask, when people would not buy even at lower levels, unless the reduction was extremely drastic? So the market has for the moment resolved itself into a state of mind. Some of the copper men take a long, long view. Prices will go lower, they freely admit; but a year from now, when people know where they stand, prices are apt to be higher than at present. Thus the optimists of the trade apparently look either for a reduction of output or for a "reconstruction demand" equal to the recent demand for destructive purposes.

Instead of our usual copy of the annual cotton report, we have been startled by receiving this year a reply postal from Washington to be used if we really want that valuable document. Right on top of it comes the following item from London *Truth*, showing how much room for improvement there has been over there:

> How paper has been wasted and money squandered on war propaganda literature is now proved by the report of a select committee on the demands the Stationery Office has had to meet. The War Aims Committee wanted 5,000,000 copies of one booklet, "Parliament's Vote of Thanks to the Forces," but the order was reduced to 500,000, and of those 440,000 were not used. The Prime Minister's "Message to All at Home" was another example of the same kind, 730,000 copies out of 1,000,000 being undistributed. No wonder there has been a shortage of paper!

THE LILT OF THE ANCIENT PROSPECTOR

By Walter H. Gardner

To Hector Bean, just turned sixteen, with feet that itched to roam,
Was shown a nugget—some one dug it on the beach at Nome.
He made his mind the like to find—and ran away from home.

He had a pan, a water can, for traveling an itch,
Flour, coffee, tea, ability to throw a diamond hitch.
Equipment thorough! "Mush, you burro!" Soon he would be rich!

A whole decade our Hector stayed within the Panamints,
He found all sorts of barren quartz—but none with golden glints;
Then left that range in search of change, as many a man has since.

Bewhiskered, swarthy, headed north he sought the Arctic Zone,
Up-turning gravel, pausing travel by each likely stone;
The while his poor old aged burro shrunk to skin and bone.

And there he drifted, sluiced and sifted bar and bench and bluff,
Becoming weazened, growing seasoned (whiskers like a ruff).
Finding traces many places—never quite enough.

He cinched his pack and started back. With undiminished hope
He picked and panned and swept and scanned the whole Pacific Slope.
At one outcrop he made a stop; but vain his shaft and stope.

From Culiacan to Mazatlan he panned and panned and panned;
Then two springs on the Amazon—a hard fall on the Rand.
On Gila Creek he swung his pick; some colors, mostly sand.

At last he tried where Telluride has since achieved renown,
To ascertain if one slim vein would broaden deeper down.
It did! Four hundred to the ton read assays from the town!

Immediately, tall and stately, came a millionaire;
Around he stalked, with hammer knocked some samples here and there.
Then said to Hector, "Well, prospector, set a price that's fair!"

Old man Bean peered o'er the scene, "She sure is proper ore!"
And paused to scratch his shaggy thatch, "I ain't seen sich before!
I'd like to make a little stake—then look around some more!

"If I could get a new outfit, the claim is your'n, my son,
While I opine she's sure some mine, *it's looking that's the fun!*
'N I think I know right where to go to find a better one!"

Personals

Have You Contributed to the Association of the 27th Engineers?

C. Carleton Semple will leave for Peru immediately after Christmas.

Pope Yeatman, together with **Irwin H. Cornell,** arrived home from Europe last Saturday.

H. B. Johnson is on a professional trip in Texas, and will return to Boston in three weeks.

Mark L. Requa has been presented with a loving cup by the personnel of the oil division of the Fuel Administration.

O. E. Jager recently returned from England on the "Megantic," and will spend a short time at Corvallis, Oregon.

Charles Wigglesworth, mining and construction engineer, is now in Burnet, Tex., where he is doing consulting work.

J. R. Enlow, of the Chihuahua smeltery of the American Smelting and Refining Co., recently visited his family in El Paso, Texas.

L. P. Pressler, of the Canadian Johns-Manville Co., will be in Santa Fe, N. M., on personal business during the month of January.

Martin Fishback, who is connected with the newly incorporated Arizona Smelting and Power Co., Benson, Ariz., is now in New York.

F. H. McLearn, of the Canadian Geographical Society, has been investigating the geological section along the Peace and Smoky rivers.

Dr. Sergio Bagnara has resigned as metallurgical engineer to the Ordnance Department, U. S. A., and will take up professional work in New York.

K. E. Humbert, of Perin & Marshall, consulting engineers, 2 Rector St., New York, has returned from a business trip to India, Malay States, China, and Japan.

J. J. Warren, managing director of the Consolidated Mining and Smelting Co. of Canada, has returned to Trail, B. C., from a business trip to Toronto and Montreal.

E. A. S. Clarke, president of the Lackawanna Steel Co., has been elected to head the new export steel company which is being organized by the independent steel producers.

Fred Alley, general manager of the El Carmen mine, Inde mining district, Durango, Mexico, left El Paso, Tex., recently to visit that property, going by way of Parral and Rosario.

Robert T. Hill, geologist, has opened an office at 612 American Exchange Bldg., Dallas, Tex., and will continue his office at Room 800, Central Bldg., Los Angeles, California.

William J. Young, Jr., one of the owners of the Great Western mines at Courtland, Ariz., and Mrs. Edith Choate Oesting, late of San Diego, were married recently in Pasadena, California.

Thomas Varley is at present in charge of the ore-dressing branch of the U. S. Bureau of Mines at the University of Utah, having succeeded A. E. Wells, who has been transferred to Washington.

Charles Piez, vice president and general manager of the Emergency Fleet Corporation, Philadelphia, has been elected to succeed Charles M. Schwab, who recently resigned as director general.

Gordon Bullock, chief clerk at the Arizona Copper Co.'s smeltery at Clifton, Ariz., has returned from Halifax, N. S., where he was stationed in the Quartermaster's Corps of the Canadian Army.

H. W. Clarke, formerly connected with the advertising service department of the McGraw-Hill Co., of Chicago, Ill., has been appointed manager of advertising for the Chicago Pneumatic Tool Co., Chicago.

A. S. Knowles, consulting engineer of Freyn, Brassert & Co., engineers, Chicago, sailed for France, Nov. 30, on an inspection trip of byproduct coke ovens and allied industries. He is expected to return in about six weeks.

Lieut. Roy B. Earling, formerly superintendent of the Arizona Copper Co.'s Metcalf group of mines, in the Clifton-Morenci district of Arizona, has been discharged from the artillery division of the National Army and has returned to Morenci.

F. H. Hawkins, chief assayer for the Standard-Silver Lead Mining Co., of Silverton, B. C., has gone to Anyox, B. C., to accept a situation with the Granby Consolidated Mining, Smelting and Power Co. **Thomas Brown** will succeed Mr. Hawkins at Silverton.

E. E. Campbell, [illegible] of the Anyox mine of the Granby Consolidated Mining, Smelting and Power Co., and O. B. Smith, [illegible] superintendent of the company's mining operations, recently returned to Anyox after visiting the Ketchikan district of northern British Columbia.

Norman Carmichael, general manager of the Arizona Copper Co., Joseph P. Hodgson, manager of the Morenci branch of the Phelps Dodge Corporation, and J. W. Bennie, general manager of the Shannon Copper Co., Clifton, Ariz., are members of the Greenlee County, Ariz., community committee, which will secure employment for returned soldiers.

Douglas B. Sterrett, of St. Cyr, Quebec, recently registered at the office of the American Institute of Mining Engineers. Others who registered there during the last week were Walter A. Rukeyser, Ensign, U. S. N., Blue Hill Station, Boston, Mass.; Lieut. D. F. Schindler, Havana, Cuba; Lieut. Fred S. Porter, Kennecott, Alaska; Lieut. Clinton R. Lewis, Dawson, Y. T., Canada; H. W. Nichols, Chicago, Ill., and Lieut. J. L. White, Humboldt, Arizona.

Obituary

J. King McLanahan, of Hollidaysburg, Penn., one of the best-known iron manufacturers in central Pennsylvania, died Dec. 13, aged 91 years.

Fitzhugh Lee, manager of the manufacturing department of the Grasselli Chemical Co., Cleveland, Ohio, died Dec. 14, aged 48 years.

H. E. Martin, district mining engineer of the Eastern Division of the Mesabi Range for the Oliver Iron Mining Co., died of influenza Dec. 15, at Eveleth, Minn. Mr. Martin was chief mining engineer of the Hibbing district for the same company for several years, having entered their employ in 1906. He was a graduate of the University of Wisconsin.

Charles C. Christensen, an authority on mining machinery, died Dec. 13 at his home in Chicago, Ill. He was born in Copenhagen, Denmark, and came to this country in 1880. He became associated with the old firm of Fraser & Chalmers, which is now the Allis-Chalmers Manufacturing Co., as consulting engineer. Mr. Christensen was 67 years old.

Charles H. Johnson, engineer, died at his home in New Castle, Penn., Dec. 10, after a four-weeks' illness. He was born near Clinton, Lawrence County, Penn., in 1870, and was graduated from Massachusetts Institute of Technology as a mining engineer. For a time he was engaged in engineering on the Mesabi Range, in Minnesota, and then returned to New Castle and became associated with his father, George W. Johnson, in operating an old sheet mill which was converted into a tin mill and later sold to the American Sheet and Tin Plate Co. From then on he was actively engaged in the limestone quarrying business and in other industries. At the time of his death Mr. Johnson was general manager of the Pittsburgh Limestone Co., the Lawrence Limestone Co., the G. W. Johnson Limestone Co., the Keystone Limestone Co., and the Mahoning Limestone Co., which companies have quarries in Lawrence, Butler, Blair, and Armstrong counties, Penn., and also in Maryland and West Virginia. He was president of the Johnson Bronze Co., the National Stone Co., and the Bessemer Loam-Sand Co., and was also interested in various other companies.

Societies

Chemical, Metallurgical, and Mining Society, South Africa, recently held a meeting. The new president, H. Meyer, delivered his inaugural address and dealt with many questions connected with the industry.

Institute of Metals (British). A general discussion on "The Relation of Science to the Non-Ferrous Metals Industry" was the central feature of the annual general meeting recently held. Several important papers were also presented.

Trade Catalogs

Mine-Duty Self-Starters. The Cutler-Hammer Manufacturing Co., Milwaukee, Wis. 2 pp.; illustrated. Leaflet, known as publication No. 408, describes two chief types of mine-duty self-starters.

Industrial News

Ricketts & Co., Inc., formerly at [illegible] Maiden Lane, New York, announces that it has moved its offices to [illegible] Madison Avenue.

Huff Electrostatic Separator Co., having outgrown its quarters at [illegible], Mass., has moved its factory and laboratories to Arlington, Mass., where it will have ample electric and water power facilities.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Antimony Smelting, Starring mixture for. Chung Yu Wang, Hankow, China. (U. S. No. 1,284,164; Nov. 5, 1918.)

Boring Machine. Eduardo Murphy and Americo Anzulovich, Buenos Aires, Argentina. (U. S. No. 1,283,542; Nov. 5, 1918.)

Cement Material and Method of Producing. Arthur S. Dwight and Richard Lewis Lloyd, New York, N. Y., assignors to Dwight & Lloyd Metallurgical Co., New York, N. Y. (U. S. No. 1,283,483; Nov. 5, 1918.)

Excavating Apparatus. Karl R. Slocum, Drybranch, Ga. (U. S. No. 1,283,932; Nov. 5, 1918.)

Excavating Machine. Oliver Oscar App, New York, N. Y. (U. S. No. 1,283,618; Nov. 5, 1918.)

Excavating Machine. Hans J. Bentson, Winthrop Harbor, Ill., assignor to Frederick C. Austin, Chicago, Ill. (U. S. No. 1,283,460; Nov. 5, 1918.)

Explosive. Benjamin P. Allen, Great Neck Station, N. Y. (U. S. No. 1,284,032; Nov. 5, 1918.)

Filtering Apparatus. Orange James Silsbury, Salt Lake City, Utah, assignor to United Filters Corporation, Salt Lake City, Utah. (U. S. No. 1,283,925; Nov. 5, 1918.)

Furnace. Frank R. Hill, Keeler, Calif., assignor to Wilfred W. Watterson, Bishop, Calif. (U. S. No. 1,283,515; Nov. 5, 1918.)

Gas Producer. Henry C. Perdue, Valparaiso, Ind., assignor to Morgan Construction Co., Worcester, Mass. (U. S. No. 1,284,138; Nov. 5, 1918.)

Gold—Dry Sluice Placer-Gold Separator. Laurence E. Meyer, San Diego, Calif. U. S. No. 1,283,857; Nov. 5, 1918.)

Mine Locomotives, Chair for. Richard S. Morgan, Edwardsville, Penn. (U. S. No. 1,284,130; Nov. 5, 1918.)

Miner's Lamp. Adolph C. Recker, Oakville, Conn., assignor to Waterbury Manufacturing Co., Waterbury, Conn. (U. S. No. 1,283,897; Nov. 5, 1918.)

Oil Shales—Apparatus for Treatment of Oil-Bearing Shale, Bitumens, Hydrocarbons, and Other Elements of Volatile Nature. John H. Galloupe, Denver, Colo. (U. S. No. 1,283,723; Nov. 5, 1918.)

Pebble or Ball Mill. Charles Henry Stave, Thornton, Ill. (U. S. No. 1,283,589; Nov. 5, 1918.)

Phosphorus—Method for Recovery of Phosphorus Fumes Evolved in Volatilization Method of Treating Phosphate Rock. Albert R. Merz, William H. Ross, and John N. Carothers, Washington, D. C. (Dedicated to the public.) (U. S. No. 1,284,200; Nov. 5, 1918.)

Potash From Kelp and Similar Materials, Process for Recovering. Simon Rudolph Oppenheim, Keeler, Calif. (U. S. No. 1,283,547; Nov. 5, 1918.)

Rock-Drill Bit. Charles A. Brawn, Philadelphia, Penn. (U. S. No. 1,283,646; Nov. 5, 1918.)

Screening Apparatus. Paul J. Alwart, Chicago, Ill. (U. S. No. 1,284,034; Nov. 5, 1918.)

Silicates—Process of Treating Siliceous Minerals for Production of Chemical Compounds. Jordan Homer Stover, Trenton, N. J. (U. S. No. 1,283,951; Nov. 5, 1918.)

Smelting—Process of Reducing Metallic Compounds. Hans Foersterling, Perth Amboy, N. J. (U. S. No. 1,283,716; Nov. 5, 1918.)

Smelting—Process of Roasting Ores. William A. Ingram, Los Angeles, Calif. (U. S. No. 1,283,782; Nov. 5, 1918.)

Smelting Ore, Process of. James H. Gray, New York, N. Y. (U. S. No. 1,283,500; Nov. 5 1918.)

Editorial Correspondence

SAN FRANCISCO, CALIF.—Dec. 19

Many of the Gold Properties in California, shut down because of high costs, are today being rapidly filled with water, as the pumps have been pulled and the mines abandoned to whomever may have the money and the courage to reopen them. Other mine owners, who estimated that the loss would be greater through abandonment, have devoted their labor to keeping the properties alive, stopped all development, stopped the payment of dividends because they have no surplus to pay dividends with, and are biding their time till the conditions readjust themselves.

Concessions to Oil-Well Operators sought to be written into the new revenue bill pending in Congress, according to the report of Claude I. Parker, of Los Angeles, made to J. K. Firth, secretary of the Pacific Coast Petroleum War Service Committee, now at Washington, will, if adopted, result in a large annual saving to the petroleum and metal-mining industry of California. These concessions include recognition of the right of lessees as well as lessors to depletion allowance in the payment of Federal income and excess-profits taxes; authorization of a reserve deduction, in addition to depletion and depreciation, from returns of net annual income of 10% of the sale price of the product to replace extracted oil or minerals; provision for constructive capital allowance where the net income from the business is disproportionate to the invested capital, and depreciation allowance of 10% on permanent equipment of oil and mining companies and 5% on oil tanks. Mr. Parker states that the manner of arriving at depletion of an oil-operating company is to be upon a reduction of flow basis, to be ascertained by chart system to be prepared by the Internal Revenue Bureau. If the oil or mining operator be a lessee, and the royalty agreement be one-eighth to the lessor, then in such case the lessee operator will be entitled to deduct from gross income an amount equivalent to seven-eighths of the total allowable depletion, and the lessor will be entitled to deduct from gross income the remaining one-eighth of total depletion.

SALT LAKE CITY—Dec. 20

Utah Consolidated Mining Co. filed two new suits against the Utah Apex Mining Co. in the U. S. district court Dec. 10. One suit is regarding the Yampa lode claim, and the complaint alleges that the property and also the cause for action were purchased by the plaintiff from a third party on Aug. 2 of this year, and that since then and prior to that time the Utah Apex company has been working certain veins in the property. The complaint asks for a temporary restraining order against the Utah Apex company, a decree setting forth the title of the Utah Consolidated company to the property, and an accounting and judgment for ores taken from the property. The second suit concerns the Mercer lode claim and the Mercer lode claim No. 2. The same petition and the same claims are made as in the case of the Yampa lode claim.

Twenty Utah Mining Companies filed suit in the U. S. district court Dec. 13 against the State Treasurer, Daniel O. Larsen, to test the validity of the so-called occupation tax on mines, amounting to 3% of the net proceeds, attempted to be assessed under the statutes passed by the Legislature in 1917. The taxes in question aggregate about $800,000. Those interested are the Utah Copper, Pleasant Valley Coal, Utah Fuel, Silver King Coalition, Grand Central, Gold Chain, Chief Consolidated, Eagle and Blue Bell, Bingham Mines, Victoria, Mammoth Bullion Consolidated, American Fuel, Standard Coal, Utah Apex, Cameron Coal, Schofield Coal, Ohio Copper, Western Utah Copper and Cardiff. The complaint states that the plaintiffs paid all the property taxes assessed against them for 1917 and 1918 and that the attempted occupation tax is invalid for several reasons, among them being that the statute was attempted to be passed by the Legislature after the constitutional time fixed for the legislative session had expired. It is also alleged that the act was never properly passed because the necessary steps prescribed by the constitution were not taken by the Legislature. Also that the constitution of the state provides that when the taxable property in the state exceeds in value $300,000,000, the tax rate cannot exceed 4 mills, and the operative effect of the tax that is contested would be to raise the levy to about 19 mills. Also that the tax involved in the suit is an additional property tax and double taxation, and, therefore, was not assessed or levied uniformly and equally, as required by the constitution of the state, and that it is discriminatory and attempts to take the property of the plaintiffs without due process of law, and denies to them the equal protection of the laws, in violation and contravention of the Constitution of the United States. The complaint mentions the various steps taken by the State Board of Equalization to assess a tax under the act of 1917, and the proceedings taken by the defendant State Treasurer in the attempted collection of the tax. It alleges that the defendant has advertised for sale as for delinquent taxes the properties of all the plaintiffs, and that the statute and the action of the defendant in attempting to sell the property cast a cloud, in the nature of an attempted lien, on the property of the plaintiffs. The complaint seeks to enjoin the enforcement of the 1917 statute and to enjoin the threatened sale of the property by the State Treasurer. Application was made for a temporary restraining order to stop the sale until the questions of law involved can be decided by three judges, as required by the Federal law. Argument regarding the above was heard by Judge Tillman D. Johnson on Dec. 14, and a temporary restraining order was issued to the State Treasurer forbidding the collection of the occupation tax, plus a tax of 3% on net earnings of mines, until the question of the legality of the tax has been determined. Pending the decision, Judge Johnson fixed the bond of the Utah Copper Co. at $50,000, the Silver King Coalition at $3000, and that of the Judge Mining and Smelting Co. and others at $2000 each.

DENVER, COLO.—Dec. 19

The Roosevelt Tunnel in the Cripple Creek district is credited with the opening of five important oreshoots in 1918, at depths ranging from 1850 ft., on Raven Hill, to 2130 ft., on Battle Mountain. Advocates of deep-level development for the district point to these discoveries to support their views. The first discovery of the year was made when a drift was advanced northeast from the main tunnel through the property of the United Gold Mines Co. to a point directly under the winze sunk from the 1650 level of the main shaft of the Cresson Consolidated, on Raven Hill. In crosscutting under the shaft, a second important discovery was made in Cresson territory. Shipments from both orebodies are being made through the main shaft of the Elkton Consolidated company. As the tunnel passed through the territory of the Rose Nicol Gold Mining Co., at a depth of 2000 ft., a third important oreshoot was opened on the Rose Nicol vein. Beyond this property, the tunnel entered ground of the Portland Company, and a crosscut was driven southeasterly toward Portland No. 2 shaft. This crosscut has opened two important orebodies, the latest discovery being made on Nov. 30 at 2137-ft. depth. Portland No. 2 shaft will now be sunk to the tunnel level, and systematic development of these deeper orebodies will be undertaken. The advance in the crosscut is continuing.

Breckenridge has had a successful season, with five dredges in operation. Two of these boats have stopped operations for the winter, and will undergo the usual overhauling and repairs. The Tonopah Placers Co. has been operating three dredges, having a combined capacity of 10,000 cu.yd. of gravel per day. This company's No. 1 Bucyrus dredge is digging in the Westerman ground in the Blue River Valley. The No. 2 Bucyrus dredge, of 2000 cu.yd. capacity, is operating in Swan Valley at Snyder's camp on ground leased from the Farncomb Hill Gold Dredging Co. The No. 3 dredge in French Gulch continued operations until forced to shut down by water shortage. J. E. Hopkins is manager. The Power River Gold Dredging Co. is operating a modern 2000-cu.yd. dredge on the B. & L. placer in the Blue River Valley, two miles north of Breckenridge. The boat was completed last winter, and has put in a full season except for time lost in repairs. The French Gulch Dredging Co. dredged about a mile of French Gulch this season with a 1000-cu.yd. boat. The last clean-up in November yielded over $18,000. Warren F. Sears is superintendent. The Farncomb Hill Gold Dredging Co. paid a dividend of $15,000 out of royalties paid to it by the Tonopah Placers Co. Robert W. Foote, of Breckenridge is president. The outlook for all these dredges is favorable.

Uranium in Fluorspar mined near Jamestown, Boulder County, Colo., is responsible for four different kinds of activity recently: First, that of the fluorspar operators, who immediately proceeded to acquire title to as much of the territory as possible; second, the rush of prospectors to the district; third, the almost immediate development of wild-cat organizations by irresponsible promoters; and, fourth, the protest from a quickly organized group of honest and substantial business and mining men of Boulder County against the premature reports of optimists and dishonest representations of others. The occurrence of minute quantities of uranium in fluorspar deposits of the Jamestown district has been known for a number of years. Investigators have found that the element is present in such small quantities that its extraction is commercially impossible. Recently uranium has been discovered in the residues resulting from concentration of the fluorspar. A black streak of an unknown substance on the concentrating tables attracted attention. The iron and lead cencentrates containing this were reconcentrated, and a sample was submitted for examination at the Bureau of Mines experiment station at Golden. This material was the result of concentrating the original ore about 1200 to 1, and was found to contain a very small quantity of uranium oxide. This information fell into irresponsible hands, unfortunately, the result being a premature uranium boom. Mining men of Boulder County are incensed over the attempts of certain unscrupulous promoters to sell wildcat stock, and have proposed stringent local legislation to curb fake promotions of all kinds.

JOPLIN, MO.—Dec. 19

Tri-State Mine Safety and Sanitation Association, the largest mine-operators' organization in the Joplin district, has elected C. F. Dyke, of Joplin, manager of the Montreal mine, as president; A. E. Bendelari, manager for the Eagle-Picher Lead Co. mines, treasurer; W. B. Shackelford, manager of the Admiralty Zinc Co., secretary; and the following as vice-presidents: D. D. Muir, of the U. S. Smelting Co.; W. J. Borries, White Mining Co.; J. W. Newton, Commerce Mining and Royalty Co.; Temple Chapman, independent operator; C. E. Schwarz, St. Louis Smelting and Refining Co., and F. C. Wallower, Golden Rod Mining and Smelting Co. The following directors were named: F. H. Gartung, M. D. Draper, P. B. Butler, H. I. Young, Charles Heron, Charles T. Neil, F. N. Bendelari, and John Hoffman.

Renewed Activity in the Joplin Camp is predicted and is being partly realized, as a result of high costs and high royalties prevailing in the newer sections of the district, in Oklahoma and west of Baxter Springs, Kan. Truck haulage from Joplin, where most of the supply houses have their headquarters, to the Oklahoma field is expensive. Royalties also are much higher in the newer field, and operators are inclining to the belief that the average richness of the ground is little, if any, better in Oklahoma than in the older camps in Missouri. It is known that the largest producing company in Oklahoma showed a recovery of only about 6% during the present year, and many Joplin soft-ground mines have done as well and better. Among the recently developed mines in the Joplin camp are the Julian, Lucky Joe, the Bankers, and the Henryetta. The latter two have just completed new concentrating plants, and the Julian is operating a hand-jig plant and will probably erect a mill later. Small mining operations are fewer in the district than they have been for the last 10 or 15 years, the high costs and present poor demand for zinc blende being responsible. At a number of properties, however, the present dullness is being utilized for careful drilling work in blocking out ground, with the idea that when prices improve there will be nothing in the way to hinder steady operation.

HOUGHTON, MICH.—Dec. 20

An I. W. W. Outbreak in Northern Michigan is extremely unlikely, either in the lumbering woods, where most of the workers are foreign born, or in the iron and copper mining camps, where 75% of the workers are foreign born and fully 90% of alien parentage. There are many socialists, some "red socialists," in the mining districts, but few sympathize with Bolshevik teachings or with I. W. W. principles. There is no labor shortage in the districts at present, men returning from munitions plants readily finding their old places at almost as high wages as they received on war work. The woodsman who formerly got $25 a month and mediocre board is now demanding and getting $60 and board, and, in many cases, more. Employment agents of the mining companies report that their forces are 95% of normal.

Copper Production in Northern Michigan was hampered by labor scarcity during the last season. Usually shipments of refined metal are made only by lake, the copper piling up on the docks through the winter and being taken east gradually in the spring, while water shipments continue throughout the summer. Enormous shipments were made by rail this year, however, because of demands for immediate delivery. One company, the Quincy, sent most of its output to the French government. The Calumet & Hecla sent a great amount of its copper to England and Italy. With labor back at normal, the big companies anticipate an increase in copper output next season. It is feared, however, by some mine managers, that much of the foreign labor will return to Europe after the peace settlement, because of improved labor conditions and the promise of work near or at their old homes and at living wages for years to come.

VICTORIA, B. C.—Dec. 19

Prospecting of the Phoenix Mines by diamond drill, with a view to demonstrating sufficient ore to warrant operation of the now idle Greenwood (B. C.) smeltery, has been suggested by residents of the district. It is said that the provincial government is to be asked for financial aid in starting the work. J. D. MacLean, provincial secretary and member for Greenwood, and J. E. Thompson, member of Parliament for Grand Forks, B. C., are said to be in sympathy with the proposal. [illegible] Canada Copper Corporation, commercial interests in Greenwood City have asked the [illegible] to [illegible] the plant in order that a company organized by citizens may operate it.

Records of Applications for Leases on Placer Grounds of British Columbia [illegible] the [illegible] of market demand and general conditions during the last few years. In 1915 [illegible] had not [illegible] inflated and the labor problem was less serious, with the result that mining of placer areas of the province for gold proceeded much as usual, [illegible] 160 leases being issued during the year. In 1916, however, quotations advanced on all commercial metals, though gold remained stationary. This, together with labor shortage and high costs, had its effect, for leases dropped to 87. But in 1917, although the same conditions obtained, the insistent demand for platinum and the high price once more fired the enthusiasm of prospectors and operators. This is conclusively indicated by the issuance by the Provincial Department of Mines of 139 leases. The total for 1918 will show that the interest was maintained, as it will reach approximately 137 leases. Of the latter, 35 bench leases and 9 dredging leases were granted in October and November, which would seem to indicate that the predicted revival of gold production following the declaration of peace is being anticipated.

TORONTO, ONT.—Dec. 21

Laborers Are Arriving at Porcupine in large numbers. Many of them were employed in the mines before the high wages attracted them to munition work, and they speedily obtain employment. It will be some time, however, before the labor supply equals the demand, the present requirements of the Porcupine camp alone, without allowing for new developments or extensions, being conservatively estimated at 2000. Moreover, the lumber companies and the pulp and paper mills are keen competitors, and are absorbing a large proportion of the men coming north.

The Ontario Department of Lands, Forests and Mines will not be able to proceed this year with its experiments in the [illegible] of [illegible] for fuel. [illegible] [illegible] the United States, [illegible] delivery [illegible] delayed. [illegible] the spring.

The Adoption of an Industrial Relationship Plan was announced on Dec. [illegible] by W. J. Hanna, president of the Imperial Oil Co. of Sarnia, Ont. [illegible] the interests of capital and labor. [illegible] non-membership in any union, fraternity or other organization. In addition, the company has established an insurance system, under which anyone who has been with it for 12 months is to be insured for an amount based on his term of service and earnings, the minimum being $500 and the maximum $2000. Old-age pensions will also be established, enabling those who have reached the age of 65 to retire with the assurance of being provided for, and a sick benefit plan will also be put in operation. These systems will be absolutely without cost to the beneficiaries, and are not to be considered in reference to the rate of wages. All employees who have served as soldiers will be re-instated without any reduction of their former pay, and adjustments will be made to meet the physical condition of any who have suffered disabilities. The plan affects over 6000 employees, 1000 of whom, at the Sarnia refinery, have elected 15 representatives to the conference.

The Mining News

ARIZONA

Cochise County

ARIZONA SMELTING AND POWER (Benson)—Recently incorporated. Charles E. Goetz, president. Has taken over old smelting plant at Benson, including never-used 250-ton copper blast furnace. Will blow in latter in about 90 days. Has old slag dump of good fluxing material. Expects to draw ore from Johnson, Patagonia, Helvetia, and other districts.

PHELPS DODGE (Bisbee)—Will take back all former employees who left to enter service.

GREAT WESTERN (Courtland)—Work resumed under owner, William J. Young. Lessees extracting ore for shipment.

LEADVILLE (Courtland) — Shipping carload of copper ore daily to Copper Queen smeltery at Douglas. W. M. Holmes in charge.

Gila County

PORPHYRY COPPER (Globe)—Shaft bottomed at 770 ft., and 2800 ft. of development work done. Twenty-five men employed.

LAVELLE (Hayden)—Considering installation of small mill using amalgamation and concentration. Concentrates to be shipped to El Paso.

MIAMI MINE AND MILLING (Miami)—Installing 50-hp. I-R compressor for drilling.

Greenlee County

GOLDFIELD EXTENSION (Duncan)—Work stopped on Ash Peak property, after two years' development.

Maricopa County

ABE LINCOLN (Wickenburg)—Driving tunnel along main vein to connect with main shaft at 280 ft. depth. Surface ores changed to high-grade chalcopyrite, for which concentrator is planned. Break in hoist recently stopped work in shaft, from which crosscut will be run at present 700 level to main vein, passed on dip in shaft. Charles E. Nathurst, former metallurgist with United Verde, is in charge.

Pinal County

RAY-KELVIN (Ray)—J. C. Reed, of Phoenix, appointed receiver on application of H. E. Easterday.

Santa Cruz County

HARDSHELL (Patagonia)—To sink new working shaft, present hoisting facilities being inadequate.

MORNING GLORY (Patagonia)—New compressor plant installed.

PIERCE-GARDNER (Patagonia)—C. A. Pierce and Thomas Gardner shipped six carloads of silver ore to El Paso, without sorting, from claims leased near the Hardshell primarily for manganese.

RUBY COPPER (Patagonia)—Starting upon fifth drill hole.

Yavapai County

DUNDEE-ARIZONA (Jerome)—Old tunnel cutting shaft at 120 ft. to be extended northeast into fractured limestone and copper carbonate. Sinking on main shaft continued with one shift. Present depth is 750 ft.; will go to level of Extension tunnel at 960 feet.

GRAND ISLAND (Jerome)—Shaft down 420 ft. Soft ground encountered. Formation black diorite.

SHEA (Jerome) — Company planning small concentrator to remove silica.

SIMMS GROUP (Mayer)—Sold by Martin Simms and others to Halling P. Overton and associates.

ANGLO-SAXON SMELTING AND REFINING (Prescott)—John E. Russell, managing director, states that those in charge of company's affairs in London advise that project will be resumed upon conclusion of peace.

ARKANSAS

Marion County

DIXIE GIRL (Buffalo)—Drill installed to test lower ground. Mine producing zinc carbonate.

PIGEON RIDGE (Buffalo)—Leased by Henry Hand and associates. Drifting into carbonate ore. Making good production of hand-cobbed ore.

BIG BELL (Rush)—Mill completed; capacity, 100 tons per shift. Ore is high-grade zinc carbonate. Shipping point, Yellville.

MATTIE MAY (Rush)—Machinery for concentrator arriving. Mill building nearing completion. Mill capacity 100 tons per shift. Ore is zinc carbonate.

CALIFORNIA

Amador County

LIGNITE DEPOSITS in Ione district being tested for use by a process said to involve blowing dust into furnace by atomizer.

LINCOLN CONSOLIDATED (Sutter Creek)—To be reopened and operated under same management as Old Eureka. Embraces Lincoln and Wildman-Mahoney.

Butte County

FEATHER NO. [illegible] DREDGE (Oroville)—To be closed and dismantled after 10 years' operation by Natomas company. One of last wooden-hull dredges built by Natomas. Ground will be finished by other dredges. G. W. Akers was dredgemaster during life of dredge.

Los Angeles County

LOS ANGELES GRAPHITE (Los Angeles)—To install reduction plant for recovering graphite from [illegible] tract, near Los Angeles.

Nevada County

ALLISON RANCH (Grass Valley) — Shaft and drifts unwatered to 1400 level. Expect to complete unwatering 200 ft. deeper in January. Mill running full capacity 16 hours a day.

QUAKER HILL (Nevada City)—Installing electric locomotive, capacity 50 loaded cars, for hauling gravel to mill under construction. Will start about Jan. 1. Forty-five men employed.

Shasta County

BALAKLALA (Coram)—To extend aerial tram two miles west of mine to aid development. Labor more plentiful, and tram line running night and day shifts. Large hospital and two cottages completed.

SHASTA BELMONT (Winthrop)—Arrangements completed for resuming operation in January. Expect to intersect orebody 60 ft. from present end of tunnel. Flotation plant in prospect if ground shows continuation of upper-level orebodies.

COLORADO

Clear Creek County

CLEAR CREEK-GILPIN ORE (Idaho Springs)—Incoropraated by W. E. Renshaw, W. E. Passmore and E. L. Regennitter, of Idaho Springs, to operate community sampler in Clear Creek County. Remodeling of North American sampler, recently taken over, almost complete. Ore shipments arriving. Operations to start soon. Principal office at Idaho Springs.

STANLEY (Idaho Springs)—Recently reopened under leasing system. Road Adit level and tributary workings leased to A. L. Hauquitz & Co., Lower and upper Whale levels to John Symons, and Hukill workings on north side of Clear Creek to John Thomas & Co. Compressor plant, run by water power, supplying air to lessees in Stanley, to Byron Mining Co., operating Lord Byron mine in Spring Gulch, and to other small operators in Clear Creek Gulch.

Teller County

CRESSON (Cripple Creek)—Influenza cut November shipments. Cresson shaft connected with Roosevelt tunnel at 1918-ft. depth. Station cut at tunnel level and timbering completed. Ore from shoots under development at tunnel level being hoisted through Elkton shaft.

LINCOLN MINES AND REDUCTION (Cripple Creek)—Twenty men employed on construction at new concentrator on Ironclad Hill. Concrete retaining walls completed. Work under way on machinery foundations delayed by bad weather. Will let contract for 200,000 ft. of lumber. Plant ready in 90 days. Thomas Kavanaugh in charge of construction.

FLORIDA

Duval County

BUCKMAN & PRITCHARD (Pablo Beach)—Have installed Huff electrostatic equipment for concentrating monazite sand. Carload of high-grade concentrates shipped.

KANSAS

Joplin District

PHILLIPS (Baxter)—One shaft down to ore and second down 90 ft. on Cooper land, near Southern. Expect to erect mill.

SOUTHERN LEAD AND ZINC (Baxter) —Finished community boarding houses and other improvements at property.

MINNESOTA

Mesabi Range

OLIVER IRON (Virginia)—Ore-shipping season closed, and stockpiling operations proceeding at Alpena and Ordean mines. Three shovels are stripping at Missabe Mountain mine. Wanless and Shiras mines at Buhl stockpiling; Deacon mine closed since Nov. 17.

MISSOURI

Joplin District

BANKERS (Joplin)—New 200-ton mill in operation in East Hollow, near Joplin. I. P. Jones, manager.

HENRYETTA (Joplin)—Completing 250-ton mill at Smelter Hill. Three shafts in ore, 80 ft. face indicated. Lease, 25 acres. Plant to be operated by gas engines. Sludge room equipped with Deister and Arbuthnot tables, operated separately from mill. Fireproof changehouse for men. Mine owned by Henryetta, Okla., and Joplin people. M. C. Brady, Joplin, is manager.

JULIAN (Joplin)—Developing good lead mine on Robinson land at depth of 120 ft. Hand jigs used exclusively at present. May build mill. Charles McDonald, manager.

MONTANA

Silver Bow County

BUTTE & SUPERIOR (Butte)—Operations reduced to one shift, or 50%, following Anaconda's suspending its receipt of custom zinc ore from Butte district.

NEVADA

Churchill County

NEVADA-WONDER (Wonder) — Mine and mill operating steadily.

Elko County

HOLDEN M. AND M. (Tuscarora)—Acquired control of several old mines in Tuscarora district. Examinations made, and work under way. Operations to be increased in spring. J. E. Harrington, president.

Esmeralda County

C. O. D. (Goldfield)—Lessees breaking shipping-grade ore in workings from Gold Bar shaft. Several groups of lessees operating.

CRACKER JACK (Goldfield)—Developing 40-acre block leased from Goldfield Consolidated and Florence companies. Unworked from surface to 450 level.

RED HILL FLORENCE (Goldfield)—Shipping regularly from 400 and 500 levels. Will ship from 600 level soon.

Lincoln County

VIRGINIA LOUISE (Pioche)—Since resuming in July improvements consist of 1000-ft. spur from track at Prince Consolidated mine, 100-ton loading bin, inclined tramway from shaft to bin, office, warehouse, changeroom for miners, two bunk houses, and superintendent's residence. Ore pockets cut on three levels preparatory to increasing output. Development has opened large tonnage, probably extension of ore worked in Prince Consolidated mine. New 10-drill compressor to be set up at once.

Lyon County

MASON VALLEY MINES (Thompson)—Ore receipts at Thompson smeltery for week ended Dec. 10 were: Bluestone, 2083 tons; Mason Valley, 2213 tons; Nevada-Douglas, 1401 tons; miscellaneous, 290 tons.

SOUTH DAKOTA

Custer County

OLD MIKE (Custer)—Mine sold to Idaho interests, which will incorporate as Berne Mica Corporation. Preparing to operate.

RARE MINERALS (Custer)—Concentrator near completion. Will start in January. Breaking ore at Hebert mine for plant. Will also take ore properties near Custer.

SPOKANE LEAD AND SILVER (Custer)—Shipping lead-silver concentrates to Keystone in trucks, thence to smeltery at Omaha.

FIRST NATIONAL (Hill City)—Shaft unwatered and property being examined by engineers from Michigan.

MALONEY-BLUE LEAD (Sheridan)—Copper shipments continue. Boiler and compressor recently installed.

UTAH

Salt Lake County

CARDIFF (Salt Lake City)—Permission to haul ore down Big Cottonwood Canyon with teams during winter refused by City Commission on ground that accumulated waste would find its way into watercourse with spring thaw.

Summit County

GLEN-ALLEN (Park City)—Property in Blue Ledge district making surface improvements and erecting gallows frame. Milling ore carrying lead and zinc opened. J. B. Allen is manager.

PARK UTAH (Park City)—Property operating through Ontario drain tunnel. Is building houses for men near portal of tunnel. South drift from tunnel still in mineralized ground.

SILVER KING COALITION (Park City) —Examination of property being made. Park City office discontinued on Dec. 1. All business will be done through Salt Lake office.

SILVER KING CONSOLIDATED (Park City)—Making changes in Thaynes Canyon mill. Drain and operating tunnel now in 8750 ft. and advancing about 10 ft. a day.

Utah County

GLOBE (American Fork)—Tunnel in 6000 ft. John Cleghorn is manager.

MILLER (American Fork)—Carbonate lead ore, carrying gold, being shipped by Smith & Armstrong, lessees.

PACIFIC (American Fork)—Work mainly exploration and development. Some concentrates being produced.

WASHINGTON

Ferry County

LONE PINE-SURPRISE (Republic)—Since resuming work Sept. 15, 1917, has shipped 14,040 tons of ore from Last Chance mine. Will sink main shaft 150 ft. deeper.

Pend Oreille County

BEAD LAKE GOLD-COPPER (Newport)—Machinery for 100-ton concentrator on ground or at Newport. Will install this winter. New body of milling ore struck.

Stevens County

LOON LAKE COPPER (Loon Lake)—To build complete crushing and flotation plant with a capacity of 100 tons per 24 hours. Work to cost $40,000 and will begin Dec. 1. Ralph L. Flanders is secretary.

CANADA

British Columbia

GRANBY CONSOLIDATED production for November was 2,147,405 lb. of copper, against 2,549,474 in October.

IVA FERN (Nelson)—Consolidated Mining and Smelting Co. developing this property extensively.

ROCK CANDY (Grand Forks)—Bins, tramway and wagon road built on this fluorspar property by Consolidated M. & S. Co. Diamond drilling and development in progress.

INLAND (Paulson)—Recent development on Berlin claims consists of 100 ft. shaft and 200 ft. of drift.

PRINCETON MINING AND DEV. (Princeton)—New compressor and 150-ton ore bin considered for Copper Farm group. Recent development has raised daily capacity to 50 tons.

SOUTH EASTERN (Skidegate)—Gold property on Queen Charlotte Islands to be developed. Cyanide mill is planned. A. S. Holmes, manager.

CONSOLIDATED M. & S. (Trail) Conditions at smeltery following influenza improving. Cost of epidemic estimated at more than $50,000. Over 300,000 tons of ores and concentrates received to second week in December. Three new shippers on last list, namely: Silver Hoard, Ainsworth, 21 tons; Grant, Woodbury Creek, 4; Spokane mine, Salmo, 20.

PLACER DEVELOPMENT (Tulameen) —Ground 25 miles from Princeton on Tulameen River leased from Efanjay Gold Mining Co. Sluicing gravel from river bed for gold and platinum. Dam and flume built.

NAOMI (Vavenby Station)—Working option taken by W. E. Butler, Calgary, Alta., and J. L. Miller, Lethbridge, Alta. Building wagon road.

LIGHTNING CREEK GOLD GRAVELS (Wingdam)—Drilling with keystone drill on Lightning Creek.

Ontario

GRAPHITE PROPERTY 35 miles north of Ottawa and four miles from Canadian Pacific R.R. and Gatineau River will be diamond drilled. R. A. Bryce, 801 Traders Bank Bldg., Toronto, is superintendent.

CROWN RESERVE (Cobalt) — Vein struck on 200-ft. level in virgin territory.

BALDWIN (Kirkland Lake) — Camp buildings erected. Shaft down 193 ft., and crosscut in 60 ft., cutting 5-ft. quartz vein.

HILL GOLD (Matheson)—Will resume work soon.

DOME (Porcupine)—Force being rapidly increased with view of resuming production soon.

GOLD LAKE (Porcupine)—Has purchased mining equipment of Slade Forbes Asbestos Company.

McINTYRE (Porcupine)—Preparing to increase mill capacity from 600 to 1000 tons a day. With increased capacity, lower cost of supplies, and improved labor situation expected that cost of $3.50 to $4 a ton will be reached.

SOVEREIGN (Timmins)—Plans adopted for exploring this claim.

MEXICO

Sonora

GREENE-CANANEA (Cananea) — Mining operations curtailed for about two weeks in November owing to strike of peons. Ore on hand kept mill running. Mexican labor returning from United States.

SOUTH AMERICA

Bolivia

BOLIVIAN TIN CORPORATION (Potosi)—One of two dredges operating near Potosi destroyed by fire in November.

Chili

CHILI COPPER (Chuquicamata)—November production was 9,854,000 lb. of copper. October production was 8,548,000 pounds.

The Market Report

SILVER AND STERLING EXCHANGE

Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Dec.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
19	4.7580	101⅛	48 7/16	23	4.7580	101⅛	48 7/16
20	4.7585	101⅛	48 7/16	24	4.7580	101⅛	48 7/16
21	4.7580	101⅛	48 7/16	25			

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

	Copper	Tin	Lead		Zinc
Dec.	Electrolytic	Spot.	N. Y.	St. L.	St. L.
19	*	†	7.05	6.75	7.60 @7.70
20	*	†	7.05	6.75	7.60 @7.70
21	*	†	6.00	5.85	7.55 @7.65
23	*	†	5.75	5.60	7.50 @7.60
24	*	†	5.50	5.35	7.50 @7.60
25	....	...	..	....	....

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

* No market. Producers ask 26c. No buyers.

† No market. Major supplies held for distribution at an arbitrary price of 72½c.

LONDON

	Copper			Tin		Lead		Zinc
	Standard		Electrolytic					
Dec.	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot
19	111½	100	...	254	248	40.5	39.5	56
20	108½	100	...	264	255	40.5	39.5	56
21	.	...	...	.			.	.
23	108½	100	...	266	254	40.5	39.5	56
24	...	...	..	...	...	...	...	..
25	. .	...	. .	.	.			.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

The quotations for copper have come in a rather confused way this week. We have given the mean of the figures cabled. The figures will be subject to correction when more definite information is received.

Metal Markets

The prime feature this week was the sharp break in the price for lead. Otherwise the markets remained about in statu quo. The general situation is treated editorially. Consumers of all metals appear everywhere either to be overstocked or else to have no orders.

There has been considerable uncertainty respecting the quotations for pig lead in London. Previous to the change of price, toward the end of November, they were cabled to this side as "£29 10s. spot, £28 10s. futures." The figure of £29 was variously stated as the "official" or settling price. There was similar irregularity in the publication of the London metal papers, some giving "official quotations £28½ to £29½, settlement £29," while others have given "spot £29½, futures £28½" and "spot £29½, and one month £28½." Official publications, so far as we have been able to ascertain, simply stated the price of £29. We communicated recently with an authoritative quarter in London to clear up this confusion, and obtained the reply that since Jan. 2 the official maximum price permitted in any dealings was £29, and that quotations for spot and forwards issued through the Metal Exchange did not represent any dealings. Since the change of price in November, exactly the same conditions have existed, with the quotations of £39½ to £40½, settlement £40. There has been also some uncertainty respecting the actual date of the change of price, which has been variously given as Nov. 25 to Nov. 28. We have previously reported the date as Nov. 28. Confusions and delays with respect to cables explain this. Our latest, direct advices are that the advance to £40 was made on Nov. 26.

The official and settlement price for lead in London from Jan. 2 to Nov. 25, 1918, both dates inclusive, was £29; and from Nov. 25 onward it has been £40. We have corrected our tables of monthly average prices of metals in accordance with this latest information.

It has been ordered in Germany that 20% of all confiscated metals, and also of all new production, be forthwith released for peace purposes.

Copper—There is nothing of importance to report. Producers still unitedly ask 26c. and find no buyers. There has been the usual gossip about resales at low prices, bids at lower prices, etc. Everybody expects a market to begin at lower prices on Jan. 2. The most authentic information is that electrolytic copper was offered for resale this week at 21c., and intimations that London might buy copper at about 19c.

A few of the producers met Mr. Brookings in Washington on Dec. 20 and exchanged formal felicitations and farewells.

The Anaconda Copper Mining Co. today reduced its quarterly dividend from $2 to $1.50.

Copper Sheets—The base price of copper sheets is 35½@36c. per lb. Copper wire is quoted at 28c. per lb. f.o.b. mill, carload lots.

Lead—The Lead Producers' Committee met in New York on the afternoon of Dec. 20 and decided to dissolve and let a free market be instituted on the following day. On Dec. 21 lead was offered in tonnage at 6c., New York, without finding buyers. On Dec. 23 the American Smelting and Refining Co. reduced its price to 6½c. This meant simply that it considered lead to be worth that much and would not, for the present, anyhow, meet the competition. On the same day, lead was offered by other sellers at 5¾c., New York, with only a few sales resulting. Today it was offered at 5½c. and sales were effected at that figure, but in no significant tonnage. It is probable that the lead market will go lower. The rapid action is the attempt of this market, long restricted, to find itself. The point will, of course, be reached on some day when buyers will be interested in taking in lead, after which the market will have an opportunity to re-establish itself at higher figures. Lead has been offered for delivery in St. Louis at the arbitrary differential of 0.15c. below the New York price.

The Lead Producers' Committee, under date of Dec. 20, made the following official announcement: "Effective Dec. 21, this committee has ceased to be the exclusive central agency of all producers, who are now free to quote individually. There are no restrictions on resales."

The Consolidated Mining and Smelting Co. reports large stocks of lead in Canada. Besides about 8000 tons of pooled lead remaining unsold, there is a large quantity in the hands of the Imperial Munitions Board hanging over the market, but arrangements have been made to avert any sudden dumping of the latter. J. J. Warren, managing director, adds: "We are quite willing for the present to continue receiving lead from Canadian shippers in normal quantities, but advance payments for lead will be calculated on a basis of 7c. per lb. instead of the basis we have used recently, with the understanding that we may vary this estimated price if circumstances warrant. Whatever price is used will be adjusted finally to the sales price by the pooling scheme."

Tin—A formal announcement appears elsewhere in this paper. This is to the effect that [illegible] tons of tin was purchased by the U. S. Steel Products Co., and [illegible] per lb. [illegible] to be sold for [illegible]. In the meanwhile American smelters and resellers hover a little under that figure. There was a sporadic market during the week in lots offered for resale and in American tin. At the beginning of the week Straits and equivalent grades were quoted at 72c. and 99% grades at 71c. At the close quotations were 71 and 70c., respectively. A 25-ton lot of Straits tin was being offered for resale at 71c., without finding buyer.

The London tin quotations for Dec. 4 and 11 are respectively: Spot, £275, £275; 3 mo., £270, £270.

Zinc—This market became weaker from day to day on relatively small business. The statistical position as reflected by visible stocks is becoming impaired, and there is a great deal of uncertainty with regard to the invisible stocks. Consumers who are approached by sellers generally express themselves as being well provided with supplies.

The new official prices for spelter in Great Britain are £57 for good ordinary brands delivered at buyers' works, and £75 for refined (99.9%).

The company operating the zinc smelteries at Overpelt and Lommel, in Belgium, declared the usual dividends last fall. The report of the Austro-Belge Co., however, showed an operating loss.

Some of the Belgian zinc smelteries were operated during the war, as appeared from the occasional financial statements and production reports that were published in German papers. Since the armistice, we received word from an authoritative British quarter that the plants of the country have not experienced material damage. On Dec. 23 we received a dispatch dated in Brussels, Dec. 22, from an authority (than which there is none higher) in the zinc industry of Belgium, to the effect that owing to various causes it will be impossible to resume work in zinc smelteries of Belgium for an indeterminate time.

Zinc Sheets—Unchanged at $15 per 100 lb., less usual trade discounts and extras as per list of Feb. 4.

Other Metals

Aluminum—Unchanged at 33c. per lb. There is much aluminum on the market.

Antimony—This market was dull and weaker. During the first half of the week some sales were reported at 7⅝@7¾c., but during the latter half, beginning with Monday, carload lots were offered at 7½c., and we quote that price at the close.

British metal papers say that the quantity of the stocks of antimony that have been revealed in European markets is surprising.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.50 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.50@1.75 per pound.

Nickel—Market quotation: Ingot and shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Weaker but quiet. We quote New York at $115. San Francisco telegraphs $115, weak.

Gold, Silver and Platinum

Silver—The market is steady, London and New York unchanged. Production of silver for the year 1918 is estimated at 180,000,000 oz. Shipments for the week ended Dec. 21 were [illegible].

Mexican dollars at New York: Dec. 19, 77⅝; Dec. 20, 77⅝; Dec. 21, 77⅝; Dec. 23, 77⅝; Dec. 24, 77⅝; Dec. 25, ——.

Platinum—By a typographical error our quotation read last week [illegible], when, of course, [illegible] was meant. This week the market has been a little easier, the Government Assay Office offering to sell from its accumulated stock at [illegible]. We quote that price for refined ingot. Refiners bought sponge platinum at $100.

The New York Assay Office was the sole [illegible] for crude platinum bought by the Government during the last year. It handled upward of 60,000 oz., and has unused supplies which are now being sold at $105 per ounce.

Palladium—Quoted at $125

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 21—Blende per ton, high, $49.40; basis 60% zinc, no premium sold; Class B, $44; Prime Western, $42.50 @ 40; sludge and flotation, $37.50; calamine, basis 40% zinc, $35@30. Average selling prices: Blende, $42.10; calamine, [illegible]; all ores, $42.05.

Lead, high, $101.75; basis 80% lead, $100@80; average selling price, all grades of lead, $83.02 per ton.

Shipments the week: Blende, 9223; calamine, 148; lead, 1160 tons. Value, all ores the week, $496,320.

For the third week purchasers of ore on a premium basis have not appeared in the market, this week cleaning up on advance purchases, with no orders for purchases next week expected. Next week being holiday week, light business in all grades is expected. Buyers will attempt to load up advance purchases. There is no restriction of output. The output of 1916 averaged 5747 tons per week, filling a prewar demand. Today it is in excess of 8000 tons per week, with stock accumulating.

Platteville, Wis., Dec. 21—Although the Government schedule was still effective, theoretically at least, no offerings were made by buyers on premium-grade zinc ore during the week. Neither were any sales of high-lead blende of 60% zinc reported. Lead ore, basis 80% lead, $75 per ton. Shipments reported for the week were 1022 tons blende, 103 tons galena, and 98 tons sulphur ore. For the year to date the totals are 119,875 tons blende, 7791 tons galena, and 39,523 tons sulphur ore. During the week 2409 tons blende was shipped to separating plants.

Other Minerals

Pyrites—Spanish pyrites is quoted, subject to the raising of the embargo, at 16½c. on the basis of 10s. ocean freight. Restrictions still continue. Unchanged. Ocean freights have fallen to 30s.

Iron Trade Review

PITTSBURGH—Dec. 23

There is little demand for steel products, in the aggregate, on contract, and practically no demand from new buyers. In pig iron, contract shipments are being taken fairly well, relatively speaking, but there is no new demand. Many mills, perhaps the majority, have closed for the present week, and some that found occasion to operate this week will close later. In several instances, indeed, mills operate this week only because they wish to clean up orders for a protracted closing.

Three influences conspire to make the demand for steel particularly light at this time. The first, of course, is the readjustments that customers must make in their affairs in shifting from a war to a peace basis. The second is the reduction in steel prices, as reductions always cause a halt. The third is the season of the year, which is always a dull one in the steel market, on account of inventories and other matters.

The real test of the steel market will hardly come before the second half of January, so extensive are the adjustments and rearrangements that buyers of steel must make. Though the mills, in the aggregate, have a considerable volume of specifications on hand, it will not require many weeks to fill them, and unless there is a sudden and extensive revival in demand, steel mill operations will probably be at less than [illegible] of capacity by the end of January, perhaps at less than 60 per cent.

Steel producers intend to hold to the recently reduced price levels as long as possible, by reason of the fact that for a few months at least demand will be chiefly against contracts rather than in the form of new buying. If demand continues light, there may be further declines, but the present attitude of the trade is that they can hardly be looked for before April 1 and possibly not until June. No heavy demand will spring up overnight, as there are so many adjustments to be made. To the average steel producer the matter of his customers' wage cost is of more concern than his own wage cost. This is the case with investments in particular, as permanent structures for purely investment purposes will not be erected as long as wage rates are so high and at the same time labor performance is so unsatisfactory.

Pig Iron—To date the blast furnaces have been altogether indisposed to reduce their prices $3 a ton, in accordance with the general program suggested by the price committee of the American Iron and Steel Institute, although the steel producers promptly adopted their part of the program. Some furnace interests seem to think reductions may occur immediately after Jan. 1, but the general feeling among merchant blast furnacemen is not to reduce prices until this is absolutely necessary. The furnaces are fairly well sold up, and customers are expected to take their iron. There are occasional lots of resale iron offered at cut prices, but they do not make a market. We quote the market steady but absolutely inactive at the old Government prices: Bessemer, $35.20; basic, $33; foundry, $34; malleable, $34.50; forge, $33, f.o.b. basing point, freight from Valleys to Pittsburgh being $1.40 and from six detached furnaces somewhat less.

Steel—There are freer offerings of soft steel and discard steel, but little demand. Discard steel would not bring over $40 at the outside. Soft steel is quotable at the $4 reduction: Billets, $43.50; sheet bars and small billets, $47; slabs, $46. Rods are $57, the old Government price not having been reduced.

Ferroalloys

Ferroalloys—There is absolutely no market, buyers showing no interest, and it would probably require heavy cuts to effect sales of either ferromanganese or spiegeleisen. As previously reported, resale ferromanganese has been offered at $240, delivered, or $10 under the old price, without effecting sales. As stated, furnaces recently reduced their asking price on spiegeleisen $5 to $70, f.o.b. furnace, which remains the asking price.

Coke—Indications remain that the Fuel Administration will relinquish its control of coke prices at the end of this month. By reason of the curtailment in production caused by influenza, coke has been scarce, and unless furnaces slow down their operations, as they may do, an open market in coke might result in higher prices. So many mills are closing for the week, however, that blast furnaces are likely to slow down, though without actually banking.

MONTHLY AVERAGE PRICES OF METALS

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481	23.500	136.750	110.000	151.000	125.000
April	27.935	23.500	133.842	110.000	147.158	125.000
May	28.788	23.500	130.000	110.000	142.000	125.000
June	29.962	23.500	130.000	110.000	142.000	125.000
July	26.620	25.904	128.409	119.913	140.409	134.913
Aug.	25.380	26.000	122.391	122.000	137.000	137.000
Sept.	25.073	26.000	117.500	122.000	135.250	137.000
Oct	23.500	26.000	110.000	122.000	125.000	137.000
Nov.	23.500	26.000	110.000	122.000	125.000	137.000
Dec.	23.500	..	110.000	....	125.000	.
Year	27.180	.	124.892	.	138.401	

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.530	6.684	30.500	29.00
February	8.636	6.973	8.595	6.899	30.500	29.00
March	9.199	7.201	9.120	7.091	30.500	29.00
April	9.288	6.772	9.158	6.701	30.500	29.00
May	10.207	6.818	10.202	6.704	30.500	29.00
June	11.171	7.611	11.123	7.511	30.500	29.00
July	10.710	8.033	10.644	7.750	30.500	29.00
August	10.594	8.050	10.518	7.750	30.500	29.00
September	8.680	8.050	8.611	7.750	30.500	29.00
October	6.710	8.050	6.650	7.750	30.500	29.00
November	6.249	8.050	6.187	7.750	30.500	31.20
December	6.375	....	6.312	...	30.500	.
Year	8.787		8.721		30.500	

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7.836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300	7.461	10.130	7.286	47.000	54.000
April	9.459	6.890	9.289	6.715	54.632	54.000
May	9.362	7.314	9.192	7.114	54.000	54.000
June	9.371	8.021	9.201	7.791	54.000	54.000
July	8.643	8.688	8.473	8.338	54.000	54.000
August	8.360	8.985	8.190	8.635	54.000	54.000
September	8.136	9.442	7.966	9.092	54.000	54.000
October	7.983	8.801	7.813	8.451	54.000	54.000
November	7.847	8.491	7.672	8.141	54.000	54.100
December	7.685		7.510		54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

STOCK QUOTATIONS

N. Y. EXCH.†	Dec. 23
Alaska Gold M.	3¼
Alaska Juneau	1½
Am.Sm.&Ref.,com.	77⅞
Am.Sm. & Ref., pf.	107¾
Am.Sm.Sec., pf., A	92½
Am. Zinc	12
Am. Zinc, pf.	44¼
Anaconda	63
Batopilas Min	1¾
Bethlehem Steel	61⅝
Butte & Superior	19½
Butte Cop & Zinc	6½
Cerro de Pasco	33¼
Chile Cop	19
Chino	33⅞
Colo. Fuel & Iron	38½
Crucible Steel	57
Crucible Steel, pf	87½
Dome Mines	12
Federal M. & S.	10½
Federal M. & S., pf.	38¼
Greater Nor., ore ctf	32⅛
Greene Cananea	45
Gulf States Steel	61
Homestake	94
Inspiration Con.	44¾
International Nickel	32½
Kennecott	33⅞
Lackawanna Steel	67⅝
Mexican Petrol.	166¾
Miami Copper	23¼
Nat'l Lead, com.	65
National Lead, pf.	105
Nev. Consol	17¼
Ontario Min	7⅛
Ray Con.	20½
Republic I.&S.,com.	74¼
Republic I.&S., pf.	97
Sloss-Sheffield	49
Tennessee C. & C.	14
U. S. Steel, com	95⅜
U. S. Steel, pf	112⅛
Utah Copper	73⅜
Va. Iron C. & C.	55½

BOSTON CURB*	Dec. 23
Alaska Mines Corp	‡.12
Boston Ely	.93
Boston & Mont.	.55
Butte & Lon'n Dev.	.11
Calaveras	1½
Chief Con.	6⅛
Contact	‡.05
Corbin	‡.25
Cortez	.15
Crown Reserve	.23
Crystal Cop.	‡.29
Eagle & Blue Bell	2⅜
First Nat. Cop.	‡2⅛
Houghton Copper	.30
Intermountain	‡.05
Iron Blossom	.55
Iron Cap	15½
Majestic	.22
Mexican Metals	.32
Mines of America	‡.75
Mojave Tungsten	.05
Nat. Zinc & Lead	.10
Nevada-Douglas	.35
New Baltic	1
New Cornelia	16
Oneco	.25
Pacific Mines	‡.35
Rex Cons	‡.05
Yukon Gold	1

SAN FRAN.*	Dec. 23
Alta	‡.03
Andes	.04
Best & Belcher	.01
Caledonia	.01
Challenge Con	‡.03
Confidence	.06
Con. Virginia	.06
Gould & Curry	‡.01
Hale & Norcross	.01
Jacket-Cr. Pt.	.03
Mexican	.02
Occidental	.40
Ophir	.02
Overman	.01
Savage	‡.02
Sierra Nevada	.08
Union Con.	.05
Utah Con.	‡.01
Belmont	2.50
Jim Butler	.36
MacNamara	.33
Midway	.18
Mont.-Tonopah	.13
North Star	.07
Rescue Eula	.07
West End Con.	1.20
Atlanta	.04
Booth	.11
Comb. Frac.	‡.02
Florence	.15
Jumbo Extension	.13
Kewanas	.05
Nevada Hills	.04
Nevada Packard	.32
Round Mountain	.21
Silver Pick	.05
White Caps	.09

COLO. SPRINGS*	Dec. 23
Cresson Con.	4.93¾
Doctor Jack Pot	.04¼
Elkton Con.	.06
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.75
Granite	.17¼
Isabella	.06¼
Mary McKinney	.07¾
Portland	1.05
United Gold M.	.14½
Vindicator	.43

BOSTON EXCH.†	Dec. 23
Adventure	‡.60
Ahmeek	71
Algomah	‡.30
Allouez	44
Ariz. Com.	12½
Arnold	‡.20
Bingham Mines	‡10
Bonanza	‡.10
Butte-Balaklava	.30
Calumet & Ariz	64
Calumet & Hecla	432½
Centennial	14
Copper Range	43
Daly West	‡2⅝
Davis-Daly	4½
East Butte	9½
Franklin	3⅜
Granby	‡79
Hancock	6
Hedley	‡12
Helvetia	‡.20
Indiana	‡.80
Isle Royale	24½
Keweenaw	‡1
Lake	5⅛
La Salle	‡3
Mason Valley	2⅞
Mass	4
Mayflower	‡3⅛
Michigan	‡3⅛
Mohawk	52
New Arcadian	‡1⅛
New Idria	‡13
North Butte	12⅛
North Lake	‡.75
Ojibway	‡1⅛
Old Dominion	‡35
Osceola	50
Quincy	62
St. Mary's M.L.	‡45
Santa Fe	.31
Seneca	14
Shannon	3½
Shattuck-Ariz.	‡16½
So. Lake	‡1½
So. Utah	‡.11
Superior	6½
Superior & Bost.	‡3¼
Trinity	2⅜
Tuolumne	‡.80
U. S. Smelting	‡47⅞
U. S. Smelting, pf.	‡46⅜
Utah Apex	3½
Utah Con.	8½
Utah Metal	1⅛
Victoria	2¼
Winona	‡.96
Wolverine	19
Wyandot	‡.50

N. Y. CURB†	Dec. 23
Big Ledge	[illegible]
Butte & N. Y.	.37½
Butte Detroit	.02½
Caledonia	.31
Calumet & Jerome	.37½
Can. Cop. Corpn.	2⅛
Carlisle	‡2
Cashboy	.07
Con. Ariz. Sm.	1⅛
Con. Coppermines	6⅛
Goldfield Con.	.27
Goldfield Merger	‡.08½
Greenmonster	‡[illegible]
Hecla Min.	5[illegible]
Howe Sound	4⅛
Jerome Verde	‡.50
Louisiana	‡[illegible]
Magma	25
Marsh	.05
McKinley-Dar-Sa.	‡.47
Milford	‡.75
Mother Lode	.35
Nixon Nevada	.51
Ohio Cop.	‡.75
Rawley	‡2⅜
Ray Hercules	3⅜
Richmond	‡.56
Rochester Mines	.28
St. Joseph Lead	13½
Standard S. L.	⅛
Stewart	.16
Success	.09
Tonopah	‡3⅜
Tonopah Ex.	1⅛
Tribullion	‡⅛
Troy Arizona	‡.10
United Eastern	4⅛
United Verde Ext.	‡35⅛
United Zinc	‡⅛
Utica Mines	‡.08

TORONTO*	Dec 23
Adanac	.08
Bailey	.03
Beaver Con.	.35
Chambers Ferland	.09
Coniagas	2.00
Hargraves	.02
Kerr Lake	5.00
La Rose	.31½
Lake Shore	.92
Min. Corp of Can.	2.00
Nipissing	8.75
Peterson Lake	.07
Temiskaming	.28
Wettlaufer-Lor.	.03
Davidson	.60
Dome Exten.	.24
Dome Lake	.15
Hollinger	6.12½
McIntyre	1.62½
Newray	.12½
Porcu. Crown	.24
Teck-Hughes	.30
Vipond	.20
West Dome	.14

* Bid prices. † Closing prices. ‡ Last quotations.

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